The role of materials

- **materials**
  - Steel beam
  - Water
  - Logs

- **products**
  - High-rise building
  - Wine bottle
  - Car

- **services**
  - Small wooden house
  - Fire
  - Subway
The steel industry is the world’s largest industrial source of GHG emissions; there is no material substitute for steel, since the demand for steel continue growing; steel making is already a very efficient process.
Global steel flows, 2008

- Make it lighter
- Keep it longer
- Use it more

(Cullen, J. et al., Mapping the global flow of steel: from steelmaking to end-use goods, 2012)
Material demand reduction

- Make it lighter
- Keep it longer
- Use it more

(Cullen, J. et al., Mapping the global flow of steel: from steelmaking to end-use goods, 2012)
Global production of crude steel

(WORLD STEEL ASSOCIATION, 2014)
Why do we use more materials?
Legacy and identity
Legacy and identity
Reuse
Material value

• Most products have:
  o Shorter lifetimes;
  o Diminished repair-ability.

• Products are replaced when the cost or effort to repair them outweighs their value.

  - Easy to repair;
  - Long lifetimes;
  - It has value when it fails.

  - Almost impossible to repair;
  - Short lifetimes;
  - Becomes waste when it fails.
Craft of use

- Craft of use — the actions that make products:
  - resourceful,
  - pleasurable,
  - cultivated

... through their use.

(Fletcher, K., *Craft of Use*, 2016)
Craft of use

- Land Rover Defender:
  - 80% of all Defenders ever made are still on the road;
  - Users appreciate its versatility, easiness to repair, simplicity, “immortality”, resourcefulness, and independence.

(Allwood, J. et al., *Land Rover Defender: Stories of Use*, 2014)
Craft of use

• Clothing:
  
  o Behaviour and consumption practices of users can determine the lifetime of products;
  
  o The strength of the user – object relationship determine lifetime.

(Fletcher, K., Reducing demand for materials through usership: an exploration of design, durability and fashion clothes, 2014)
Taking the most from what we already have

Global Stocks

- **3525 Mt**
  - ~550 Mt CO₂ / year
  - Other metal products
  - Domestic appliances
  - Packaging
  - Electrical machinery
  - Mechanical machinery
  - Rail
  - Line pipe
  - Bridges, tunnels, offshore

- **9874 Mt**
  - ~400 Mt CO₂ / year
  - Buildings (office blocks, industrial sheds etc.)

- **1376 Mt**
  - ~250 Mt CO₂ / year
  - Other
  - Ships
  - Trucks
  - Cars

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(Cooper, D. et al., *Component level strategies for exploiting the lifespan of steel in products*, 2014)
Conclusions

• Time = Money = Energy = Materials = (?) Better off

• The value of products and materials can be increased, although it’s often not captured by conventional metrics of success.

• There are opportunities for taking the most from existing stocks, fostering maintenance and repair.

• Innovation should focus downstream, where most added value and jobs can be created.

• Reducing material demand and its impacts can create societal value.
The Value of Materials

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AVNIR conference, Lille, France
8th November 2016