

# Renewable Energy for Low Carbon City



Rachmawan Budiarto

# Decoupling

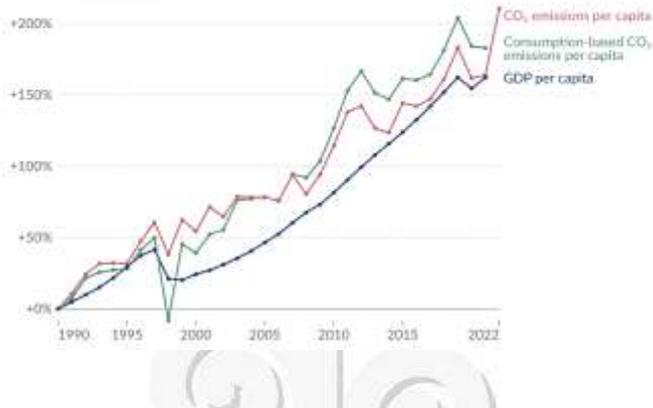


## Change in per capita CO<sub>2</sub> emissions and GDP, Indonesia

Our World in Data

Consumption-based emissions include those from fossil fuels and industry. Land-use change emissions are not included.

Table Chart Change country or region Settings

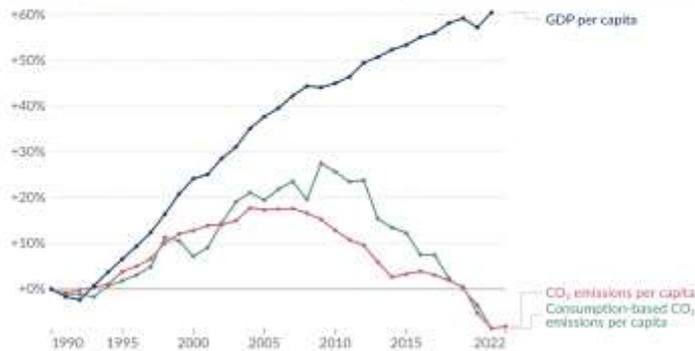


## Change in per capita CO<sub>2</sub> emissions and GDP, Australia

Our World in Data

Consumption-based emissions include those from fossil fuels and industry. Land-use change emissions are not included.

Table Chart Change country or region Settings



## Economic growth, power & energy consumption, GHG emissions 1990 - 2019.

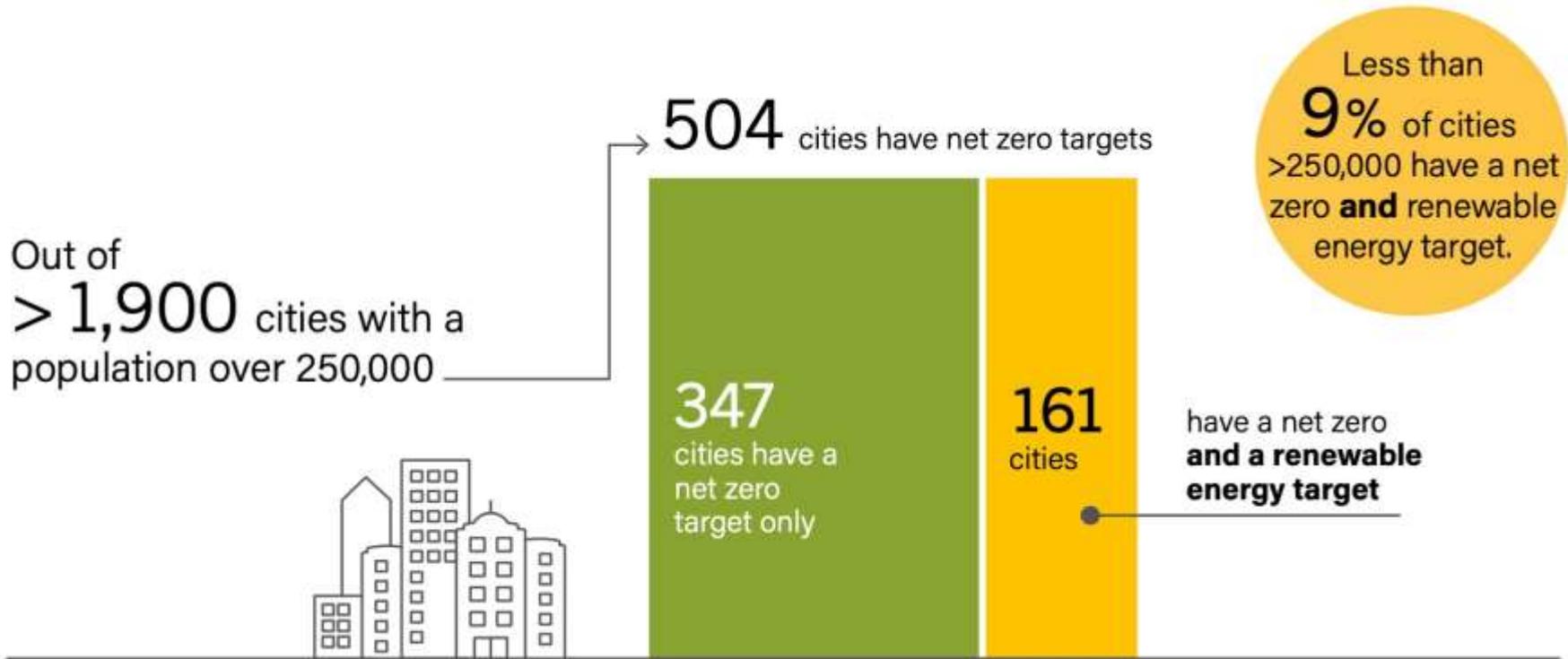
Data: BMWi 2020, UBA 2020.

CLEAN ENERGY WIRE



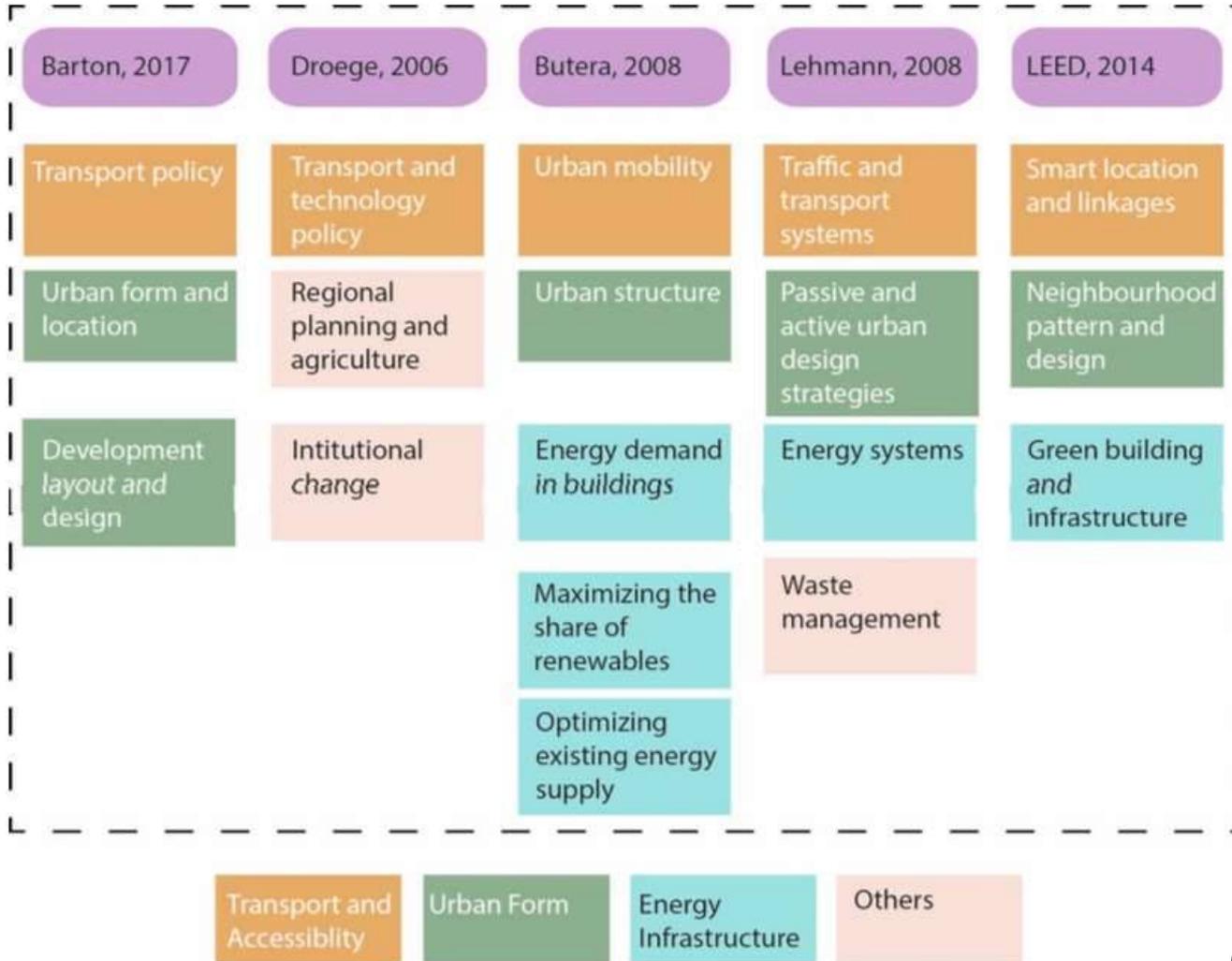


# Net Zero Emission Targets and Renewable Energy Targets in Cities with More Than 250,000 Inhabitants, 2021



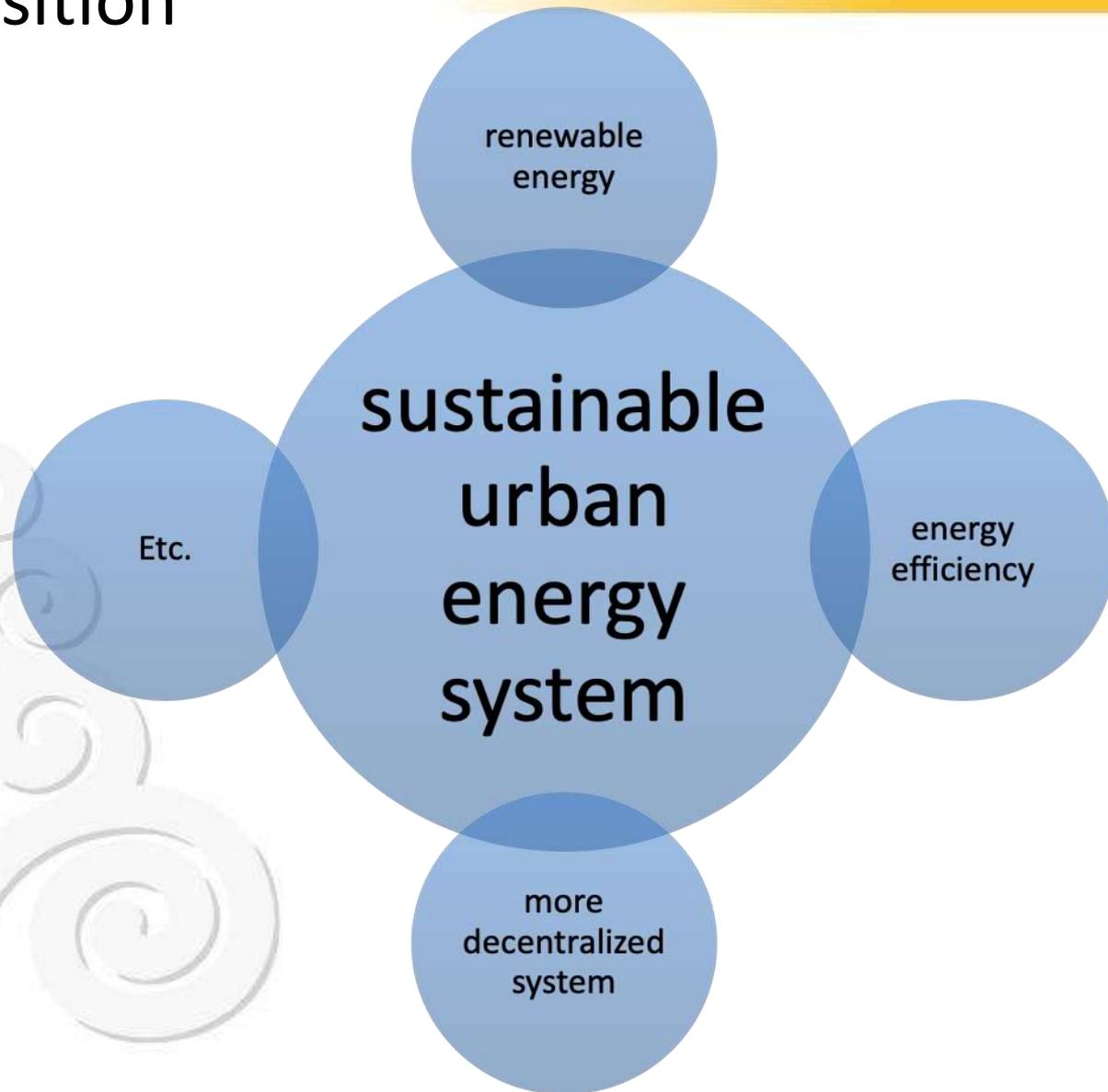
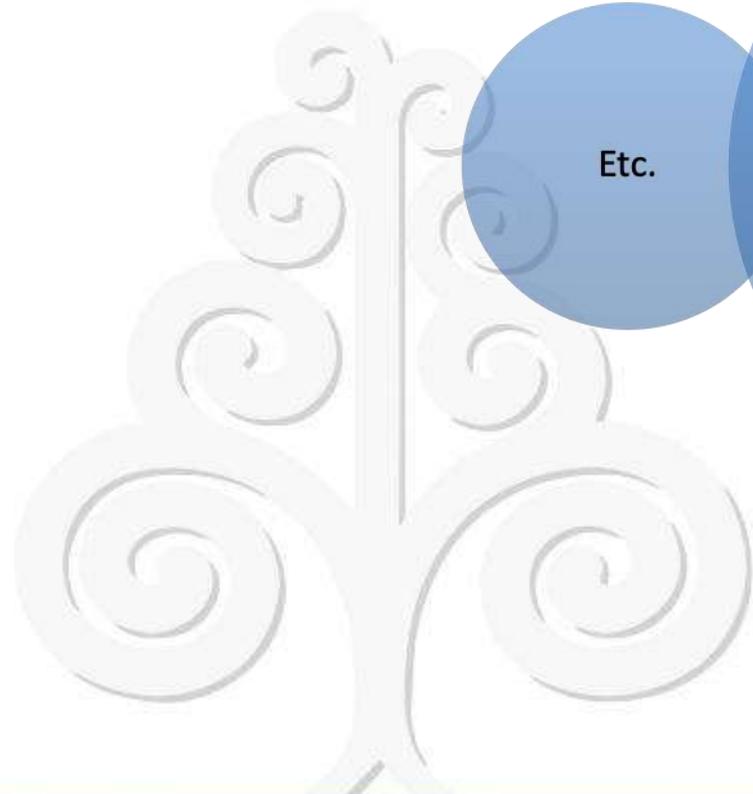
(REN21, 2022)

# Urban components of the energy transition



(sumber: Asarpota dan Nadin, 2020)

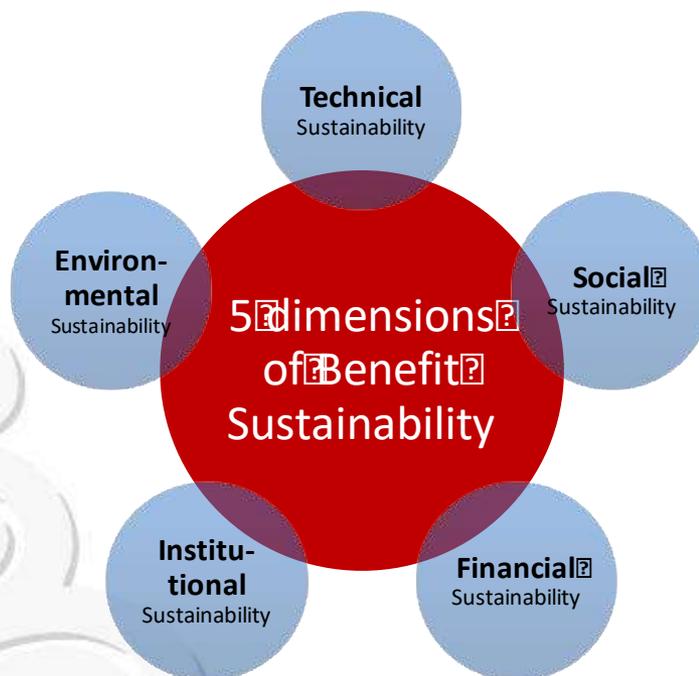
# Energy Transition





- capacity in system
- technical realibility, high capacity factor

- no environmental damage
- strengthening environmental quality



- strengthening social cohesiveness. cause no conflict in complex and delicate circumstances
- social-embedded system

- local ability in O&M + development
- well-managed system and supported business

- self-financed system system
- growing supported economic activities



## Photovoltaics by Community

### Bank Indonesia – UGM – Serikat Surya Handayani (2021)



community:

- cooperative (in financial service) institution with > 1000 members (leader)
- SMEs
- vocational higher school persons

target: capability of community

- To install, operate & maintain the PV system
- To integrate the PV with its business
- To develop PV-based (new) business (eg: financial system)

(ssh.or.id)



# PV-Based RO for Drinking Water Supply by Community

## Bank Indonesia – UGM – Serikat Surya Handayani



by community: operation, maintenance, repair, marketing, distribution (30 km from production site), to develop PV-based (new) business (eg: financial system)



## PSE Berkolaborasi dalam Net Zero Carbon Communities (NZCC) Application In Makassar City

Climate Change, News, Renewable Energy, Sosial Energy 7 May 2024, 10:15 Oleh: irawanekop

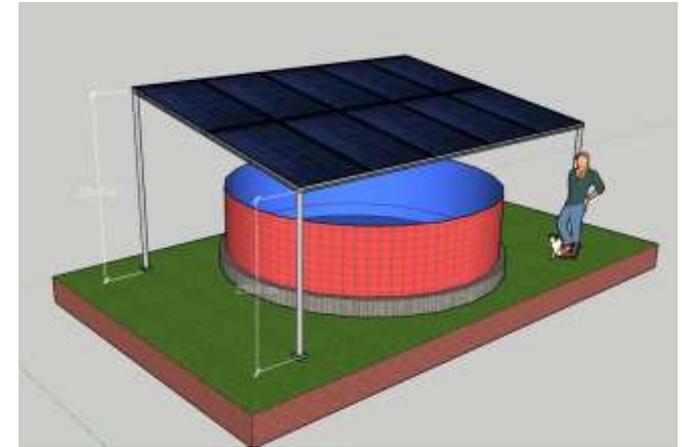
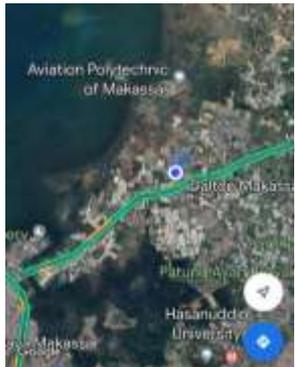
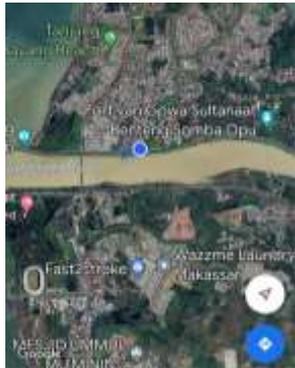
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**Net Zero Carbon Communities (NZCC)  
Application In Makassar City**  
Sponsored by U.S. National Science Foundation, U.S. Department of State, Makassar City (2024)

**Project Team**

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- multiyears,
- international collaboration,
- co-funding (US Dept. of State + Makassar City),
- common interest in sustainability,
- step 2 (previous: funded by NSF)
- CDSR network



- urban farming (fishing),
- growing managed by local community (research and community empowerment)
- local capacity building for O&M
- photovoltaics



## Building: Efficiency & Energy Production



**Nearly Zero Energy Building**  
A very highly energy performing building with renewable energy generation covering most of its annual needs.



**Net Zero Energy Building**  
A very highly energy performing building with renewable energy generation covering all of its annual needs.



**Net Plus Energy Building**  
A very highly energy performing building with renewable energy generation exceeding its annual needs.



Annual energy consumed



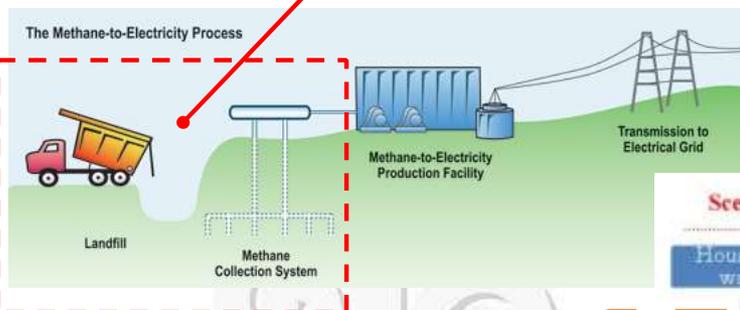
Annual energy generated or exported



(source: Emirates Green Building Council, 2017)

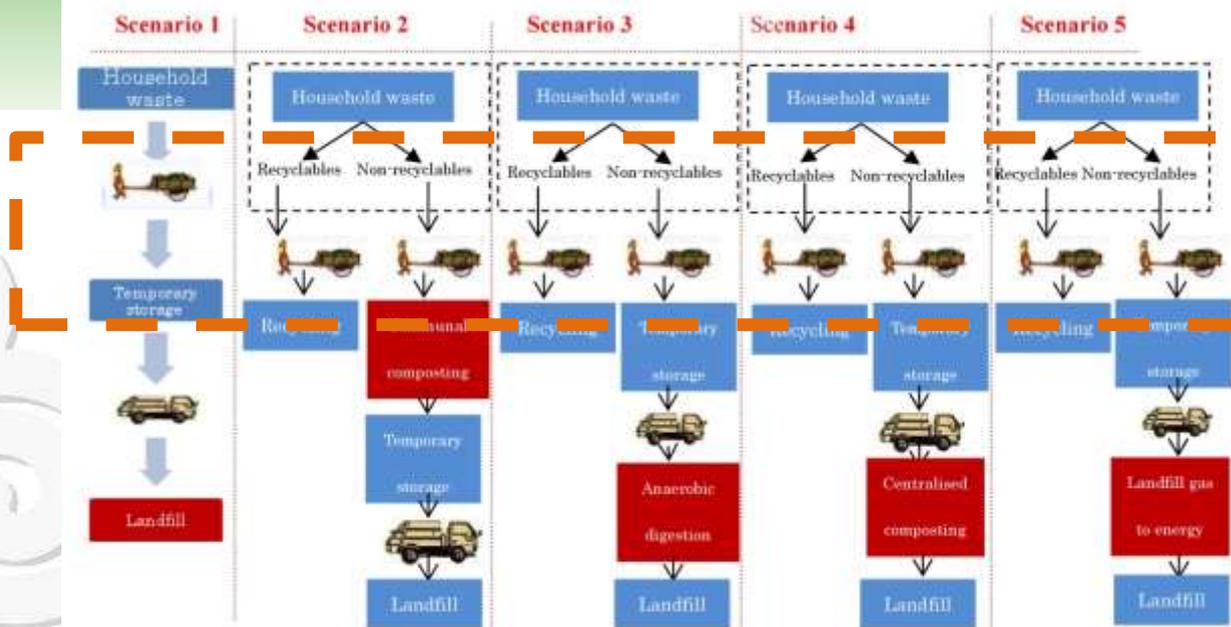


landfill being developed as "waste for value"

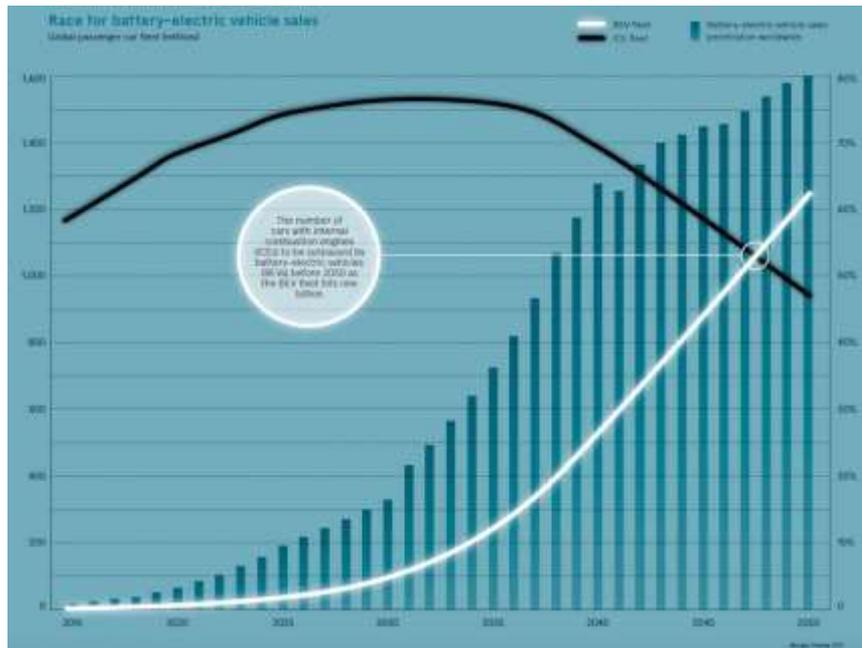


## Challenge of Benefit Sustainability

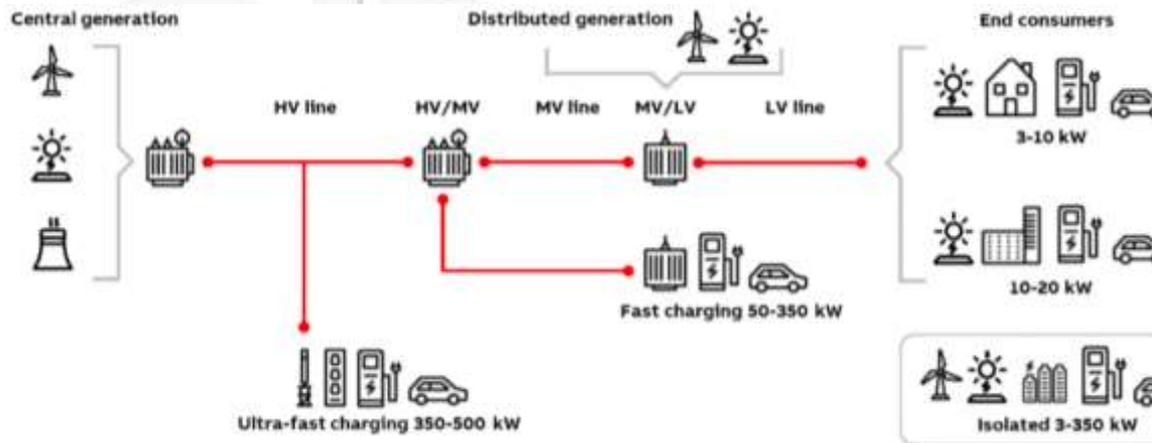
(eg: inclusivity in waste to energy)



(www.intechopen.com; IRENA, 2014)



The Era of Electric Vehicle can be supported by renewable energy



Distribution grid hosting capacity levels  
(Image: ABB)

(Desjardins, 2018; Salge dkk., 2020)



thank you  
for our better world

