Circular Economy and Digital World

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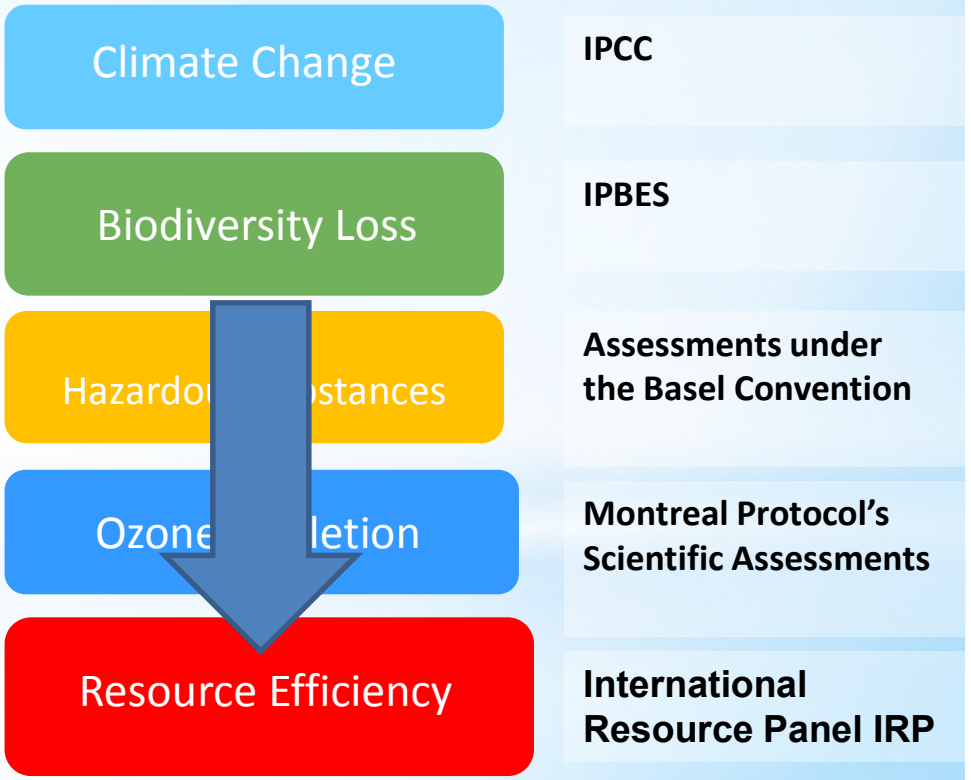
INTERNATIONAL POLICY NEEDS A SCIENCE BASE

The international resource panel was created in 2007 as a science-policy interface in responding to economic growth, escalating use of natural resources and deteriorating environment and climate change.



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SDGs DIRECTLY DEPENDENT ON NATURAL RESOURCES

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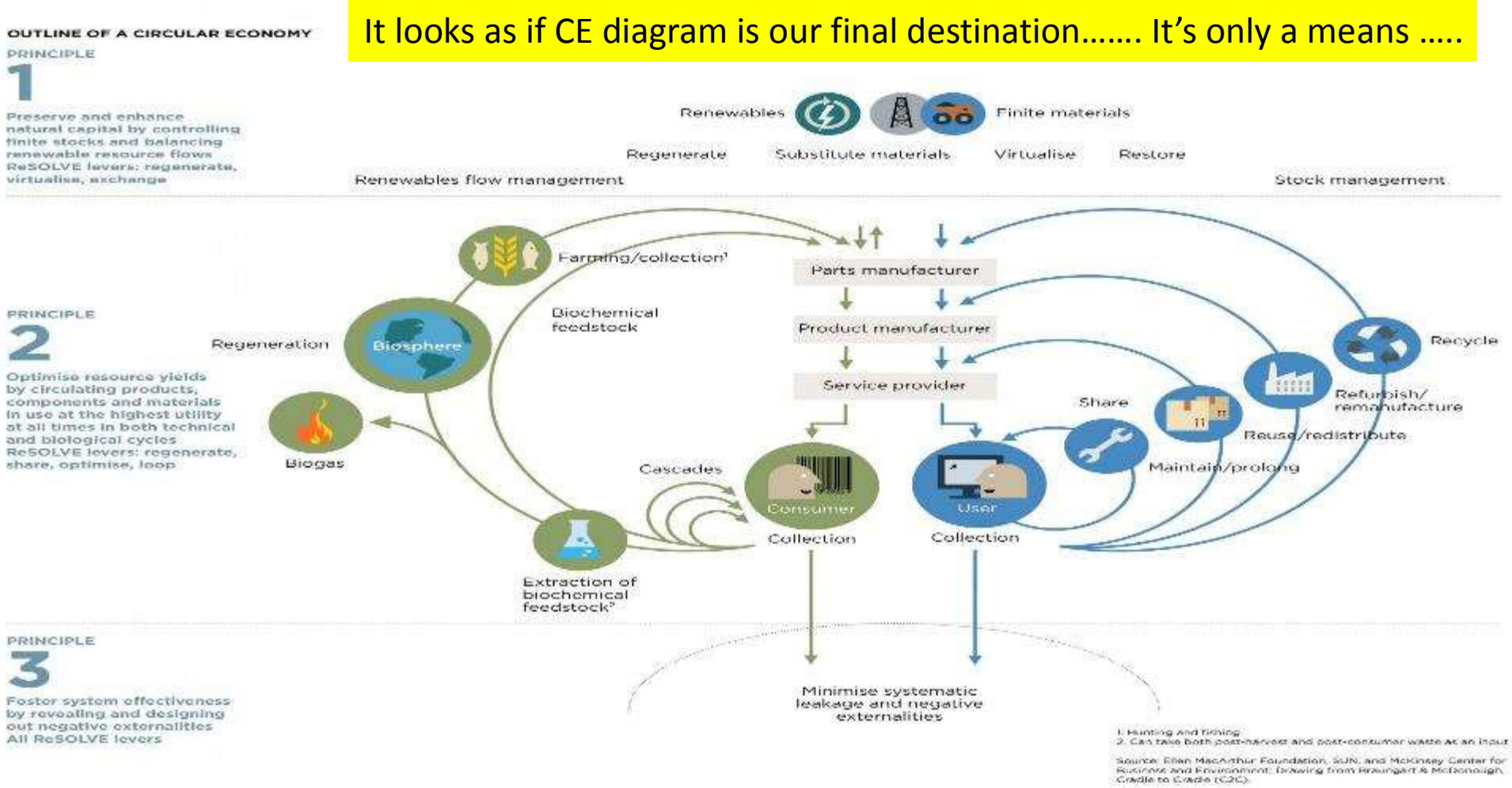
It looks as if CE diagram is our final destination……. It's only a means …..



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Sustainable Development is the main goal

while Decoupling is the framework behind SDGs

At this point of time ….. DPSIR

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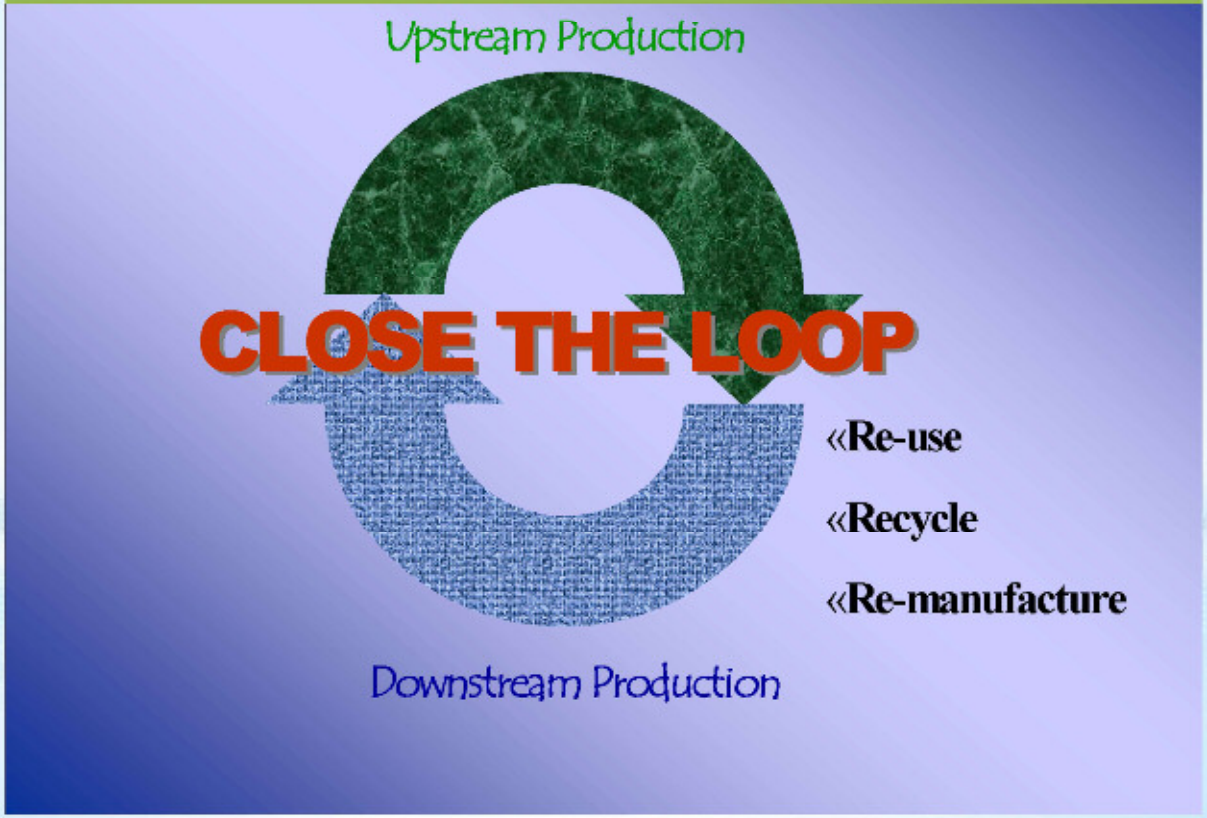
Figure 1.2: DPSIR Framework and the SDGs, Source: IRP, 2017

…. Industrial Engineering can always innovate and make continuous improvement …. Circular Economy



Globalize the Circular Economy

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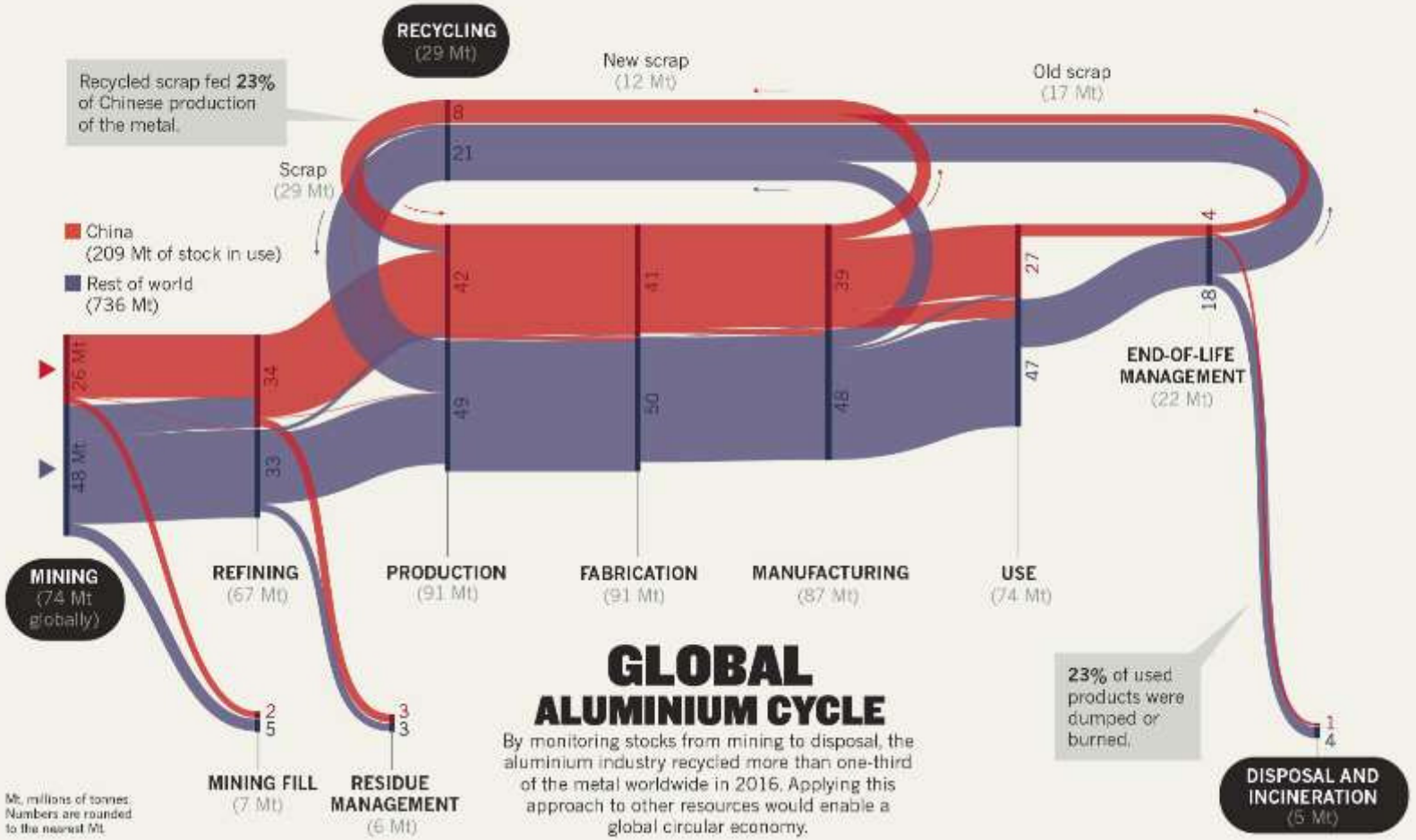

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THE NEW UNEP IRP MATERIAL FLOW AND RESOURCE PRODUCTIVITY DATA SET

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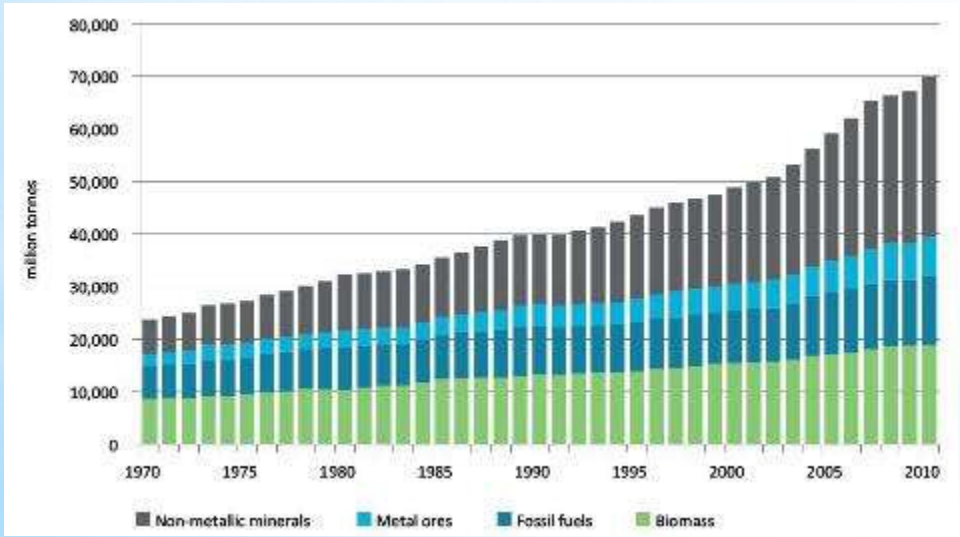
- A coherent account of material use in the global economy and for every nation, complementary to the System of National Accounts
- A large data set covering 40 years (1970-2010) and most countries of the world.
- Presents direct and consumption-based material flow indicators, covering total usage, per capita use and material use per US$.
- Information should help identify opportunities, risks and vulnerabilities related to the global supply of primary materials and show the potential for efficiency gains and reductions in material use in the global economy

GLOBAL MATERIAL FLOWS AND RESOURCE PRODUCTIVITY (1970-2010)

- *Consumption has been stronger driver of growth in material use that population growth*
- *Since 2000 material efficiency has declined - global economy needs more materials per unit of GDP. Production has shifted from material efficient countries to countries that have lower material efficiency*
- *The richest countries consume on average 10 times more materials as the poorest*
- *The level of well-being achieved in wealthy industrial countries cannot be generalised globally based on the same system of production and consumption*

GLOBAL MATERIAL USE HAS ACCELERATED

- *Annual global extraction of materials grew from 22 billion tonnes in 1970 to around 70 billion tonnes in 2010 and 90+BT in 2017*
- *Non-metallic minerals used in construction was the fastest growing group of materials*



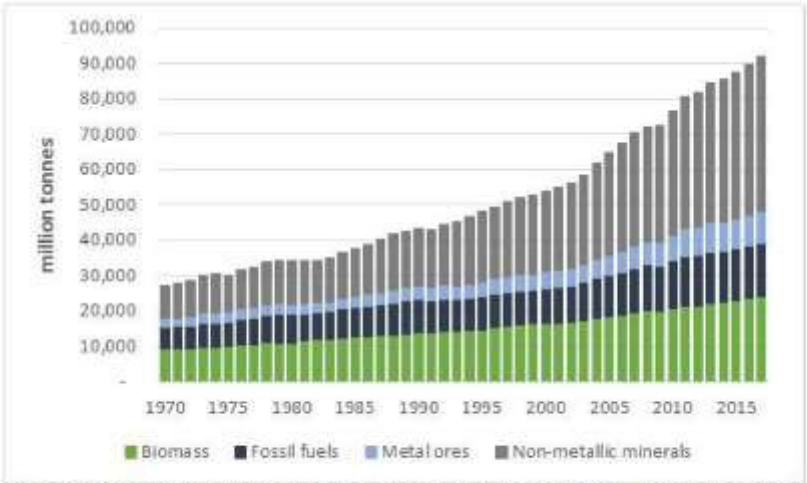


Figure 2.4: Global material extraction, four main material categories, 1970 - 2017, million tons. Source UNEP International Resource Panel, Global Material Flow Database

Global material extraction (DE) by four material categories, 1970-2010-2017, million tonnes

MATERIAL EXTRACTION GREW UNEVENLY IN THE GLOBAL ECONOMY

- *Asia and the Pacific had the largest growth, especially China and Southeast Asia*
- *Growth in Asia and the Pacific reverberated in Latin America and Africa who supplied materials to Asia*

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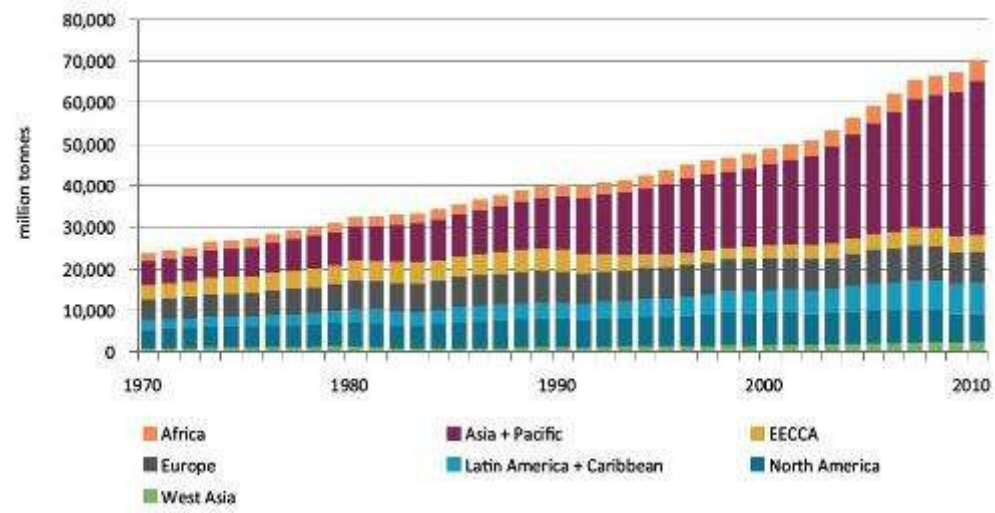

Figure 2. Domestic extraction (DE) by seven subregions, 1970–2010, million tonnes

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CONSUMPTION PATTERN & TECHNOLOGY INNOVATION COMBINED ARE DRIVING GLOBAL MATERIAL USE

- *Partly Circular Economy using eco-industrial development (EID) has been solving the resource consumption by producer effectively in 2000-2015. The technological innovation driving more consumption will be tackled in the 2015-2030.*

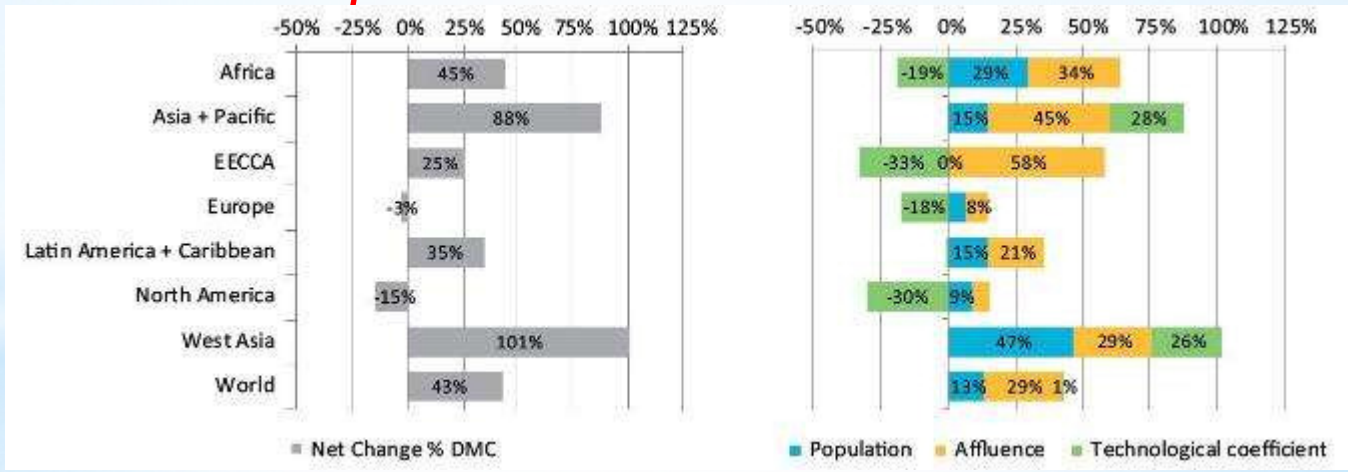


Figure 5. Drivers of net change in domestic material consumption between 2000 and 2010 for world regions: population, affluence, and material intensity

Figure 2.21: Drivers of Domestic Extraction, 2000 - 2016, percentage. Source: UNEP International Resource Panel, Material Flow Database

SCP Push-Pull Scenario

SUPPLY

Eco-design
Green Procurement
Circular Economy
RECP
LCA
Technology Progress
Policy Options

DEMAND

Lifestyle
Marketing ads
'Mesolimbic
Dopaminergic
Reward
System'
Human needs
Human wants
Human desires

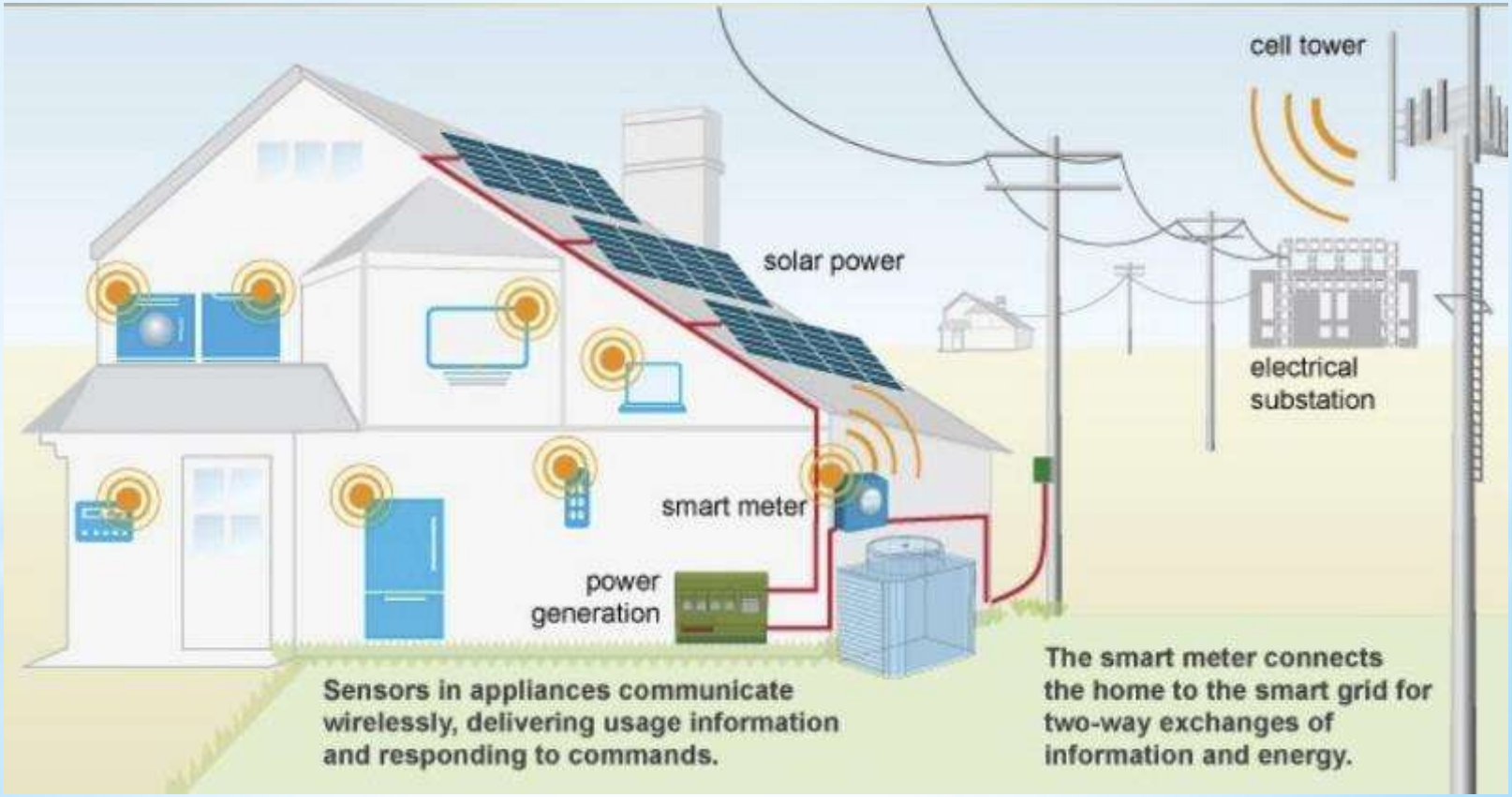
Innovative Technology

"… every aspect of our lives is increasingly influenced by an invisible network of technologies and devices that collect, transmit, and analyse incomprehensibly large amounts of information ….. "

1. Internet of Things (IoT)
2. Blockchain
3. Big Data
4. Artificial Intelligence

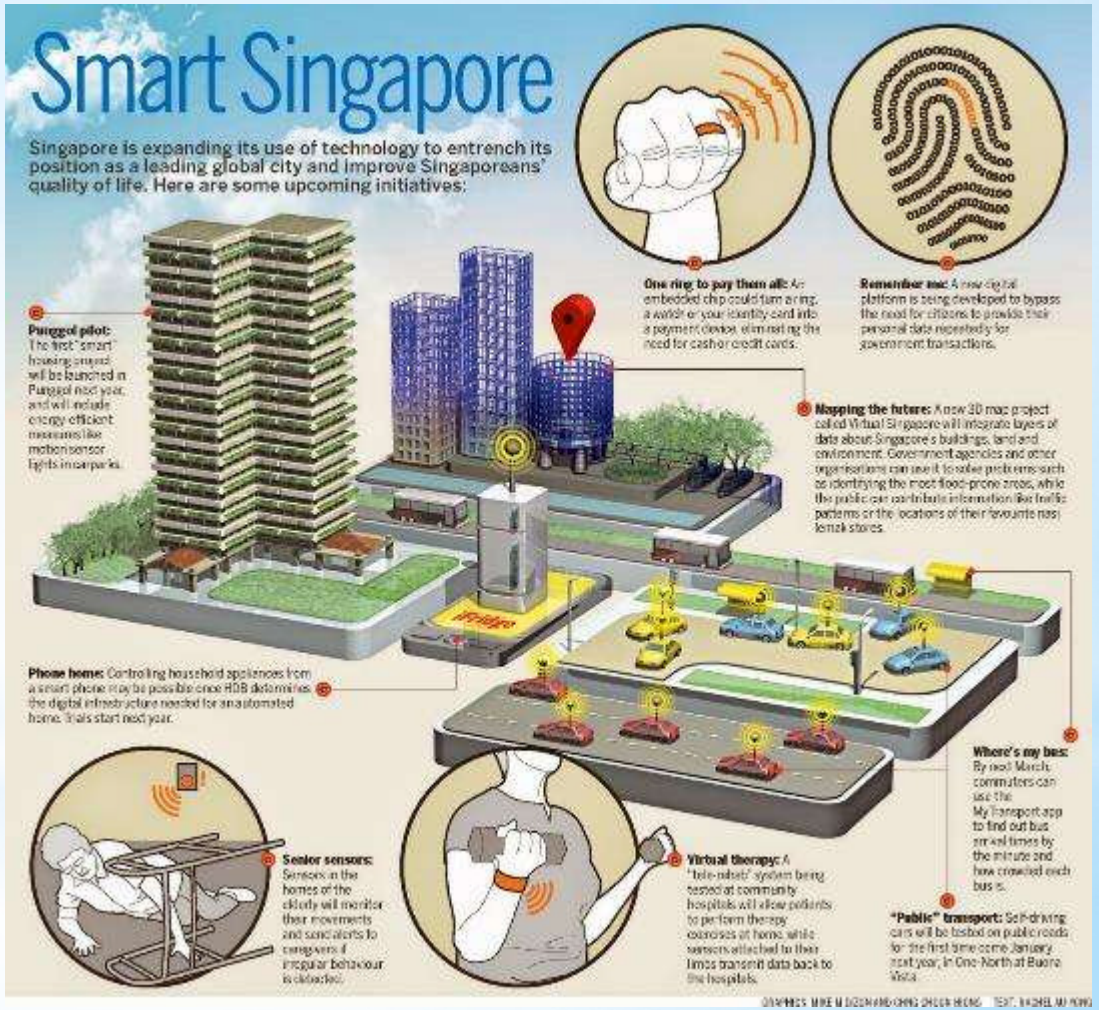
effective and cheaper extremely fast

Smart Meters

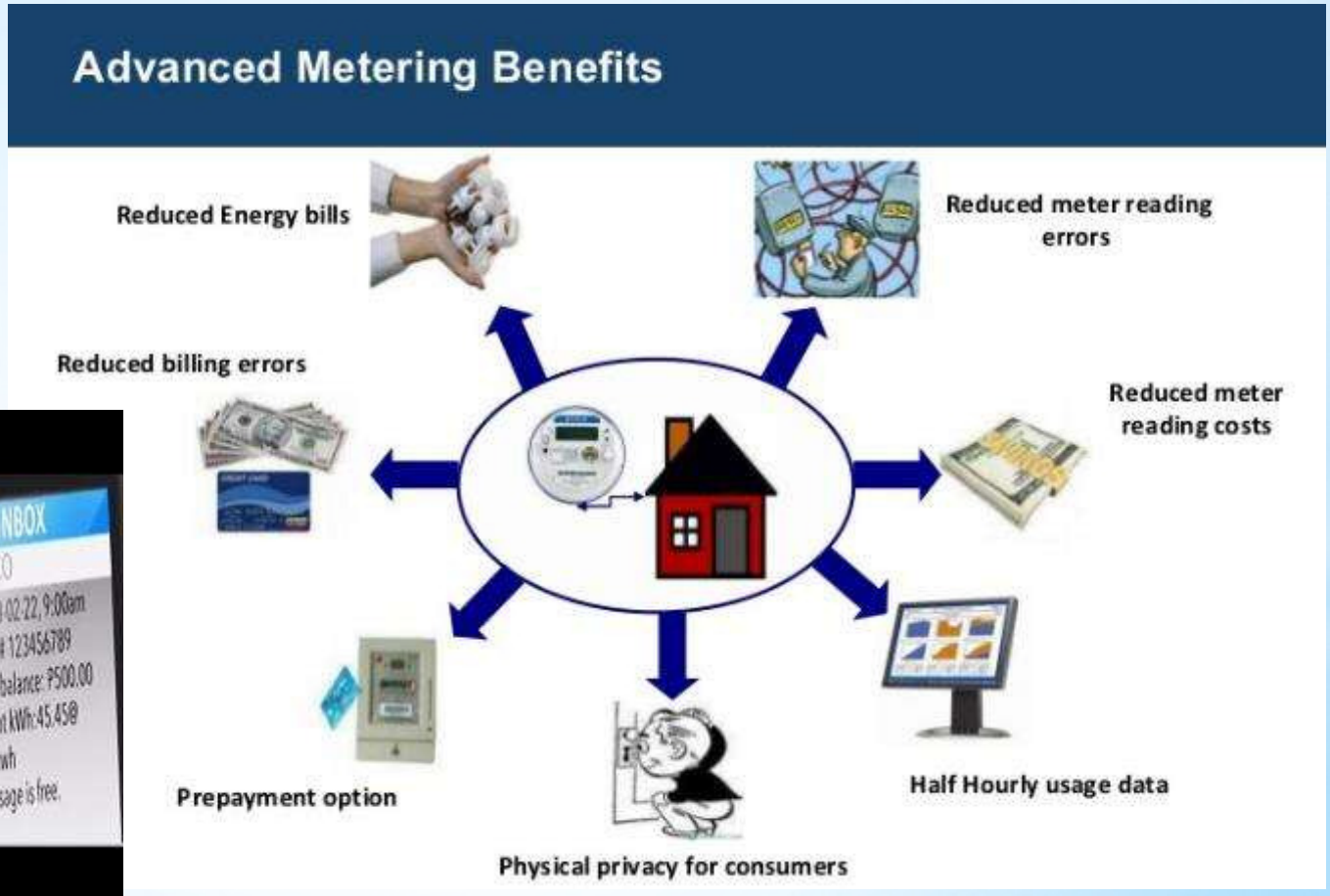


Singapore's Jurong Lake District

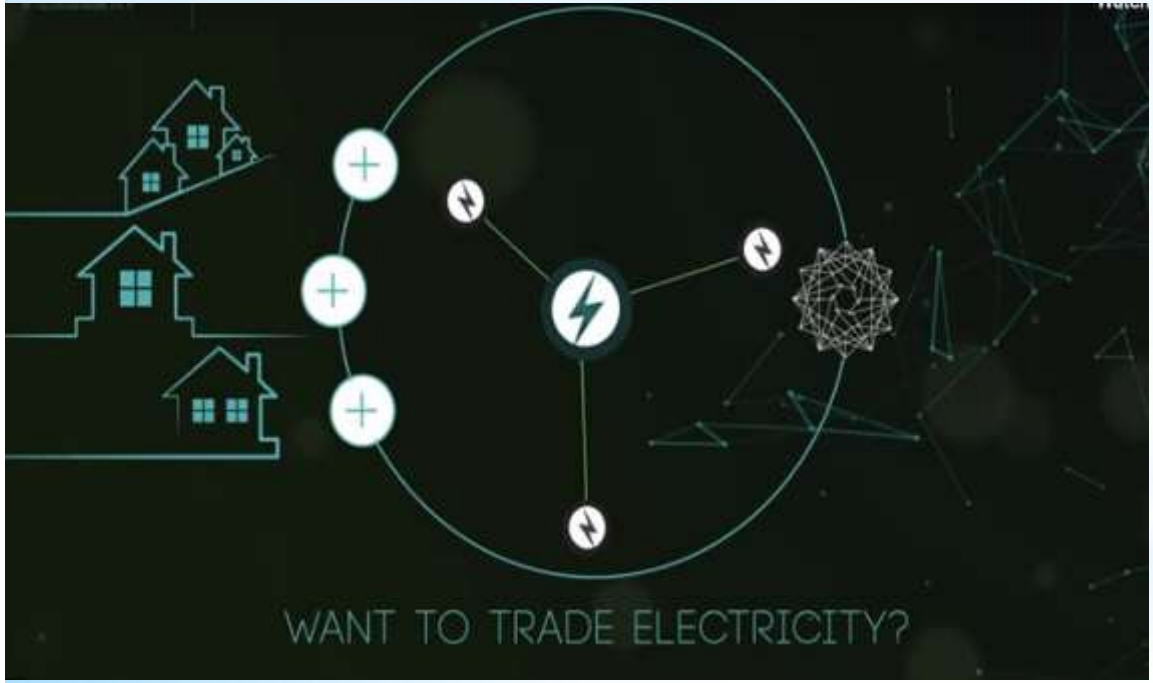
- Aims to demonstrate how technology can enable a liveable and sustainable urban environment, and a key feature is IoT technology…. But ….. Wifi bandwidth, stability, etc necessity
- Data from farecards and sensors throughout the district will give planners a clearer sense of the location, types, and frequency of transport services that are needed and cater to these needs more effectively.



IoT Example 2: Manila Electric Co. (Meralco)



Applications of Blockchain:
Peer to peer clean energy sharing

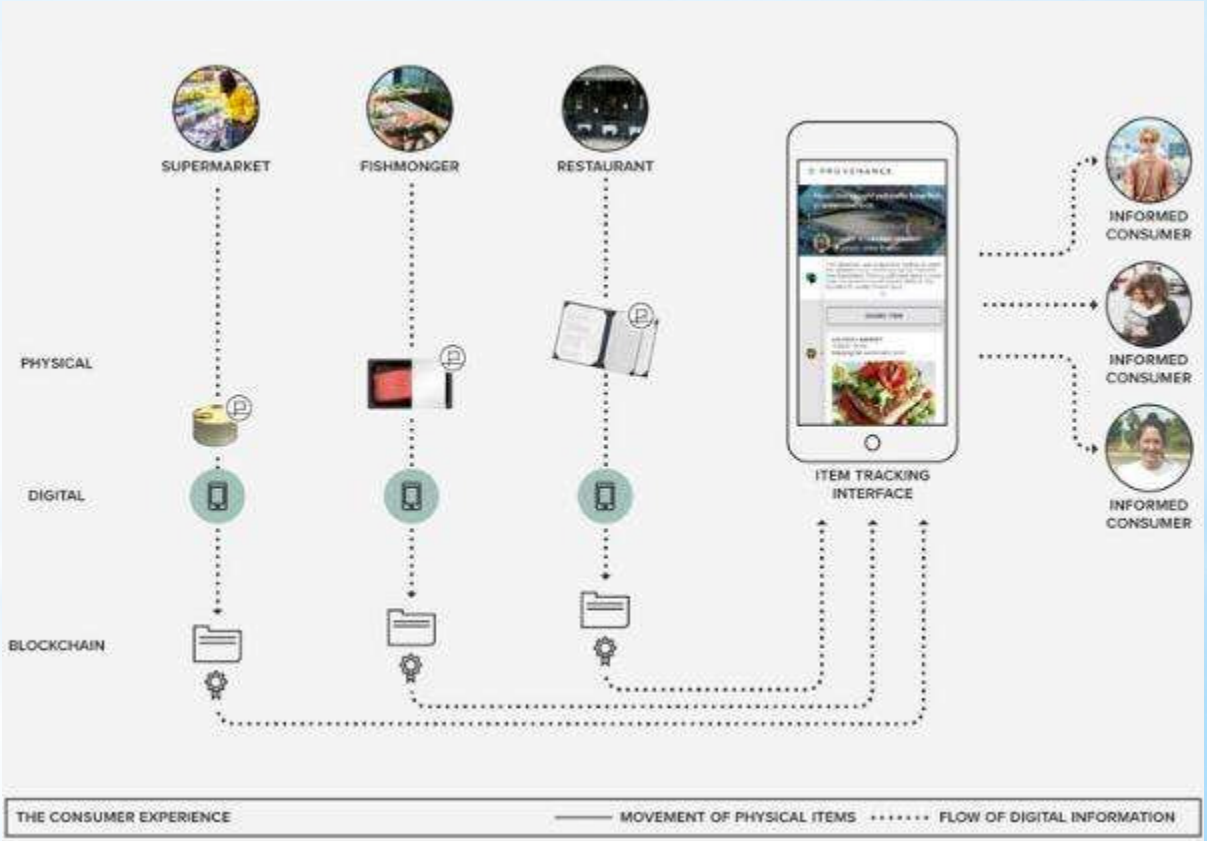


- Australian firm Power Ledger commenced a trial in Bangkok's Sukhumvit neighbourhood where an apartment complex, a school, a mall, and a dental hospital with solar panels trade clean energy with one another, and the city's electricity grid, over a blockchain marketplace.
- the system is one of the world's largest peer to peer renewable energy trading platforms using blockchain.

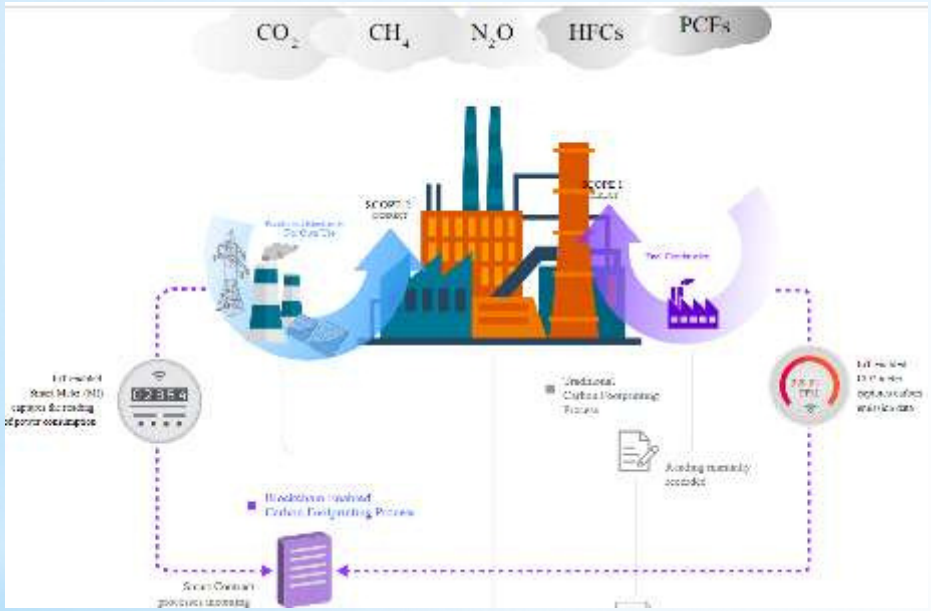
Innovative Technology

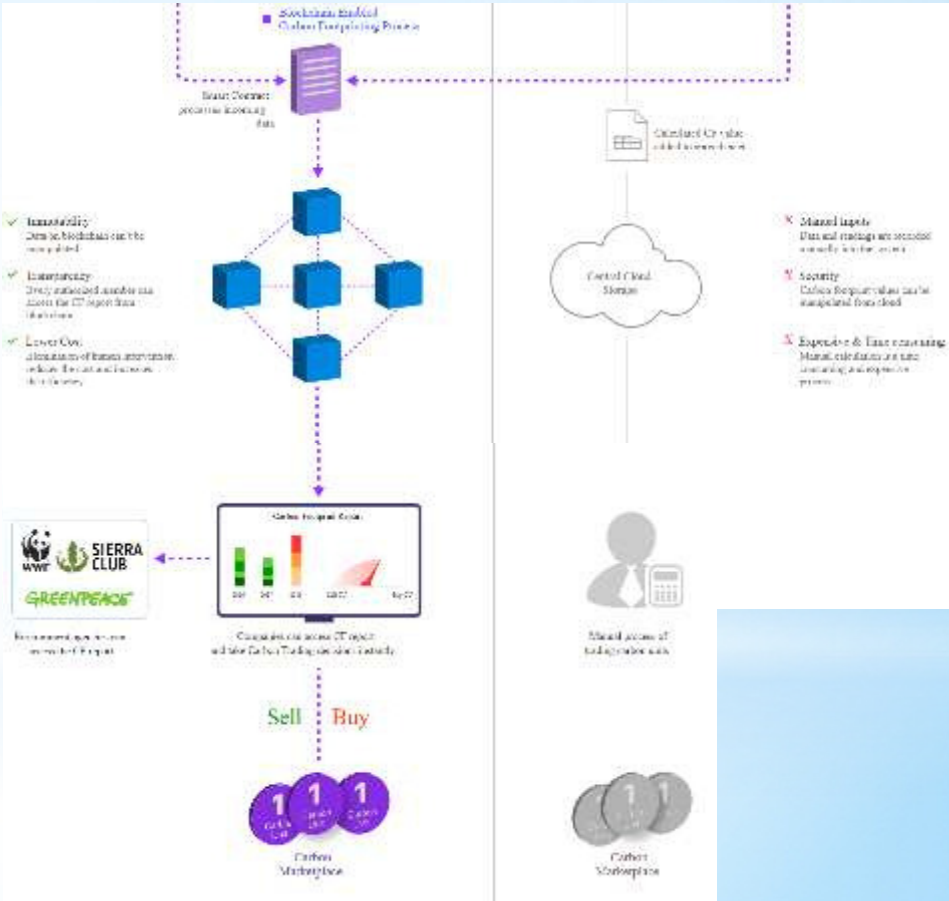
2. Blockchain

Provenance



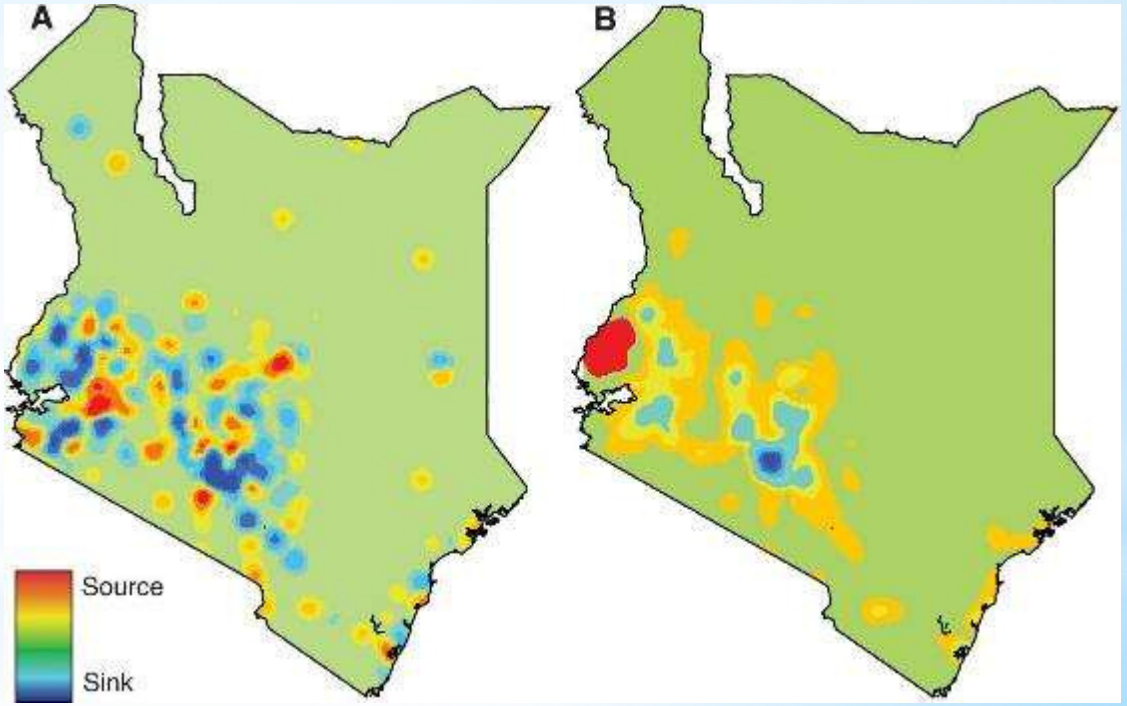
Applications of Blockchain: Carbon Footprinting





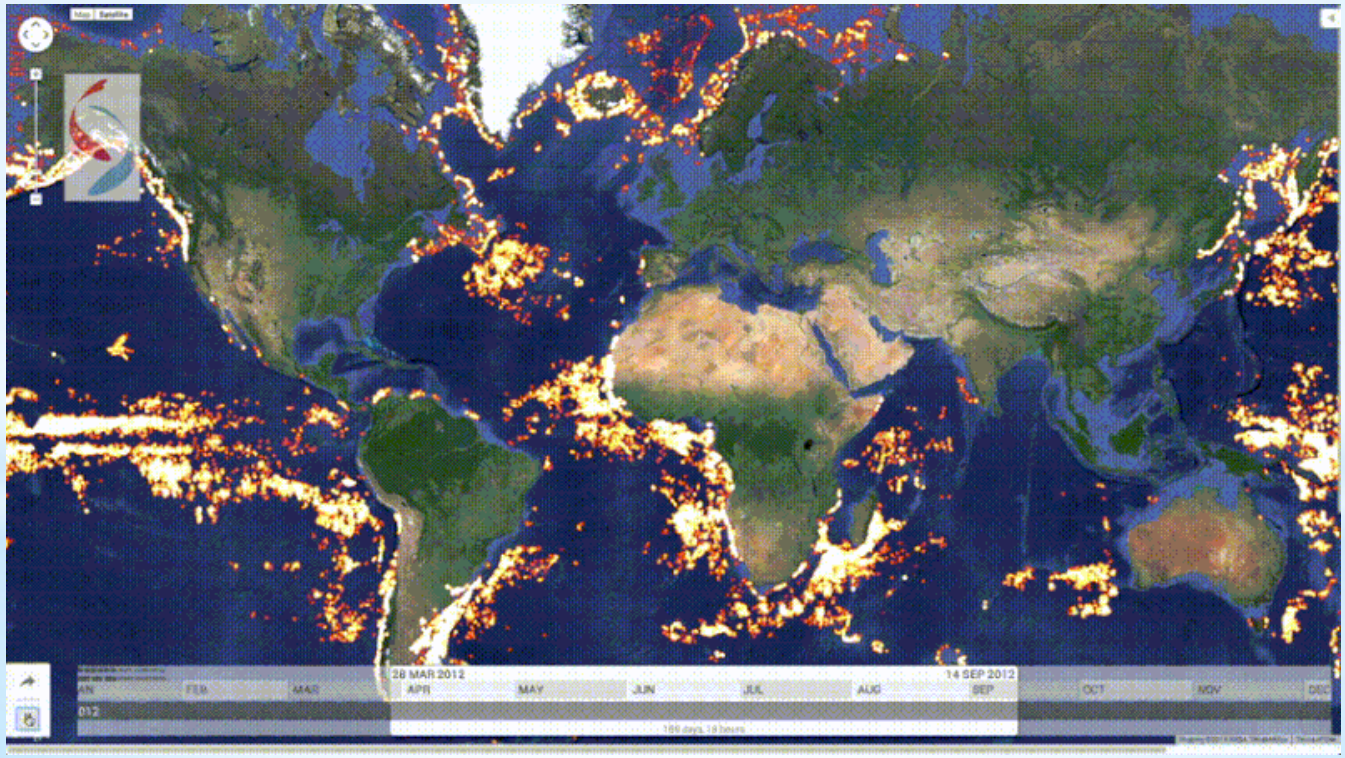
Big Data Applications

1. **Human travel patterns and malaria-** In Kenya, Caroline Buckee, a Harvard University researcher processed data from 15 million cell phones in 2012 to identify how human travel patterns contributed to the spread of malaria—this helped officials allocate resources to disease control efforts.



(A) Travel sources and sinks. (B) Parasite sources and sinks.

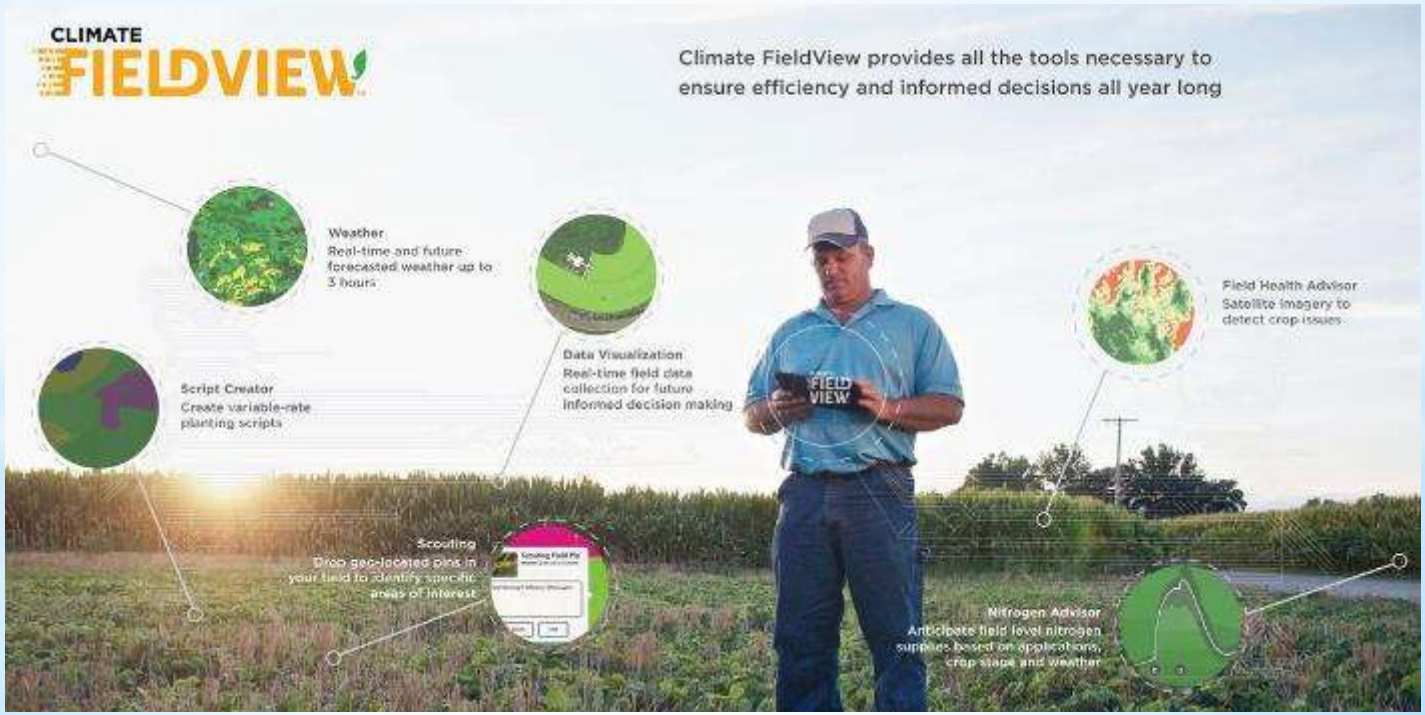
Global Fishing Watch - launched in 2016, the platform processes over 22 million position messages from more than 200,000 ships ever day to detect patterns that signify which vessels are fishing, when and where. This allows anyone with an internet connection to see fishing activity anywhere in the ocean in near real-time, for free.



Innovative Technology

4. Artificial Intelligence

The Climate Corporation's Climate Fieldview software



Thank you for listening!

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International Resource Panel

Some photos, general info, and animation may be obtained from google searched websites