A tech-sustainable planet?

- Sustainability is linked with technology
- Technology is shaped by society
- To meet SDGs we need to redefine technology usage

(1) How can we better digitalize circular economy
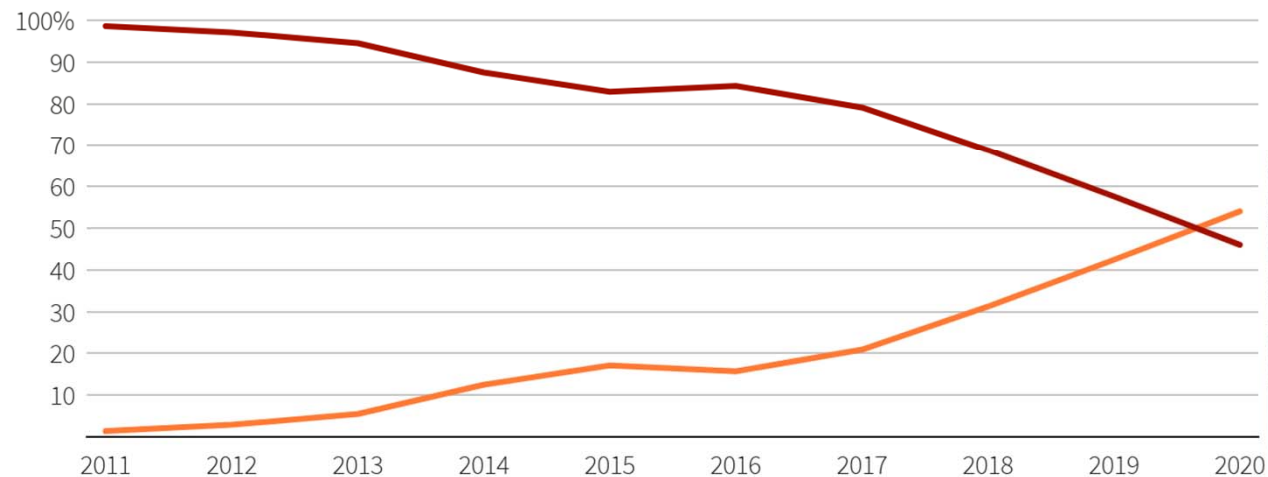**(2) and how can we create sustainable digital technologies?**

An example from Norway

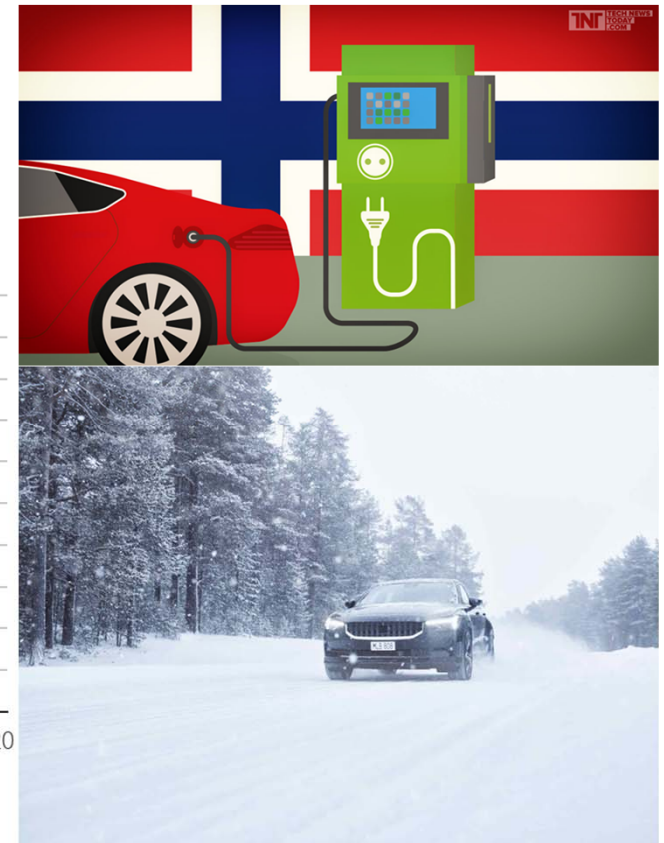*Electric car market in Norway of new sales is 54%*

Norway new car sales

Years 2011-2020, percentage of market

— Electric — Diesel & petrol, including hybrids

Source: Norwegian Road Federation (OFV)

Asia has an explosive growth in robotics

Operational stock of industrial robots ('000 of units)

Year	Asia/Australia	Europe	The Americas
2010	521	352	180
2011	577	370	193
2012	629	381	207
2013	689	392	226
2014	780	411	248
2015	887	433	274
2016	1,034	460	300
2017	1,253	498	324
2018	1,478	543	361
2019	1,688	580	389

Source: World Robotics 2020
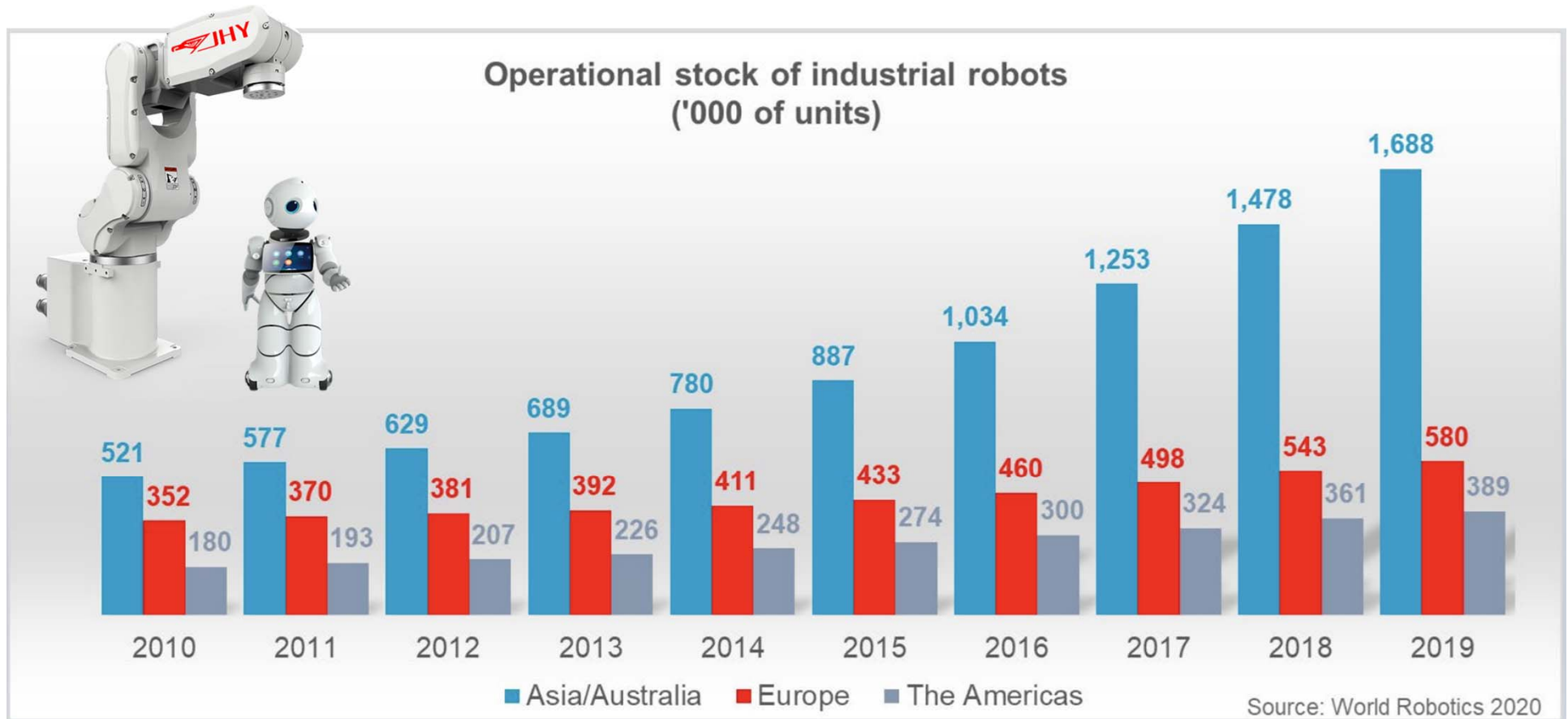
China is leading the way

Annual installations of industrial robots
15 largest markets 2019

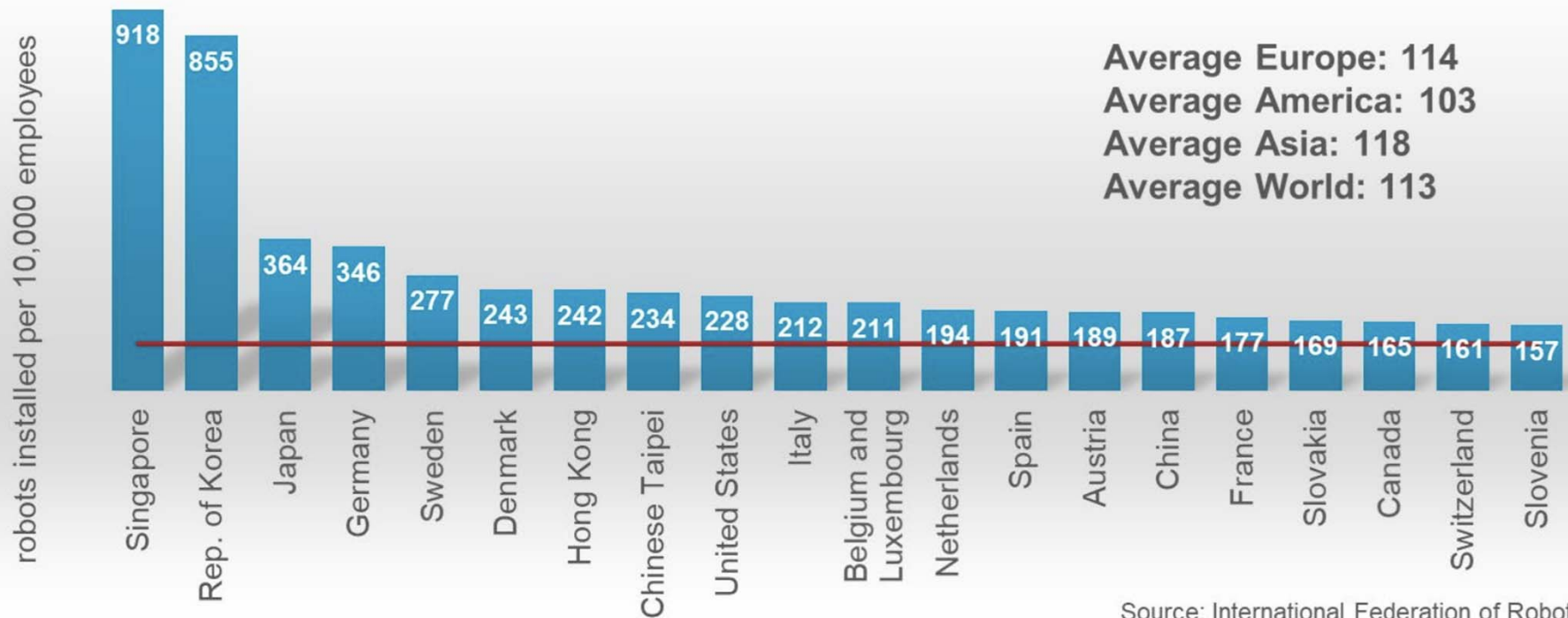| Country	'000 of units
China	140.5
Japan	49.9
United States	33.3
Rep. of Korea	27.9
Germany	20.5
Italy	11.1
France	6.7
Chinese Taipei	6.4
Mexico	4.6
India	4.3
Spain	3.8
Canada	3.6
Thailand	2.9
Poland	2.6
Czech Republic	2.6

'000 of units
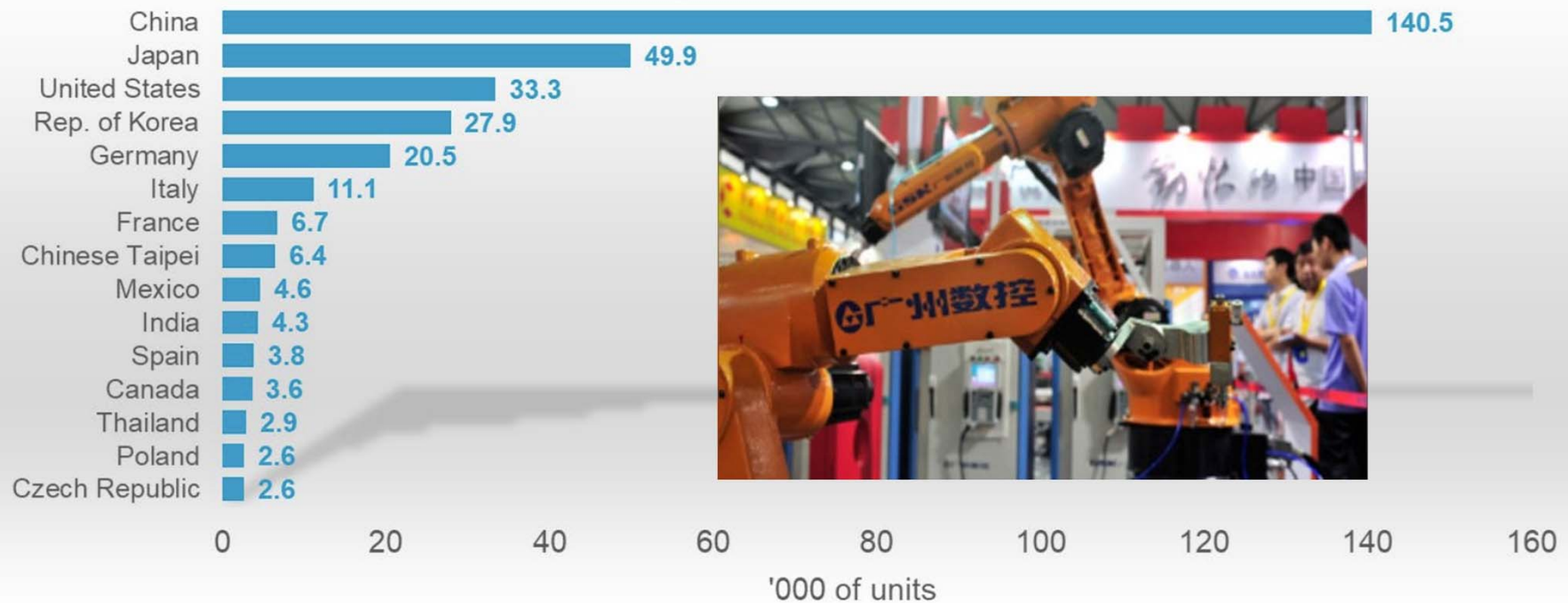
Source: World Robotics 2020

Robot density also on the rise in Asia

Robot density in the manufacturing industry 2019

Average Europe: 114
Average America: 103
Average Asia: 118
Average World: 113

robots installed per 10,000 employees

Country	Value
Singapore	918
Rep. of Korea	855
Japan	364
Germany	346
Sweden	277
Denmark	243
Hong Kong	242
Chinese Taipei	234
United States	228
Italy	212
Belgium and Luxembourg	211
Netherlands	194
Spain	191
Austria	189
China	187
France	177
Slovakia	169
Canada	165
Switzerland	161
Slovenia	157

Source: International Federation of Robotics

How does technology fit into a circular context?
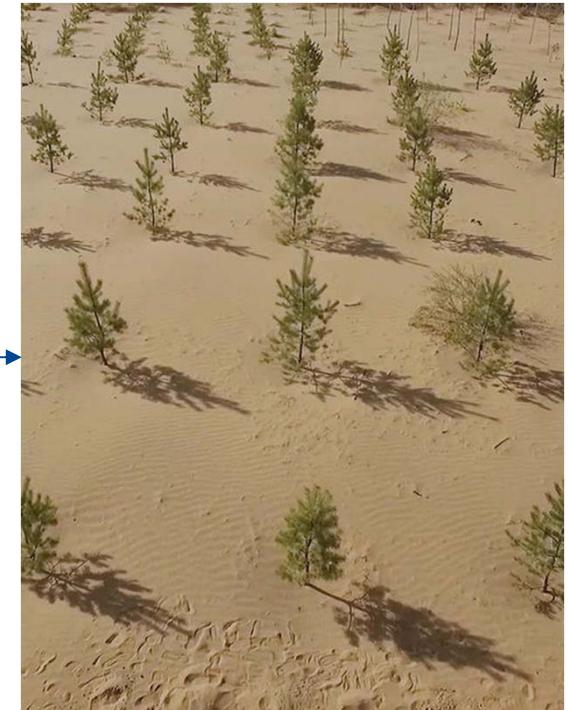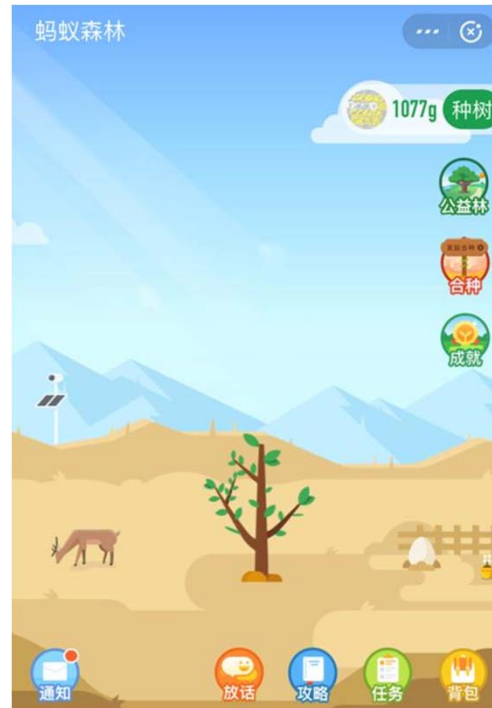
(1) What materials are used to create the technology?

(2) Is the technology lasting as long as possible?

(3) When unusable it recycled, reused, discarded?

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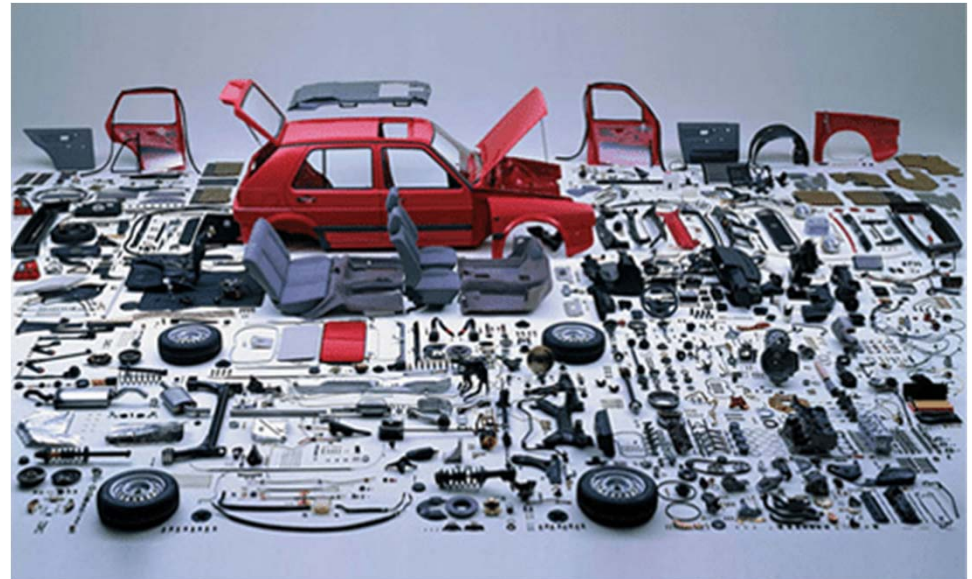
Alipay Ant Forest

- Using Digital Technologies to Scale up Climate Action

- Digital trees becoming real life trees

- Digital sustainability?

Robots Application during Pandemic

- Robot examples from Wuhan,

- Where the pandemic was
  quite severe,

- autonomous robot vehicles
  replaced delivery people with
  "autonomous robot cars" in
  special areas

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Healthcare is key

Belt and Road Initiative as a key infrastructure builder

How mobile healthcare sations are deployed in Bangladesh for example →

← My study: robots for older adults

IET The Institution of Engineering and Technology

Mobile Technologies for Delivering Healthcare in Remote, Rural or Developing Regions

Edited by
Pradeep Kumar Ray, Naoki Nakashima, Ashir Ahmed, Soong-Chul Ro and Yasuhiro Soshino

NTNU | Norwegian University of Science and Technology

Diversity and digitalization

- Digital technology often discriminate

- It is important to use diverse data, to represent diverse groups of people

- Example: Facial recognition technology is not as accurate on black and asian faces, and women are more misgendered than men.

- More inclusive databases needed

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12
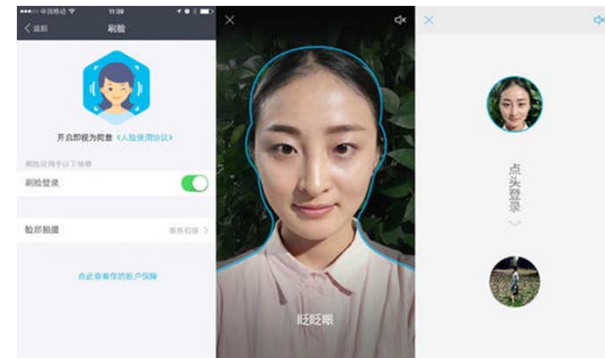
Beyond the technological fix

- New solutions can create new problems
- Is increased consumption always favourable?

" there is a point after which technological development becomes anti-economic and anti-human; the damage It causes outweighs its benefits."

The Emergent Role of Digital Technologies in the Circular Economy: A Review ☆

Aris Pagoropoulos, Daniela C.A. Pigosso, Tim C. McAloone

NTNU | Norwegian University of Science and Technology

Articles

The Circular Economy at a Crossroads: Technocratic Eco-Modernism or Convivial Technology for Social Revolution?

Andrea Genovese & Mario Pansera

A green, circular, future through tech?

switchasia

can play an important role

Thank you, questions?

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