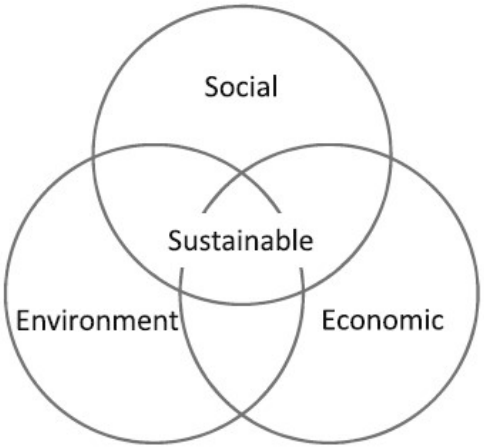
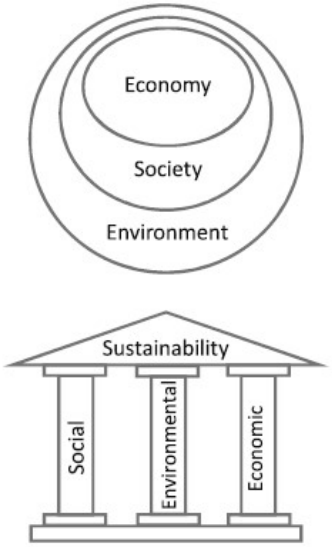
Sustainable development

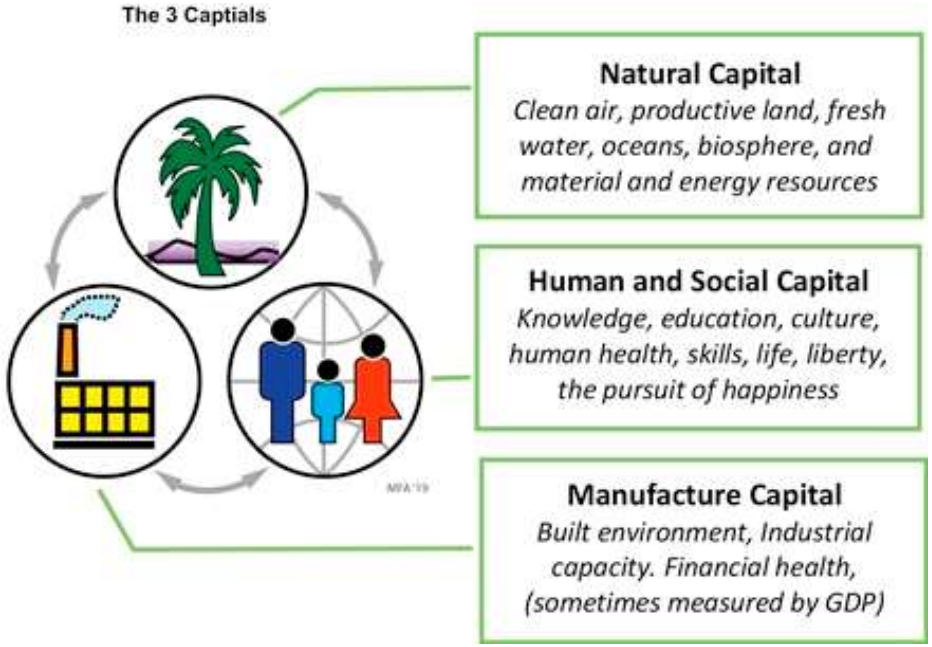
"...development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

1987, published by the World Commission on Environment and Development (WCED) in 1987. Also known as the Brundtland report

The “three P’s” and their reinterpretation as three “capitals.”







These three pillars are not independent:

Natural Capital-Resources-Manufacturing-Financial Capital-Resources for supporting Education, Health care and Social support.

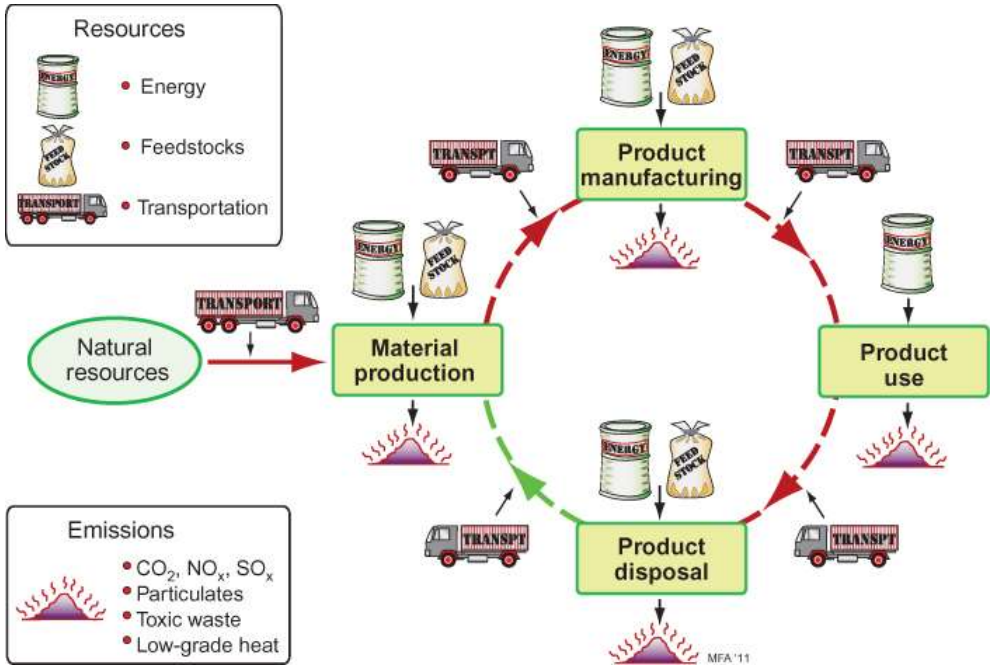
They can be mutually disruptive:

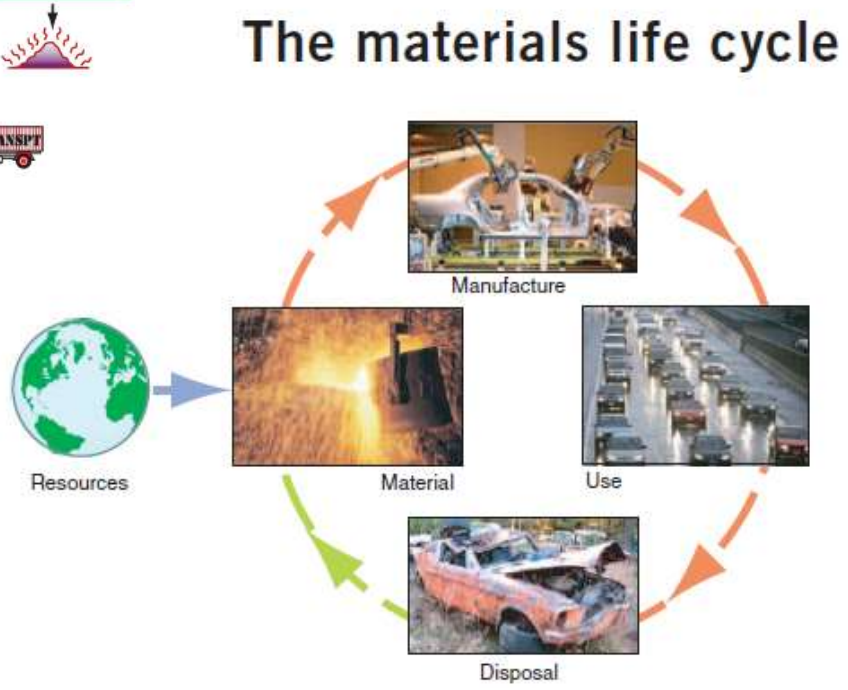
The consequences of profit-drive exploitation of nature without though for the environmental or social disruption that this can cause are well documented…Nature can bite back



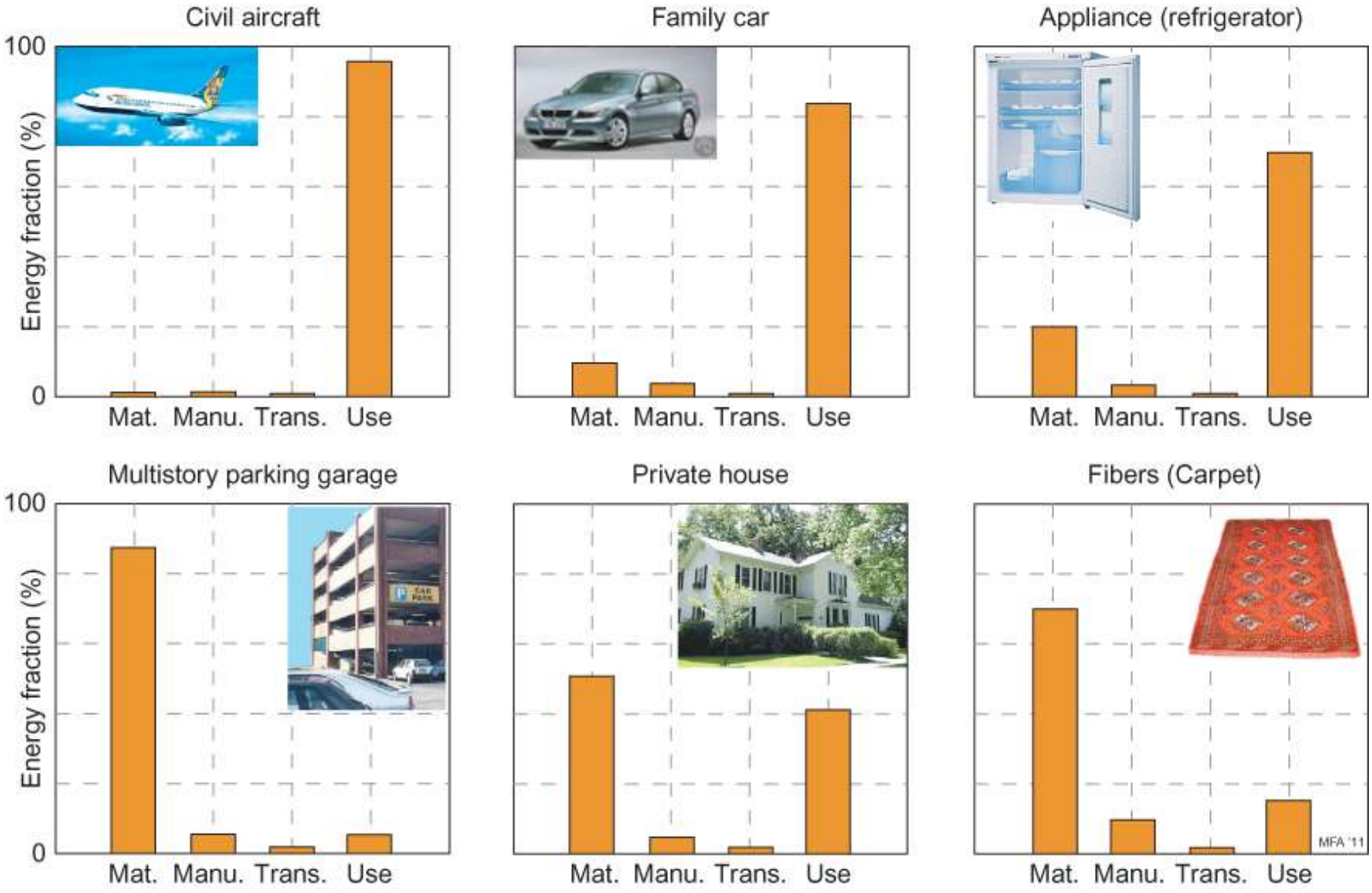
Sustainable developments developed In the 2030 Agenda for Sustainable Development Adopted by all 193 member states of the United Nations in 2015. It defines 17 development goals that include ending poverty and inequality, improving health and education, stimulating economic growth and tackling climate change.

Life Cycle Thinking





Life Cycle Thinking



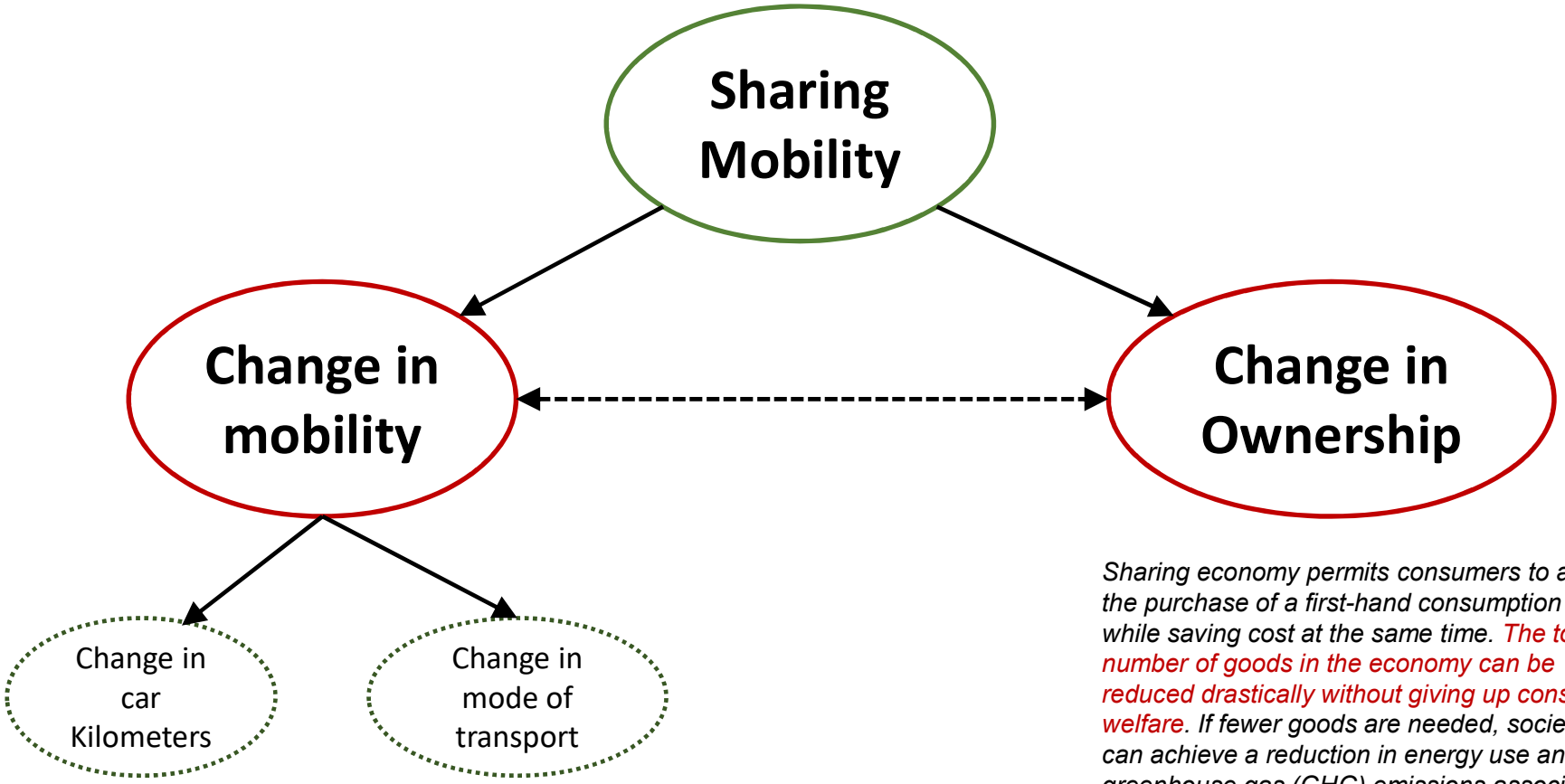
"The sharing economy is an emerging economic model usually defined as a peer-to-peer based sharing **of access to goods** and services, which are facilitated by a **community-based online platform**. It focuses on the sharing of **underutilised assets** in ways which improve efficiency, sustainability and community"

Source: Zhifu Mi, D'Maris Coffman, The sharing economy promotes sustainable societies. NATURE COMMUNICATIONS | (2019) 10:1214

" The meaning of sharing as 'sharing is use' is helpful if one wants to focus attention to the environmental benefits. In many cases, **consumers gain access to under-utilized goods** when they rent one another's goods. **If sharing practices were to scale up, the total number of consumer goods could go down considerably without loss of consumer welfare**. "

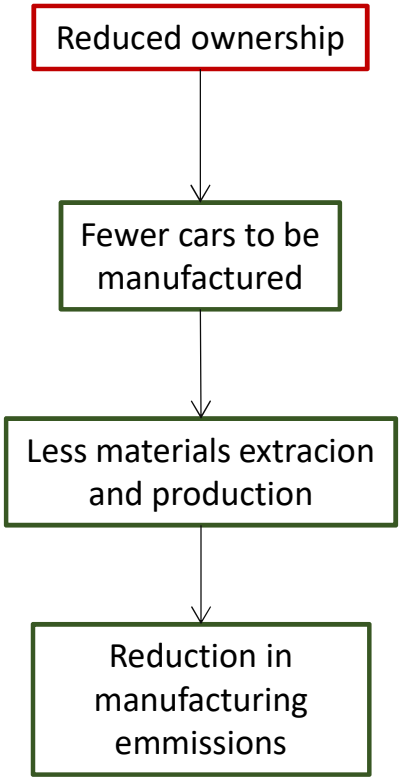
Source: Frenken K. 2017 Political economies and environmental futures for the sharing economy. Phil. Trans. R. Soc. A 375: 20160367
http://dx.doi.org/10.1098/rsta.2016.0367

- Vehicle utilization rate maximization
- Vehicle capacity/occupacy optimization



Sharing economy permits consumers to avoid the purchase of a first-hand consumption good, while saving cost at the same time. The total number of goods in the economy can be reduced drastically without giving up consumer welfare. If fewer goods are needed, societies can achieve a reduction in energy use and greenhouse gas (GHG) emissions associated with the production and demolition of goods.

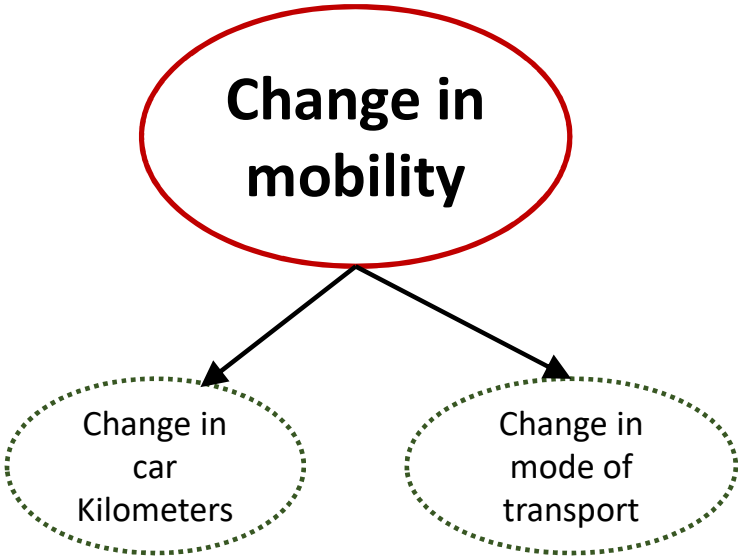
Source: Frenken K. 2017 Political economies and environmental futures for the sharing economy. Phil. Trans. R. Soc. A 375: 20160367. http://dx.doi.org/10.1098/rsta.2016.0367



Change in Ownership

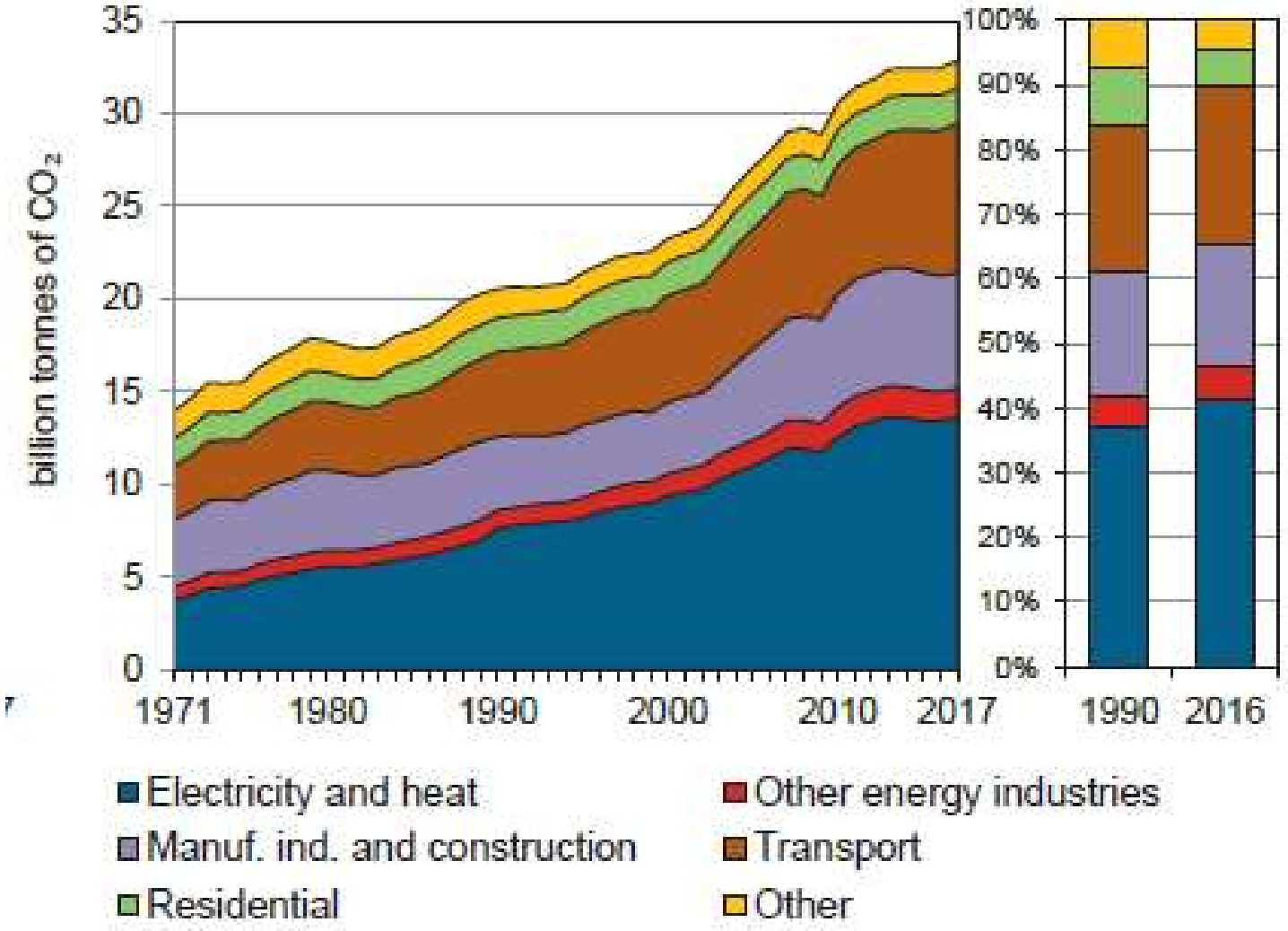
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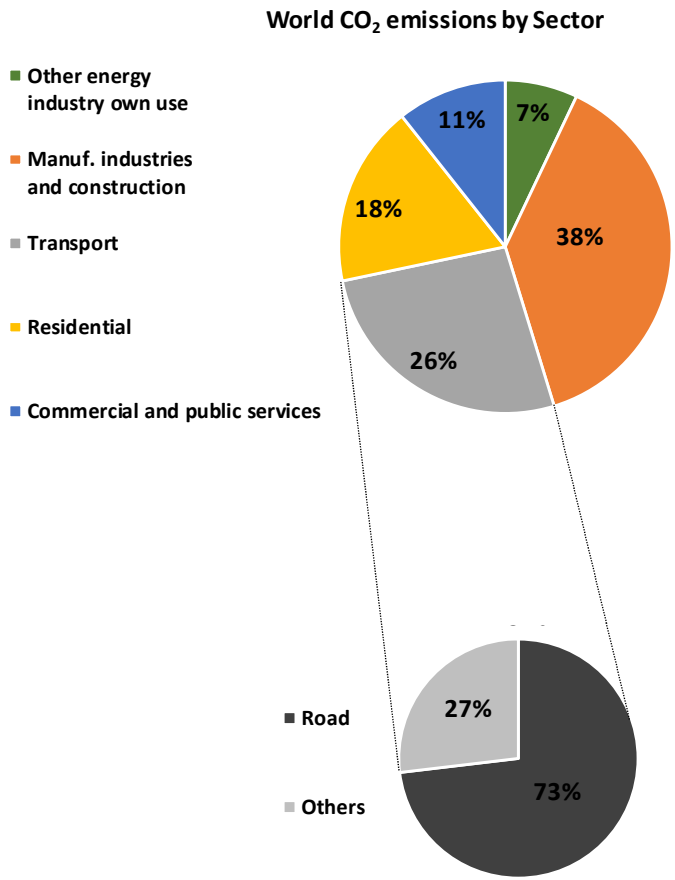
Source: Frenken K. 2017 Political economies and environmental futures for the sharing economy. Phil. Trans. R. Soc. A 375: 20160367. http://dx.doi.org/10.1098/rsta.2016.0367

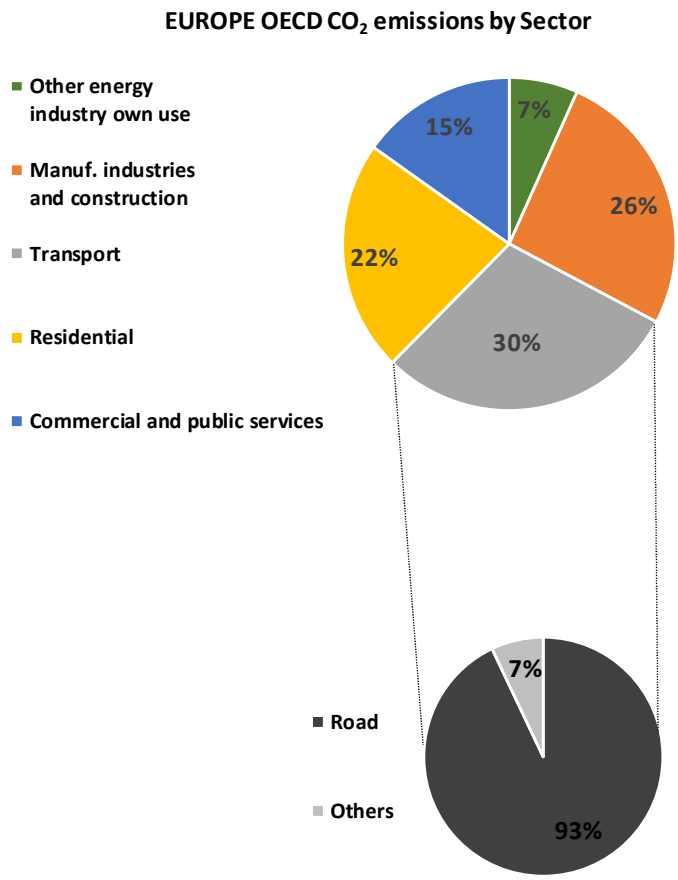


What are the benefits/repercussions on the environment of such a phenomenon?

Figure 2. CO_2 emissions by sector

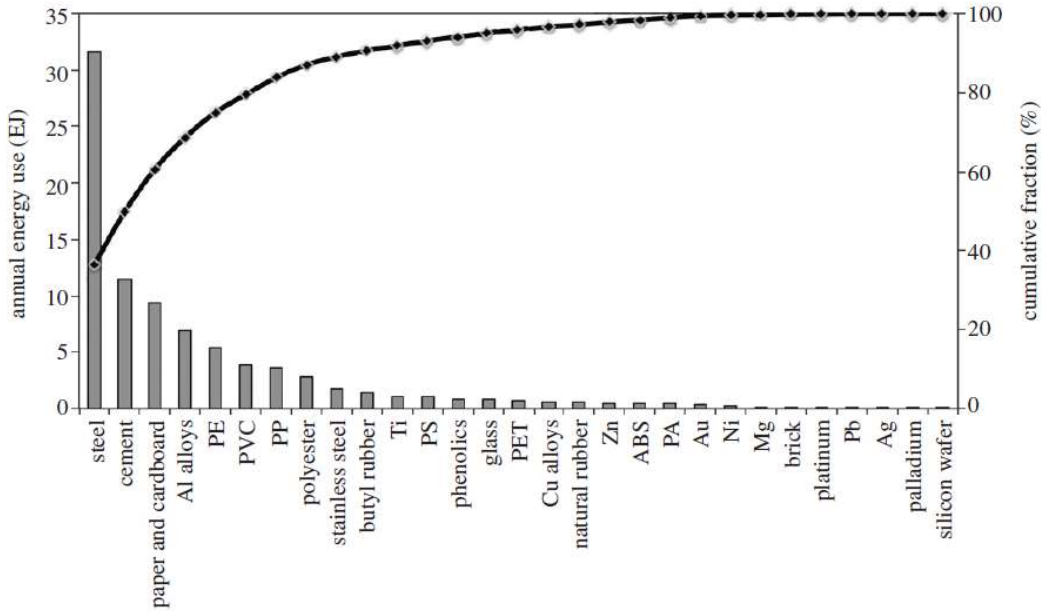






Source: IEA: CO_2 EMISSIONS FROM FOSSIL FUEL COMBUSTIONS- 2018

Materials production requires a large amount of energy use and is a significant source of greenhouse gas (GHG) emissions, producing approximately **25% of all anthropogenic CO_2 emissions.**



Just a few materials dominate material production, and if we track just the 'top five' (steel, cement, paper, aluminium and aggregated plastics), then these alone dominate the entire world material production sector whether measured by energy used or carbon dioxide emitted.

As far as metals are concerned, demand previsions state that, from 2005 to 2050, the demand for aluminum is expected to grow by a factor of between 2.6 and 3.5, while the demand for steel between 1.8 and 2.2

Source:Worrell Timothy G. Gutowski, Sahil Sahni, Julian M. Allwood, Michael F. Ashby and Ernst. The energy required to produce materials: constraints on energy-intensity improvements, parameters of demand *Phil. Trans. R. Soc. A 2013*

Steel flow breakdown analysis by End-use products

Vehicles account for 11.6%

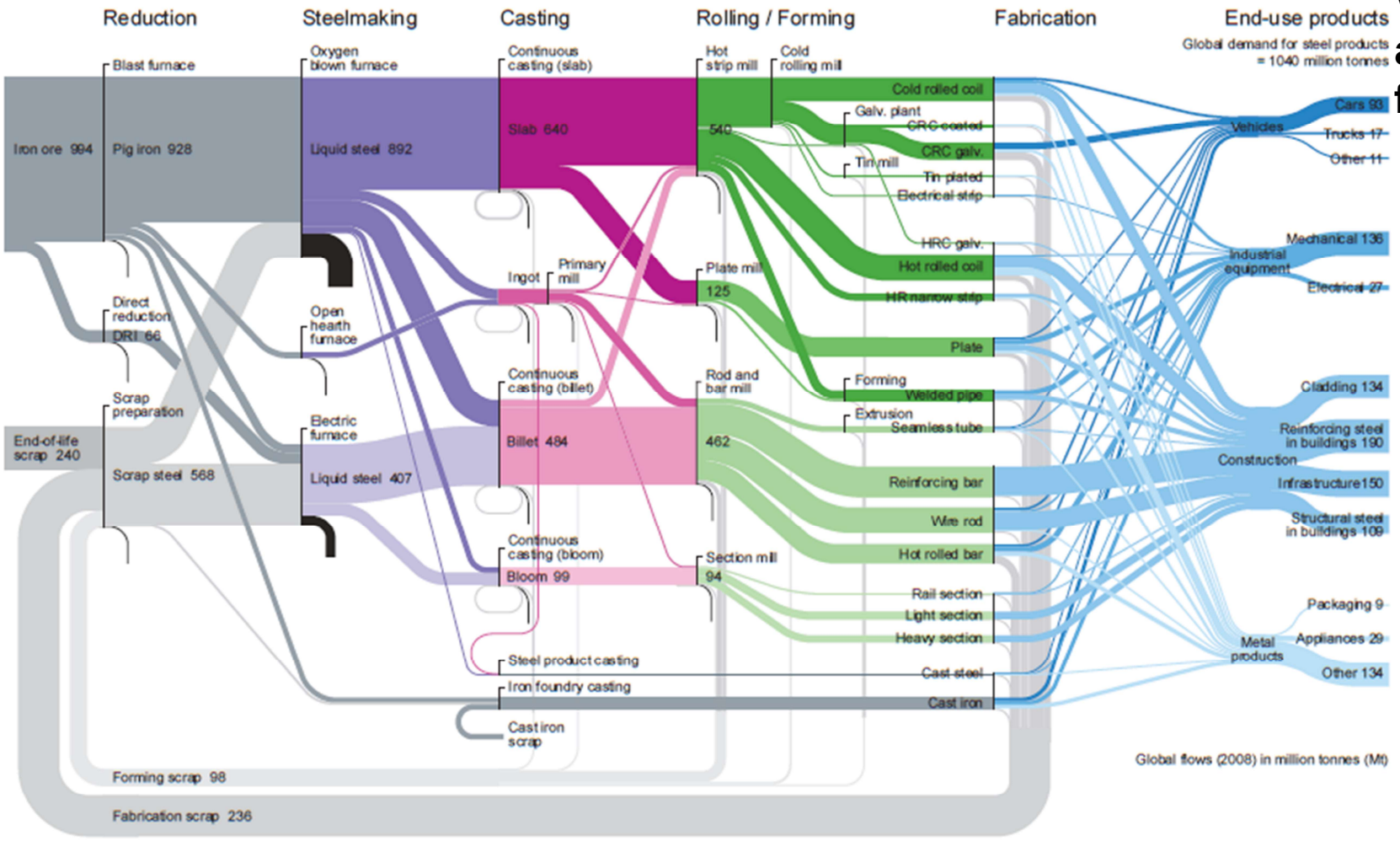


Figure 4.1—**Sankey of steel flow**

Source Sustainable materials with both eyes open Julian M Allwood Jonathan M Cullen. 2011

Aluminum flow breakdown analysis by End-use products

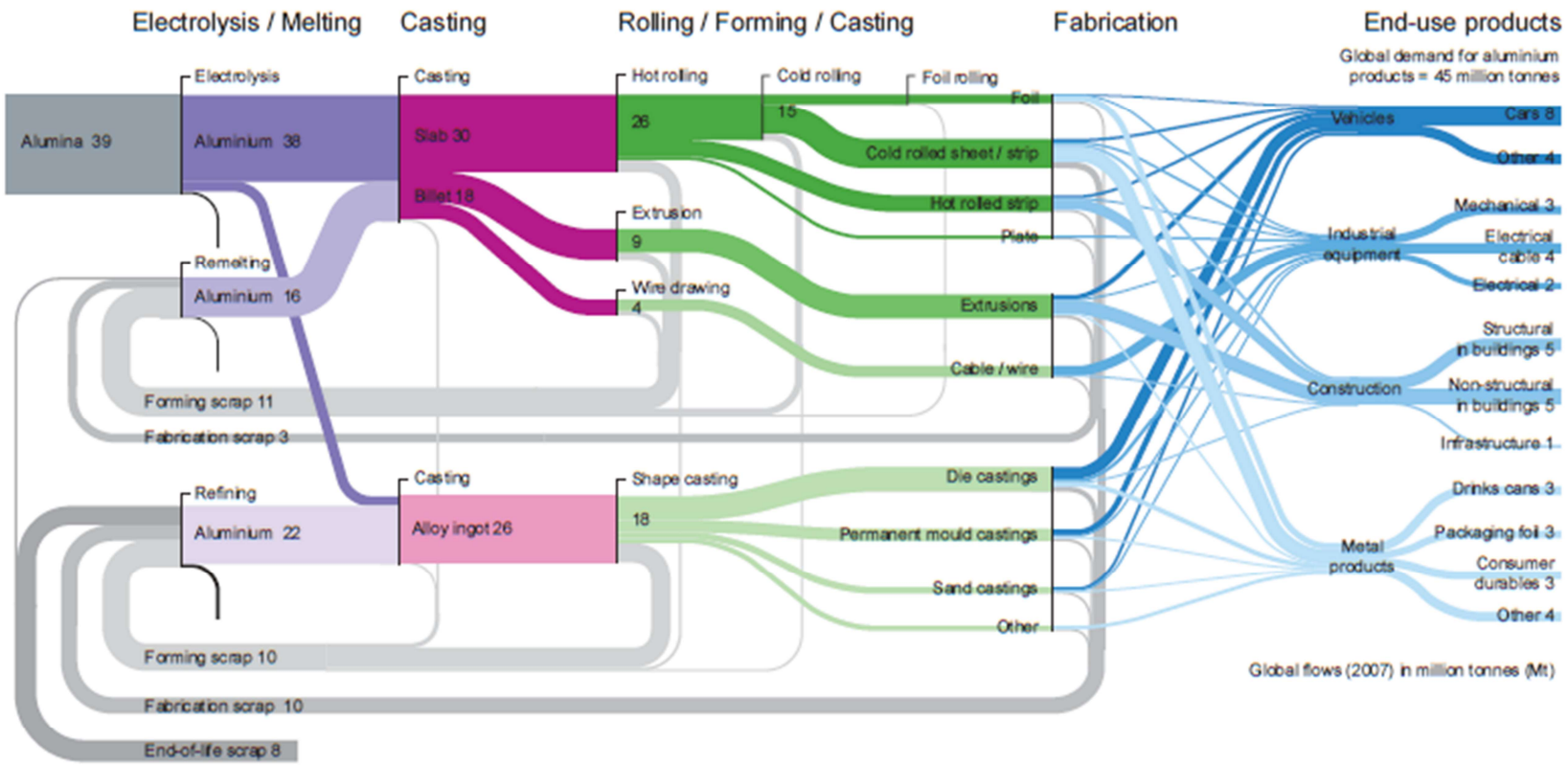


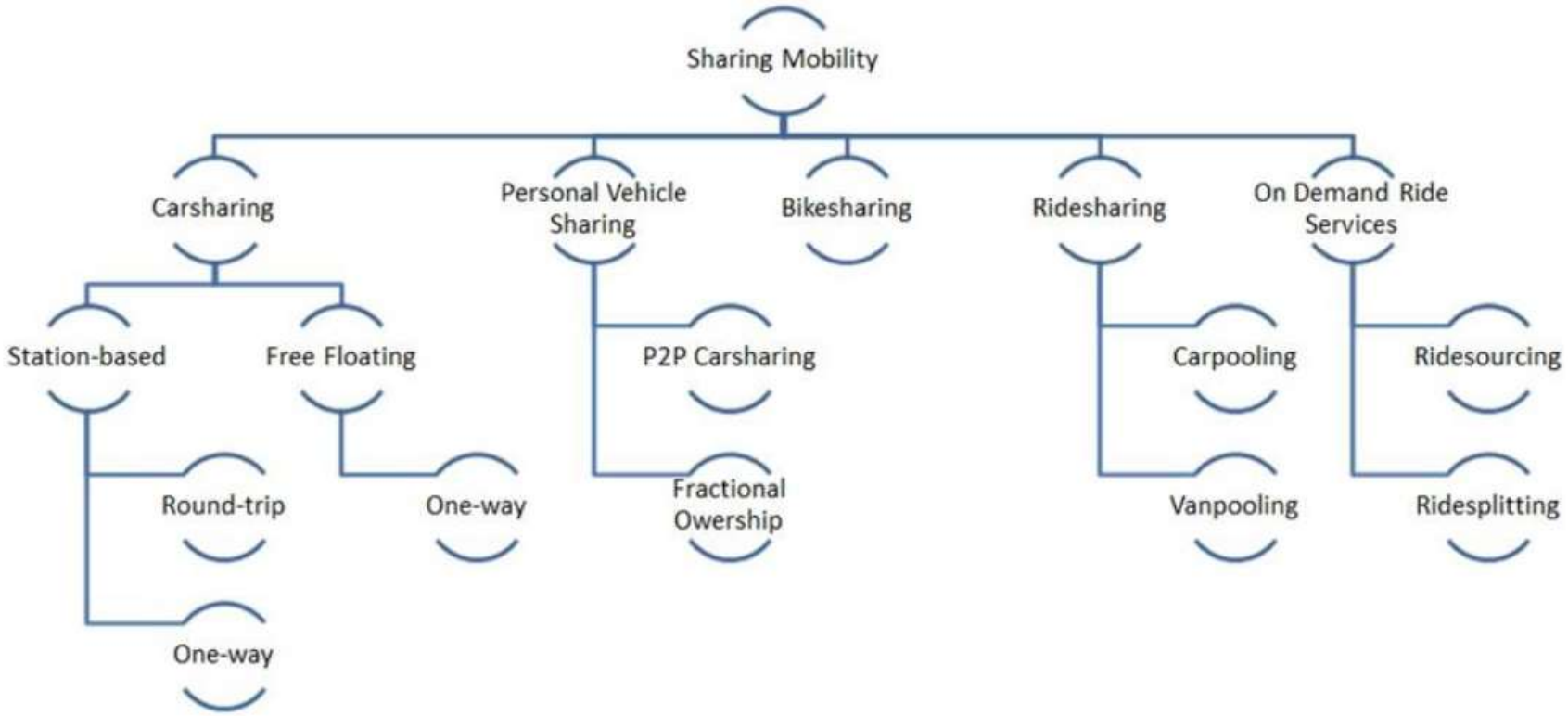
Figure 4.2—Sankey diagram of aluminium flow

Vehicles accounts for 26.6%

Source: Sustainable materials with both eyes open Julian M Allwood Jonathan M Cullen. 2011

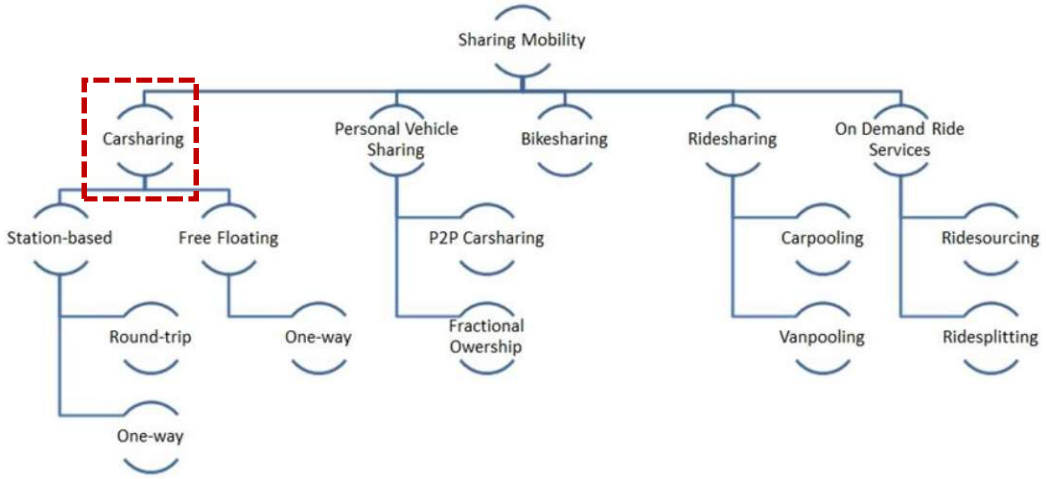
Shared mobility is an “umbrella” term that refers to a broad array of innovative transportation modes with different use cases, business models, and travel behavior impacts.

Shared mobility and its modalities



Sorce: An Overview of Shared Mobility Cláudia A. Soares Machado, Nicolas Patrick Marie de Salles Hue, Fernando Tobal Berssaneti and José Alberto Quintanilha . Sustainability 2018, 10, 4342; doi:10.3390/su10124342

Carsharing –BTC APPROACH

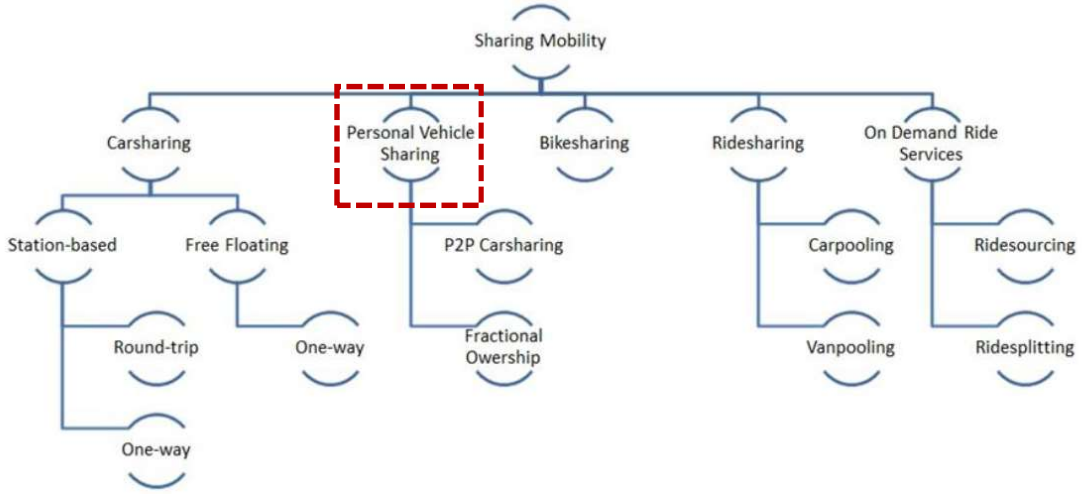


Short term rental of vehicles managed and owned by a provider.

Users typically access vehicles by joining an organization that maintains a fleet of vehicles deployed in lots located within neighborhoods and at public transit stations, employment centers, colleges and universities, and sometimes also using on-street parking.

Normally, the carsharing operator provides fuel, parking, and maintenance, and participants pay a fee each time they use a vehicle.

Personal Vehicle Sharing



Peer-to-Peer (PTP) Carsharing

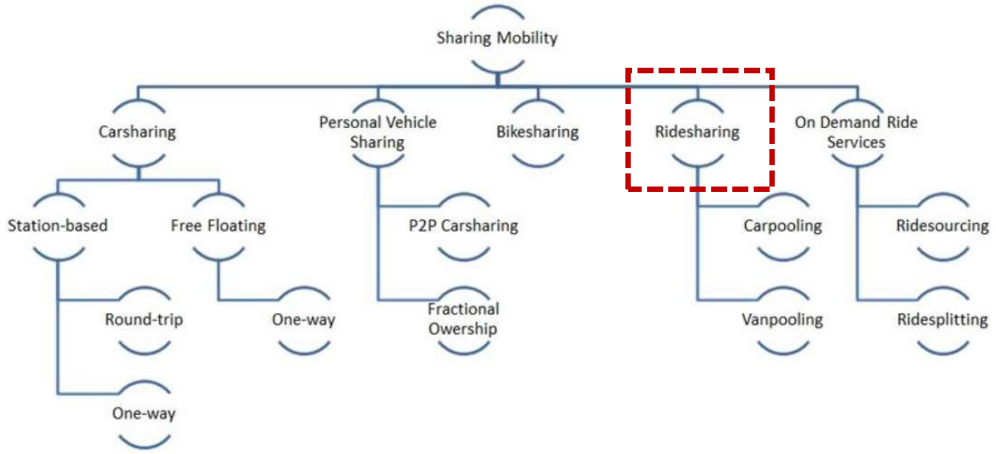
Personal Vehicle Sharing is a system in which car owners convert their personal vehicles into shared cars an rent them to other drivers on a short-term basis

The operator (company) intermediates the rental procedure by means of *peer to peer platform* where individuals can rent their cars when not in use.

getaround ex drivy

hiyacar

Ridesharing



Ridesharing pools multiple travelers with similar or overlapping paths (origins/destinations) and departure times in the same vehicle (generally a car or a van).

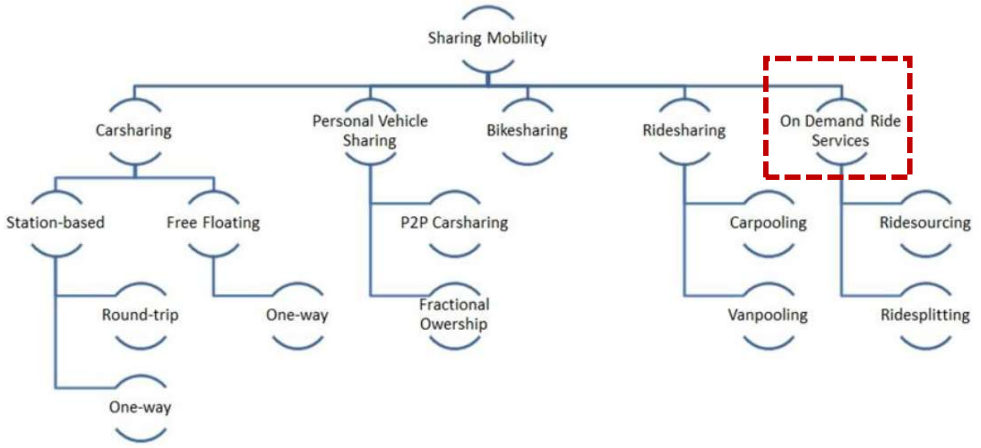
Informal carpooling programs are community-based initiatives (cooperatives) that expand the frame of the shared mobility beyond commercial models, with non-profit mobility schemes

An example is **BlaBlaCar,** a form of money-based carpooling which functions as a marketplace where drivers post their routes with prices, and passengers may buy seats.

Vanpools are typically composed of 7 to 15 people commuting on a regular basis using a van or similarly-sized vehicle who share the cost of the van and operating expenses, and may share the responsibility of driving.

Service very similar to vanpooling are collective taxis that use vans or minibuses in an on-demand service that picks up customers and drop them off where they want, maximizing the vehicle occupancy.

On-demand ride services

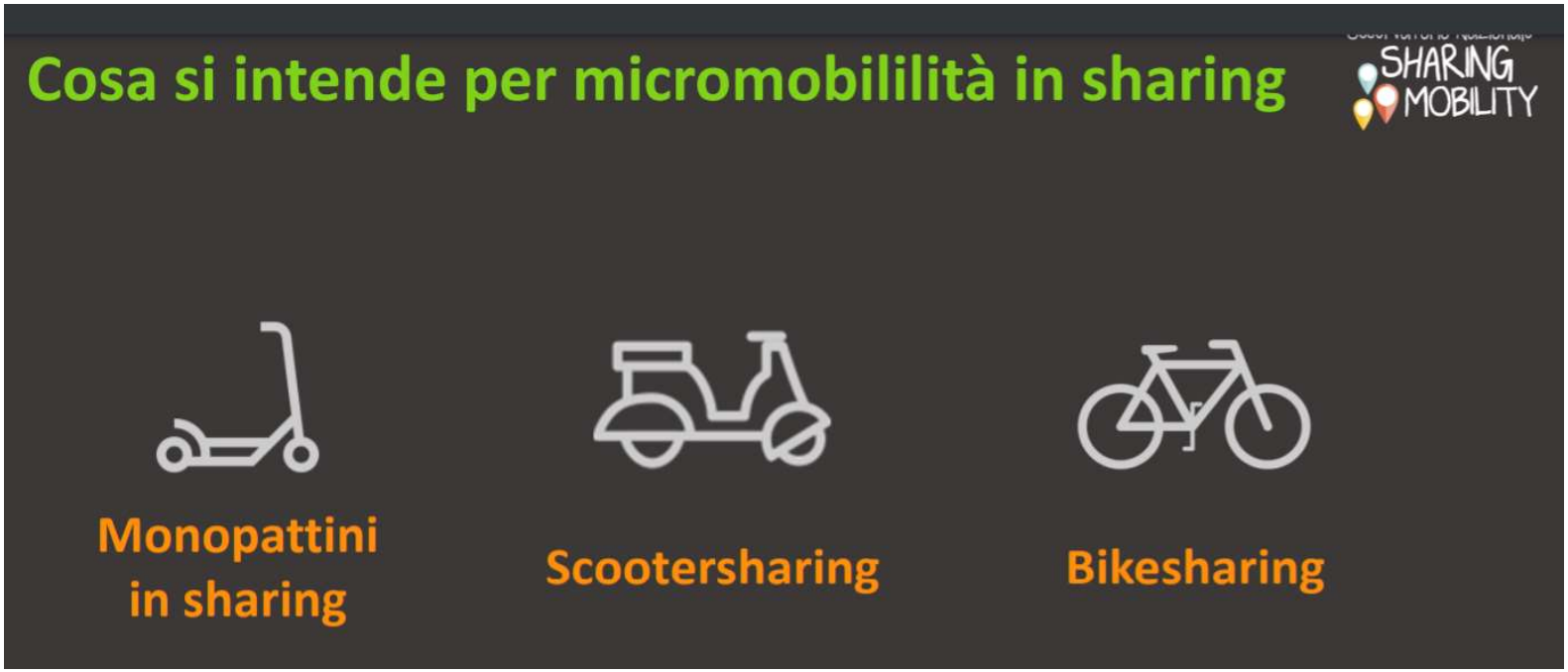


On-demand ride services are innovative means for people to access transportation options using their smartphones readily and when required

Ridesourcing

The companies own no cars themselves, but they sign up ordinary car owners who act as drivers. The service relies on an app, provided by the company, which also collects payment, taking a percentage of the total income

Uber



Spazio-Potenza-Peso

Tipologie di servizi di sharing mobility



Car sharing



Scooter sharing



Carpooling



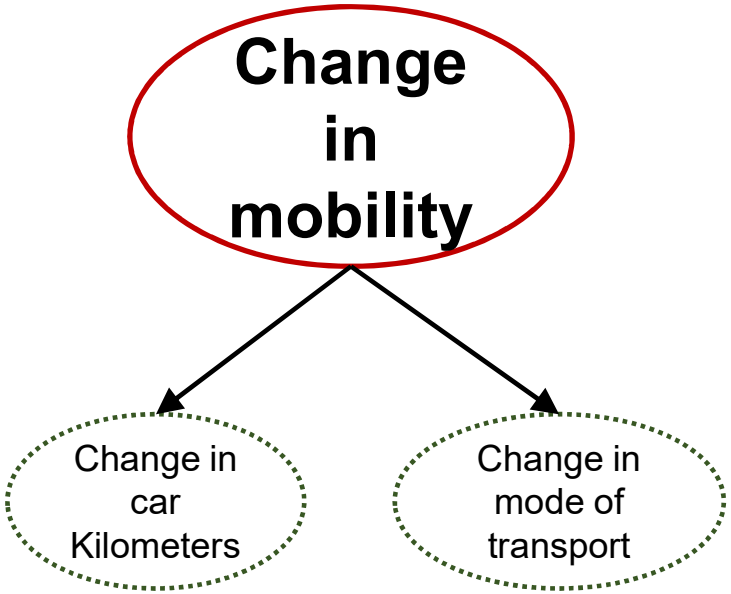
Bike sharing



Monopattino sharing



Taxi sharing



Factors to be taken into account:

- ✓ Shifting from public transportation to shared cars?
- ✓ Shifting from walking/riding a bike to shared car?
- ✓ Have the kilometers travelled by car increased/decreased?
- ✓ What are the repercussions/benefits on the congestion?
- ✓ …

Early studies estimate that vehicle ownership can be reduced by about 40–44%. Reduction in goods production it means reduction of resource consumption a greenhouse gas (GHG) emissions associated with the production and demolition of goods.

The average privately owned new vehicle in the U.S. is owned for 71.4 months (or approximately 6 years), on the other hand due to more VKT and faster wear and tear, the commercial car-share operations replace cars every 2–3 years.

Fuel efficiency improvements from faster fleet turnover, carsharing vehicles are more fuel efficient than the vehicles they replaced. This is due to a faster replacement rate of car-share vehicles since they have higher utilization rates

Change in Ownership

Replacing products with services

	Car ownership replaced by mobility service (taxi, bus, train, Uber)
	Ownership of copier replaced by copying service (Xerox)
	Home washing machine replaced by clothes-washing service (laundromats)
	Ownership of truck tires replaced by tire service (Michelin)
	Ownership of aircraft engines replaced by "power by the hour" service (Rolls Royce)
	Smartphone replacing phone, watch, web-browser, television .....

Taxis are more intensively used than private cars, Laundromats are more intensively used than home washers

The replacements of goods with services increases use intensity.

The ownership of the products and their materials remains in the hand of the product maker. It is than in the interest of the maker to make the product last as long as possible and to allow the reuse of its part rather than scrapping them.

Sustainable thinking and Sharing mobility Services

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