Towards a Circular Economy – Increasing the Role of Green Finance and Innovation in APEC Cities

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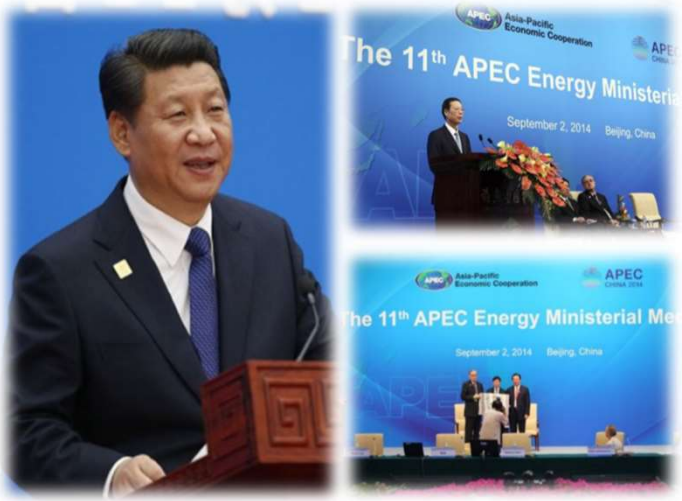
UCAS SEM & CDA Webinar, 'Innovation and Green Finance, Vienna/Beijing, 30 June 2022

APEC Sustainable Energy Center APSEC

APEC Sustainable Energy Center (APSEC) was established at the 11th APEC Energy Ministerial Meeting in 2014, and mentioned in the 22nd APEC Leaders' Declaration. It is a major achievement of the Chinese government responding positively to the initiative of APEC leaders to participate in energy cooperation in APEC region.



Sep. 2014	11th EMM, Beijing Declaration, China
Nov. 2014	22nd APEC Leaders' Declaration
Oct. 2015	12th EMM, Cebu Declaration, Philippines
Nov. 2015	23rd APEC Leaders' Declaration

APSEC Mission

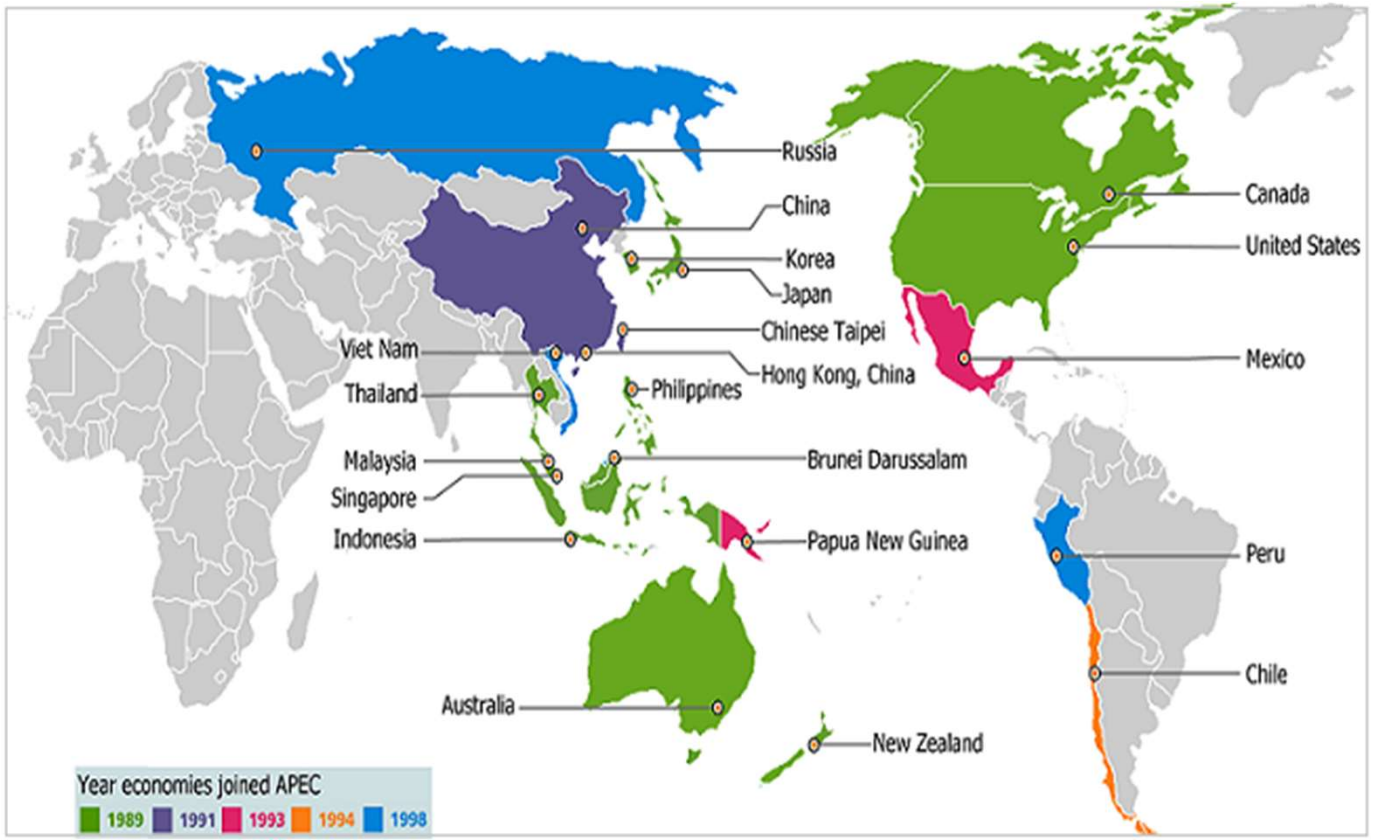
APEC Sustainable Energy Center

1. To promote pragmatic cooperation on sustainable energy development among APEC economics;

2. To act as National Energy Administration's think-tank on conducting strategic research and international cooperation in the field of sustainable energy development

CCT Pillar Program Clean Coal Technology	CNSC Pillar Program Cooperative Network of Sustainable Cities	ETS Pillar Program Energy Transition Solutions	Events: Two Workshops The Annual Forum

Asia Pacific Economic Cooperation (APEC)



Created in 1989 in Canberra
21 member economies

38% of world population
42% of global terrestrial surface
47% of world trade
60% of global GDP
62% of global CO2 emissions

Rotating annual presidency
APEC-Secretariat in Singapore

Energy Working Group with several Sub-groups and two Research Centers: APSEC in China and APERC in Japan

APEC Reports on Sustainability and Disaster Resilience

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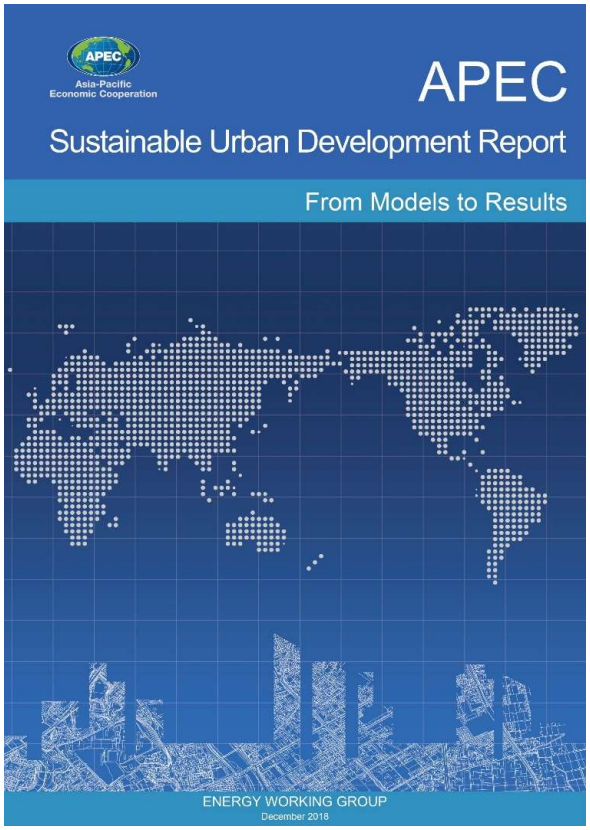

Sustainable Urban Development Report
Electronic version
https://www.apec.org/Publications/2019/04/APEC-Sustainable-Urban-Development-Report---From-Models-to-Results

Integrated Urban Planning Report
Electronic version
https://www.apec.org/Publications/2021/03/APEC-Integrated-Urban-Planning-Report

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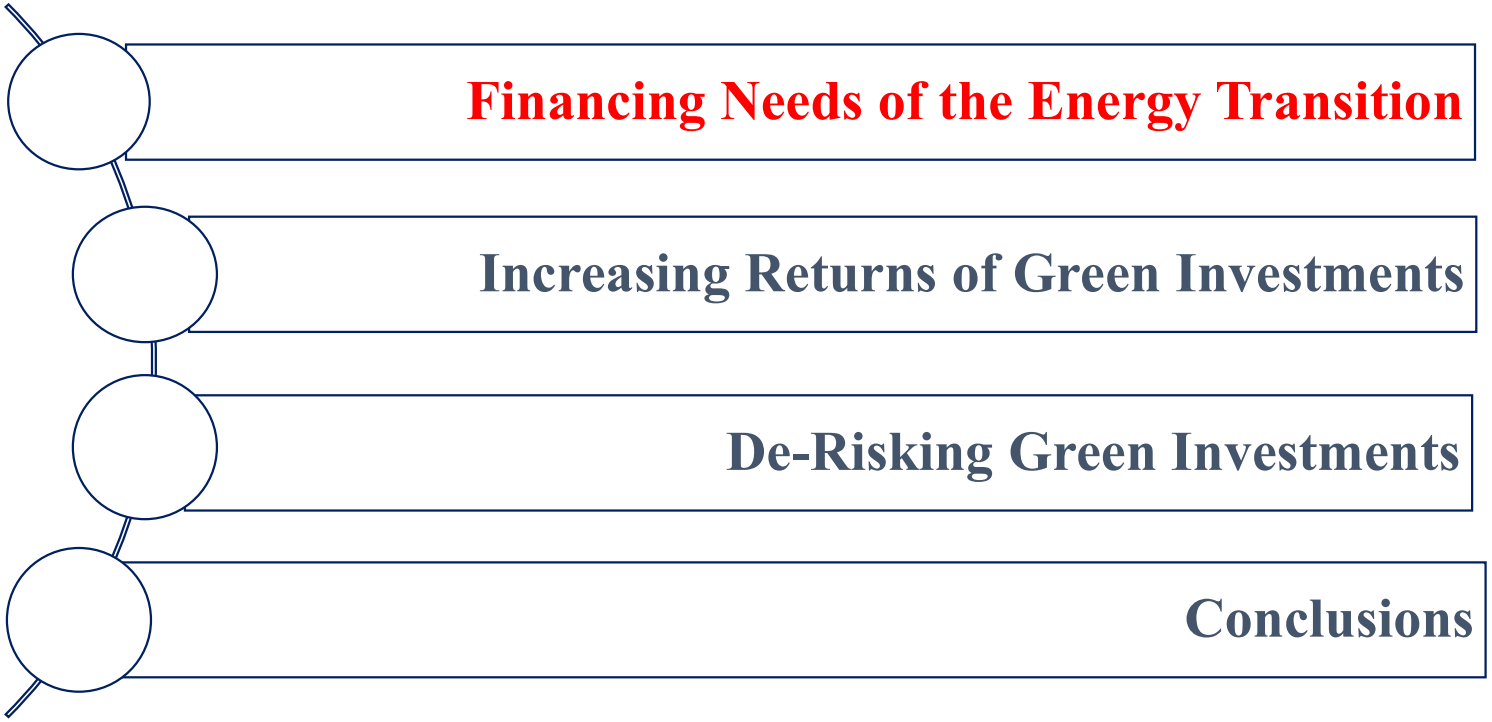
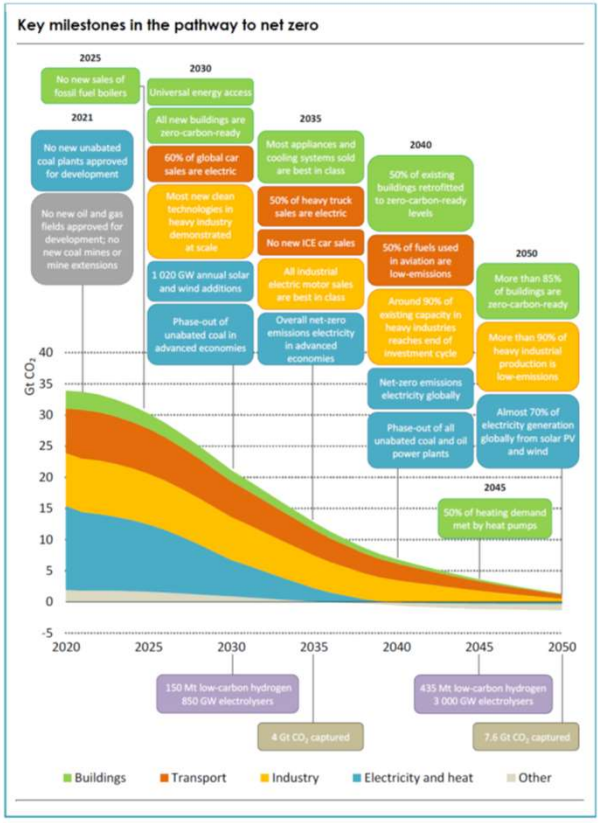


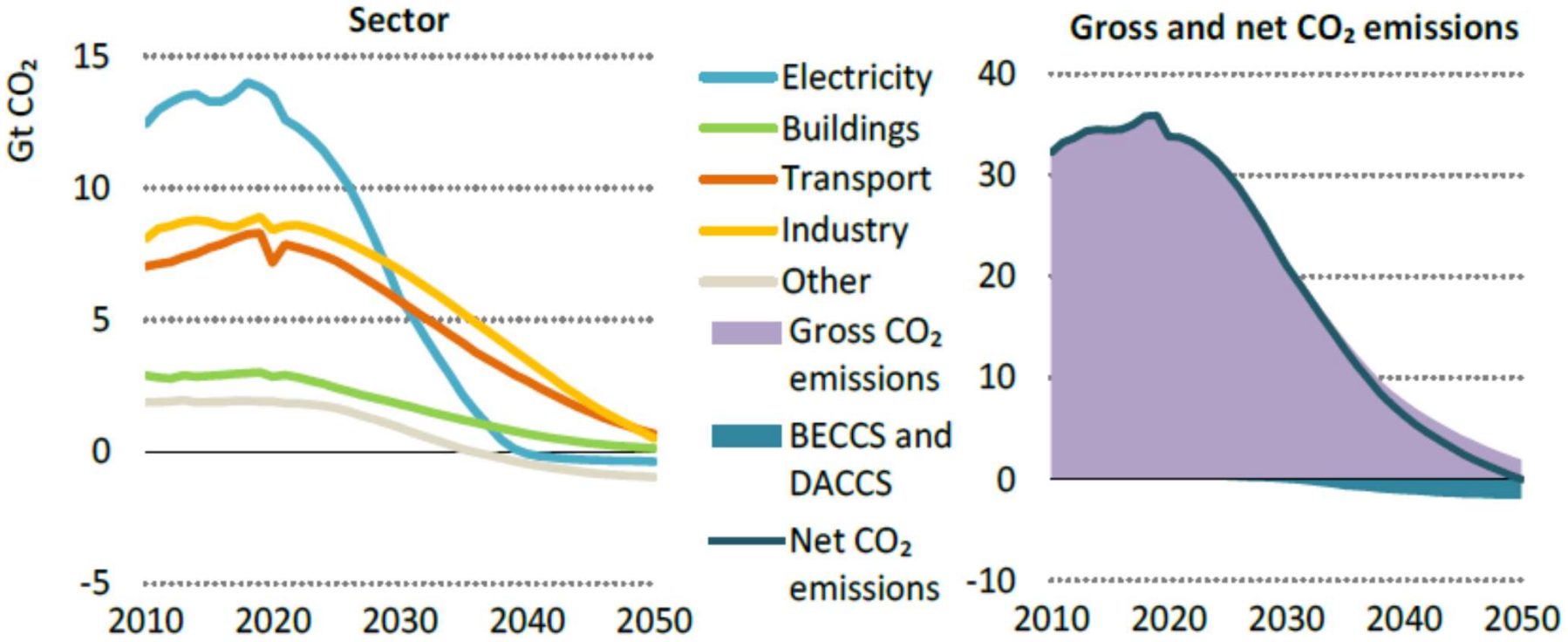
Some milestones of the IEA Roadmap to 2050



- Annual global clean energy investment triple to USD 4 trl by 2030
- Dominated by green investment
- 400 milestones to be attained by 2050
- From today, no need for new fossil fuel supply investments
- No need for any unabated new coal fired plants
- By 2030, all market-ready technologies are fully rolled out
- By 2030, all prototypes new technologies are market-ready
- By 2030, all new buildings are zero-carbon ready
- By 2035, no new sales of internal combustion engine cars
- By 2040 the global power system is carbon free in net terms
- By 2050 six times more jobs created than jobs that will be lost
- By 2050 global GDP to have additional +0.4% annual increase, resulting in adding an economy of the size of Japan to the world
- BUT: Take special care to the regions having to quit fossil energies; leave no one behind

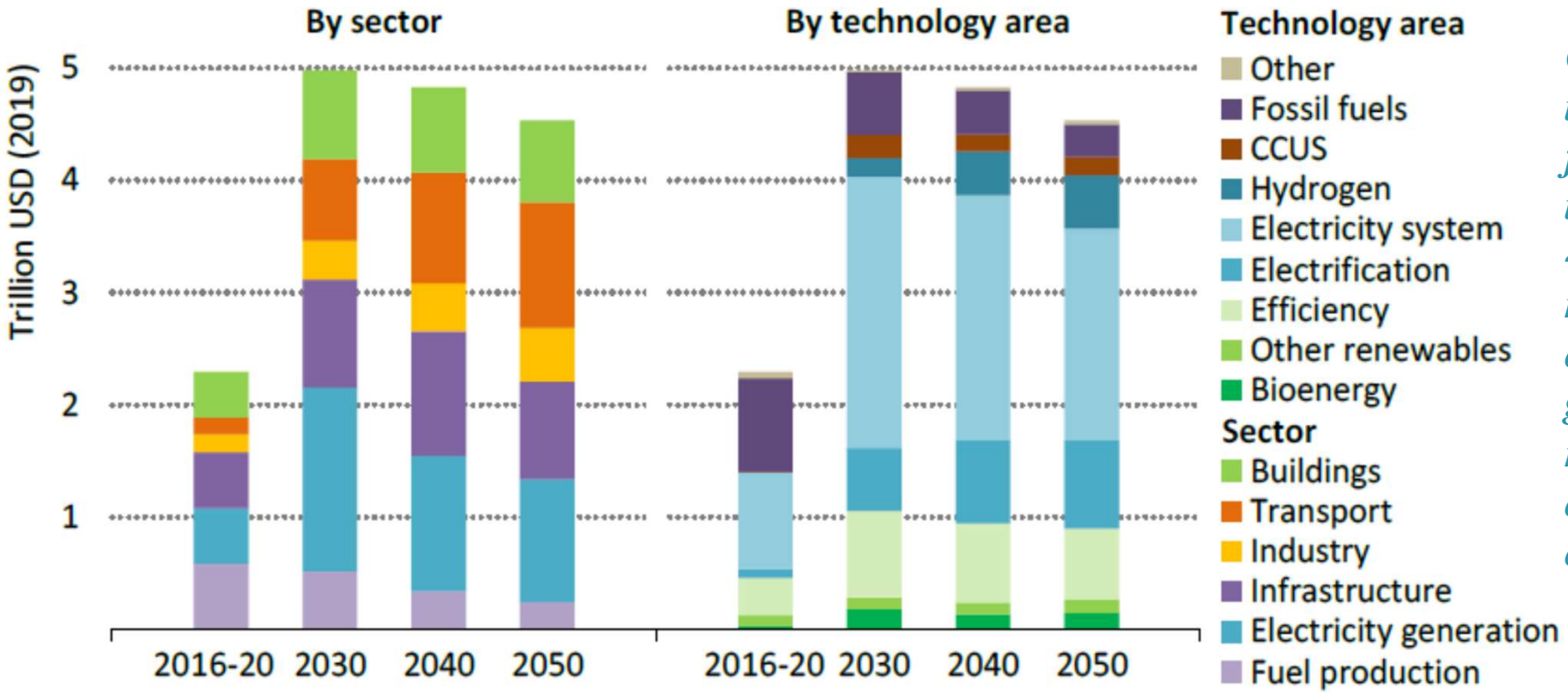
https://www.iea.org/reports/net-zero-by-2050

Difference between gross and net carbon neutrality



BECCS = bioenergy with carbon capture and storage; DACCS = direct air capture with carbon capture and storage.
BECCS and DACCS includes CO2 emissions captured and permanently stored

Annual average capital investments (all energy)



Capital investment in energy rises from 2.5% of GDP in recent years to 4.5% by 2030; the majority is spent on electricity generation, networks and electric end-user equipment

Make the 2020s the decade of massive clean energy expansion

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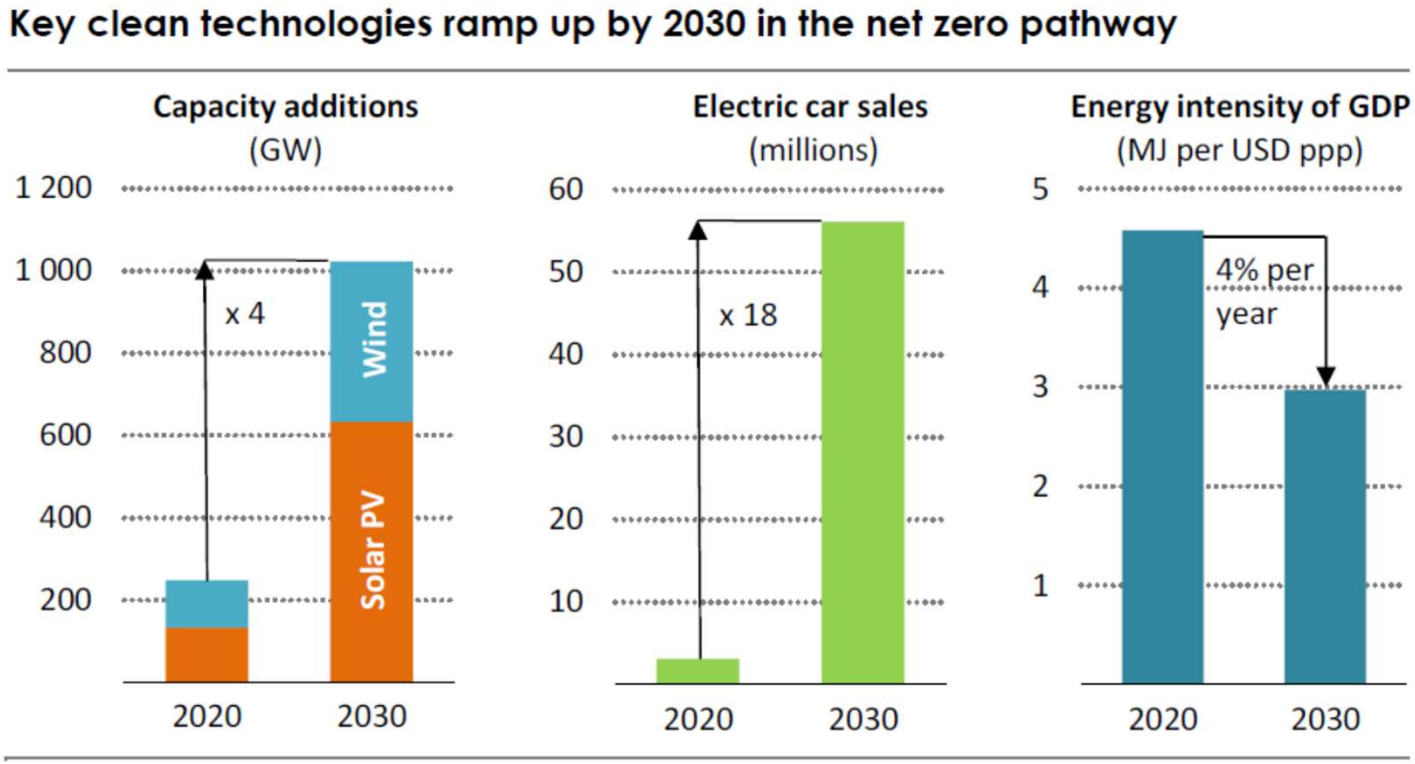
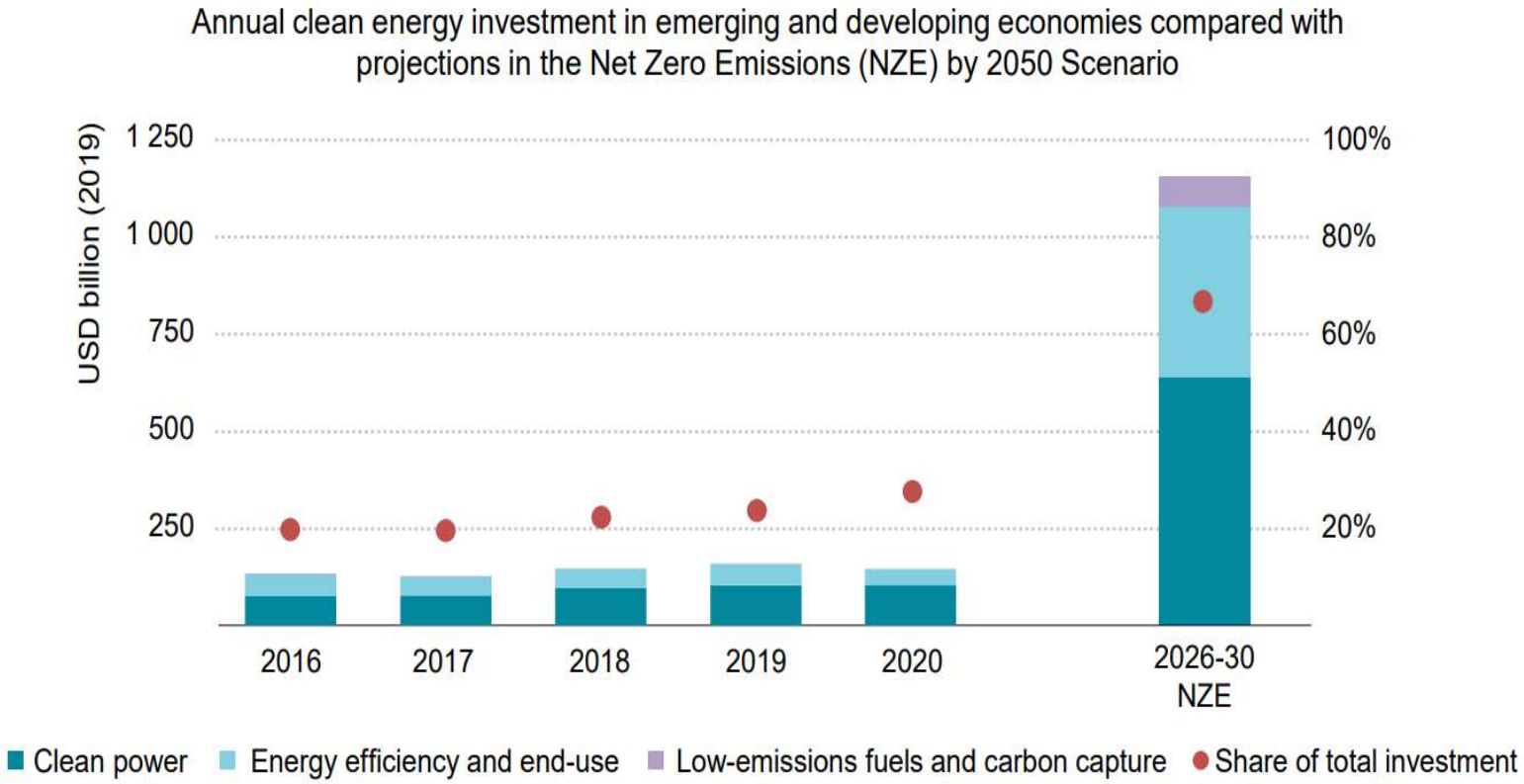


Energy Intensity improvement 4% per year needs efforts

Historic trend 2000 – 2010 : 1.35 % improvement per year

SDG 7.3.1: double speed of EI improvement (i.e. 2.7% improvement per year)

Clean energy investment in the emerging and developing world

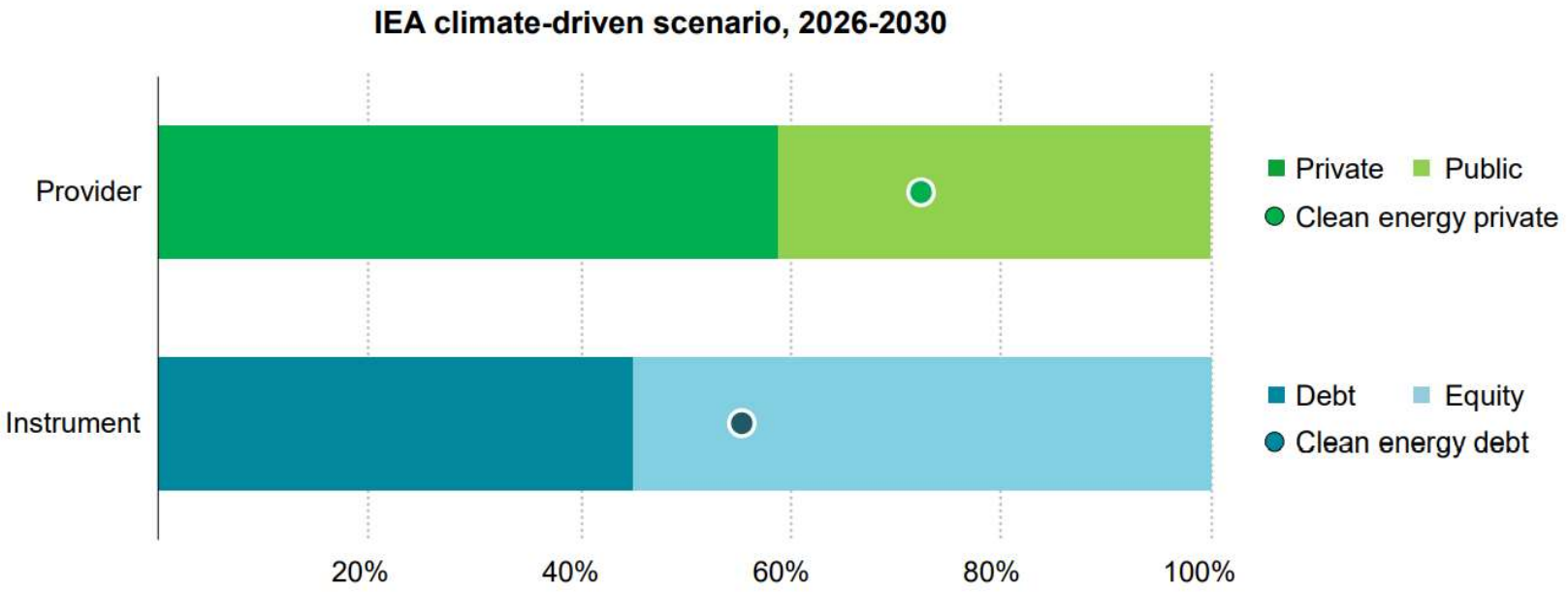


Reducing emissions in emerging economies **costs half less** than in developed economies

Emerging economies receive only 150 bln USD clean energy investment a year, should **increase** to 1 trl USD per year (sixfold increase)

The required quantum leapfrog will require **all available finance instruments** to be successful

Debt-equity mix for energy vs clean energy

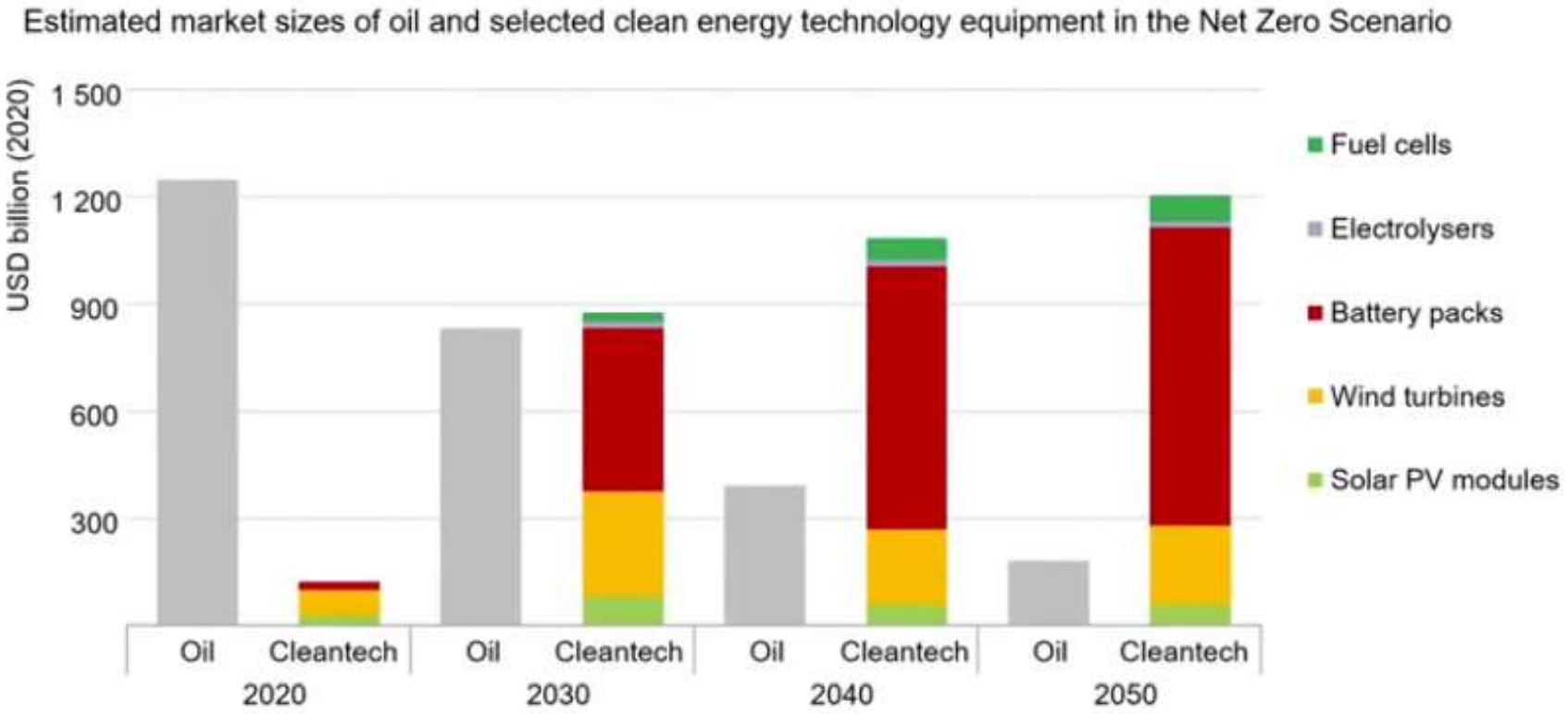


Clean energy relies **more on private funding** than average energy

Clean energy relies more on **debt** than average energy

Role of public sector and especially public equity not sufficient

New global energy economy is emerging



Key role for energy storage

Also: IRENA (2017)

Battery energy storage to increase 18 to 37-fold if renewables share doubles by 2030

IEA WEO 2021

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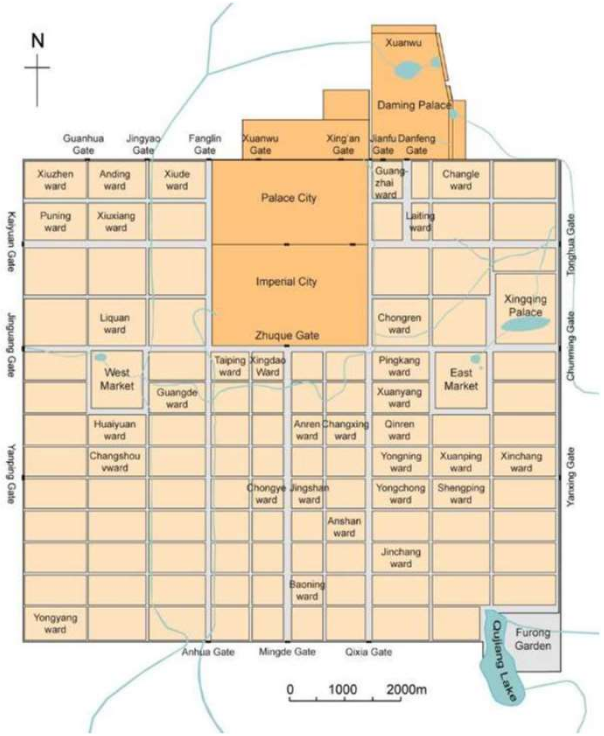
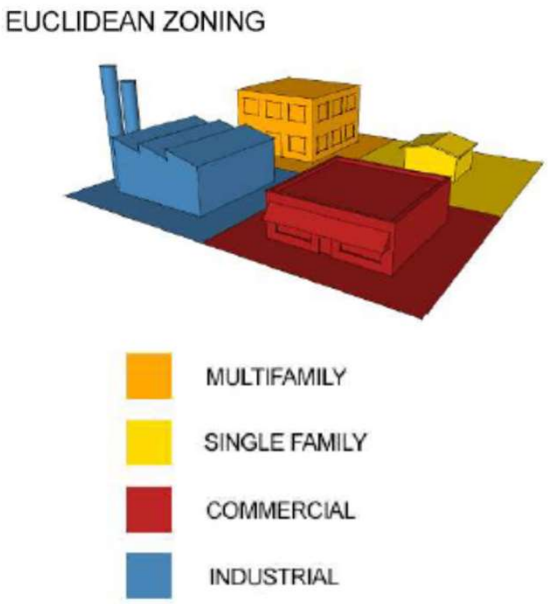
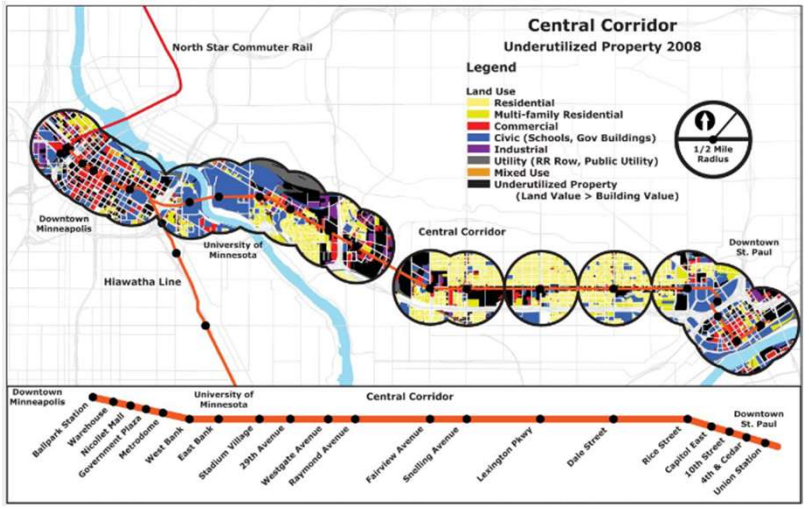
Land planning: land value capture to raise green finance



Land planning as first planning area

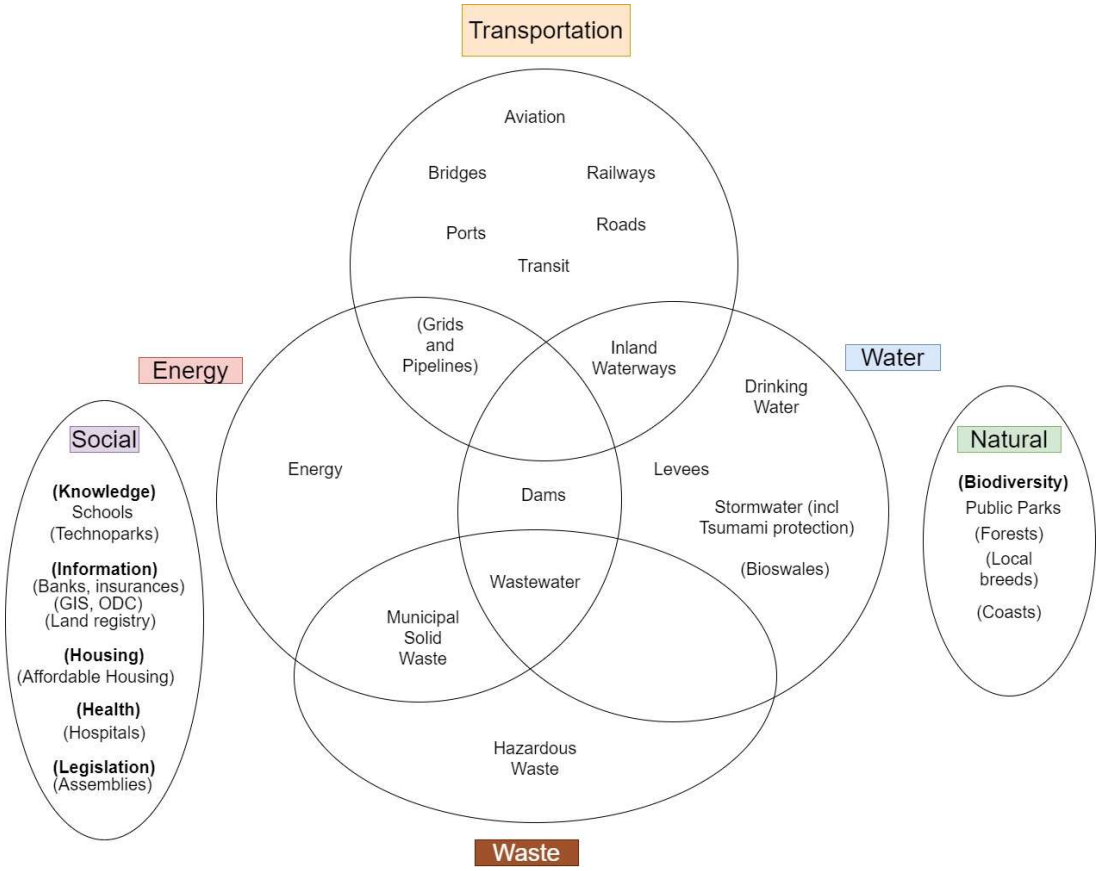


19th & 20th century zoning



1990s: Transit Oriented Development TOD
Developing cities along transit axes
Creating mixed economic-residential districts
Possibility to favor district-level technologies (district cooling, microgrids, seasonal storage)
Financing by Land Value Capture

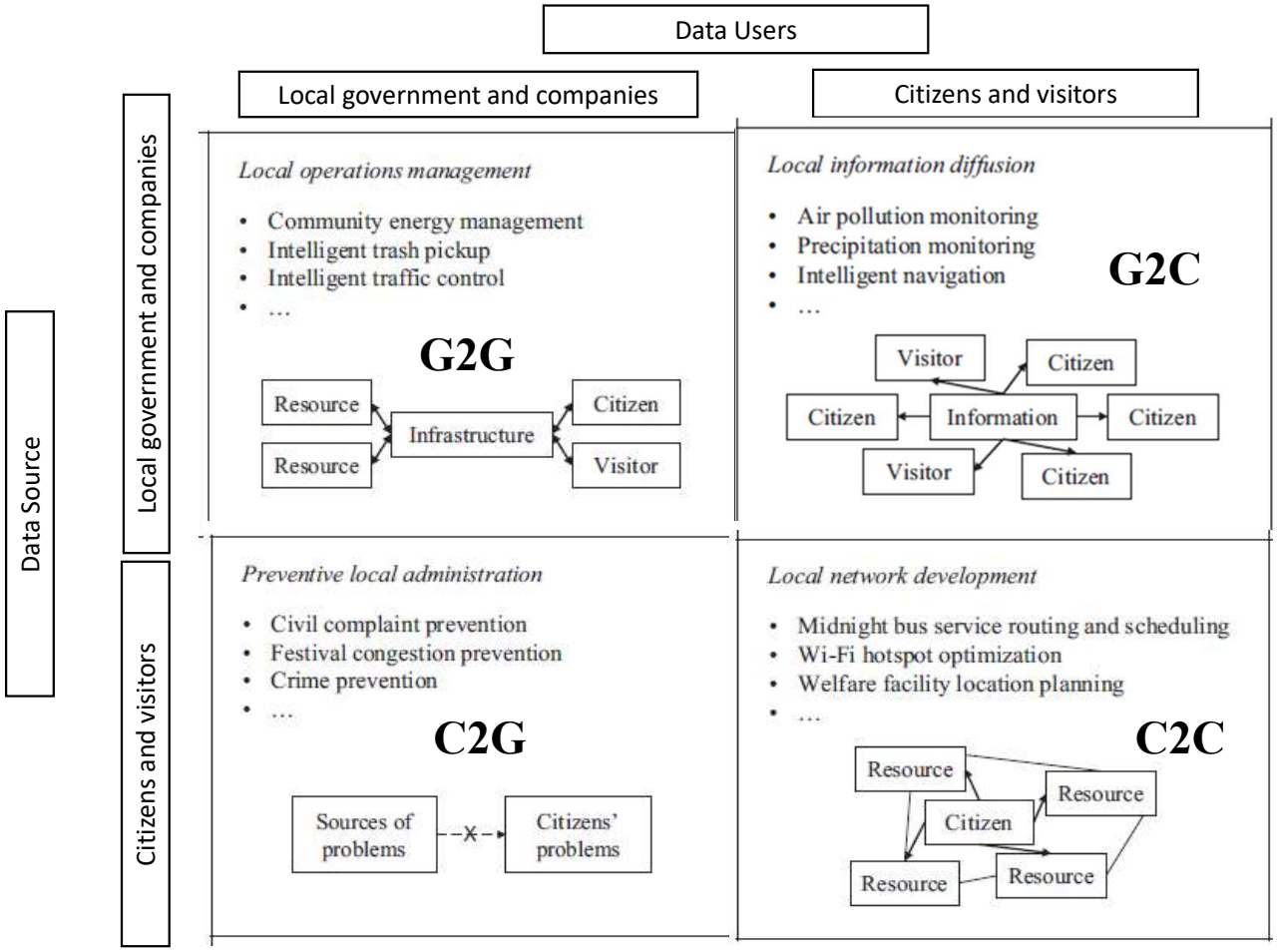
Cities as infrastructure operators to raise green finance



Central role of:

- Transit infrastructures (TOD): need to provide for a certain percentage of affordable housing around transit hubs, see UN Habitat Principles of Sustainable neighbourhood planning, https://unhabitat.org/a-new-strategy-of-sustainableneighbourhood-planning-five-principles
- Wastewater treatment: **triple** role for wastewater, energy, and water
- **Social infrastructures**: traditionally Universities + Science/Technology Parks, incubators for SMEs supplying human capital to High-tech and Medium Tech industries
- New: Data infrastructures: land registry, GIS, ODC
- **Natural infrastructures**: Parks. New: forests, mangroves, protection against natural disasters

Smart data to generate green finance

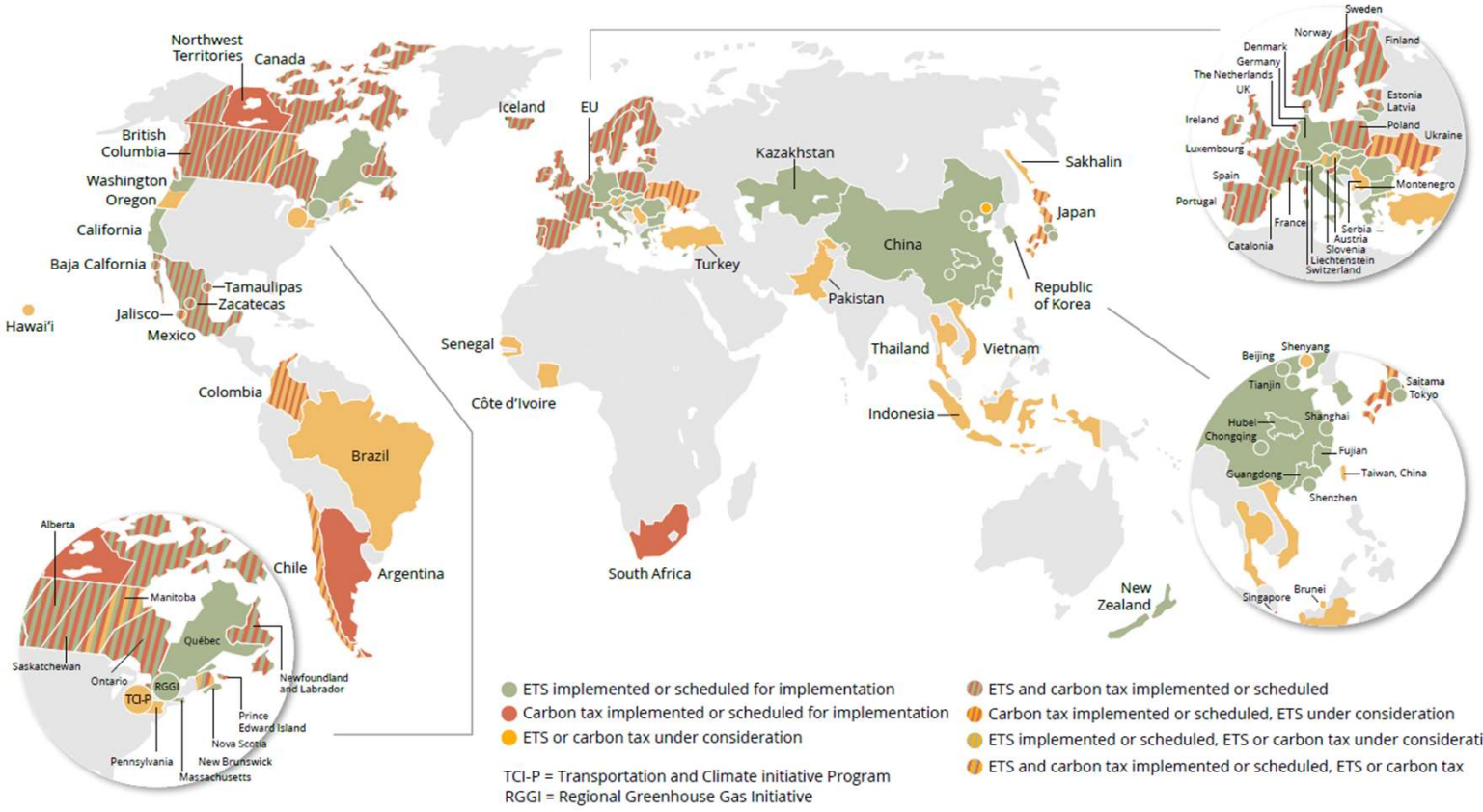


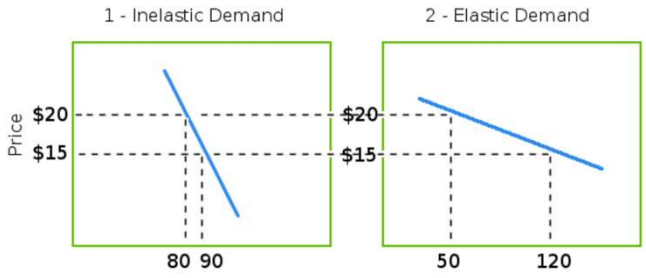
Four reference cases depending on data source and data users: G2G, G2C (= IoT), C2G, C2C (= User APPs),

Relevant for **energy transition**: e.g. Smart energy management, smart waste pickup, midnight bus service routing

Chiehyeon Lim and others: https://doi.org/10.1016/j.cities.2018.04.011

Carbon pricing to raise green finance

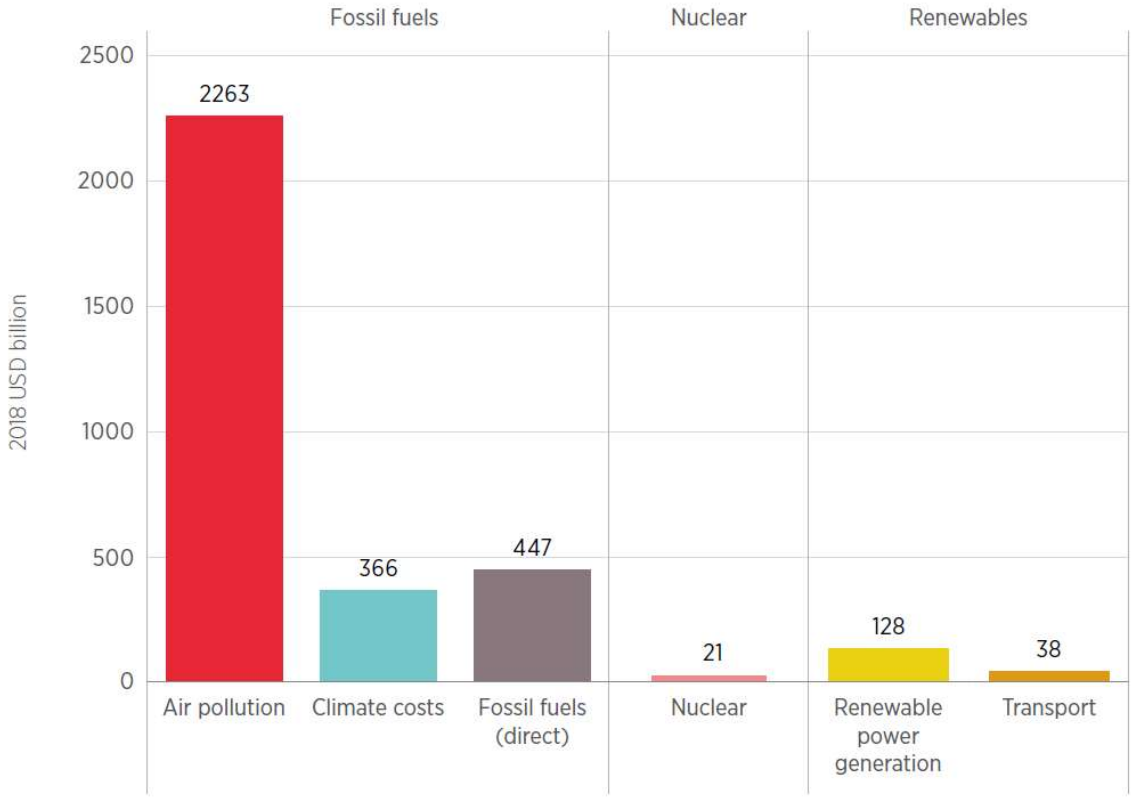




Fiscal tax vs Incentive tax

$1350 => $1600 vs $1800 => $1000

Global energy subsidies to raise green finance



Fossil fuels still receive around four times as much direct public support as renewables (2017); their external costs could be 8 to 10 times higher.

No harmonized definition; consumer subsidies, or producer subsidies, or both

Fossil fuel subsidies are hard to eliminate; when energy prices are high, subidize poor incomes; when energy prices are low, subsidize inefficient producers

Hence re-direct them to **green subsidies**

https://irena.org/-/media/Files/IRENA/Agency/Publication/2020/Apr/IRENA_Energy_subsidies_2020.pdf

Carbon compliance markets to raise green finance

China started emissions trading on 16 July 2021.
Opening day: price 48 yuan/t closing price 52.8 yuan/t.
First two weeks about 6 million t of allowances traded, total value of about 300 million yuan.
As of 5 August, prices between 53–59/t.

COP 26, Glasgow Nov 2021: clarify provisions on compliance markets:
Art. 6.2. on ITMO (ex IET),
Art. 6.4. on SDM (ex CDM and JI), and
Art. 6.8. on non-market approaches

The role of voluntary carbon markets

	2019		2020		2021 (through August)	
	Volume (MtCO2e)	Price (USD)	Volume (MtCO2e)	Price (USD)	Volume (MtCO2e)	Price (USD)
Africa	16.1	$3.94	14.9	$4.24	23.9	$5.52
Asia	45.6	$1.80	63.0	$1.60	91.8	$3.34
Europe	1.1	$2.92	1.7	$9.47	0.8	$2.96
Latin America & Caribbean	15.3	$3.45	18.9	$4.17	36.6	$3.74
North America	15.5	$3.51	11.6	$6.31	10.0	$5.13
Oceania	0.5	$12.53	0.1	$20.57	0.1	$32.93

Forest Trends Association's Ecosystem Marketplace, 2021

Asia highest volume and highest growth

Year 2021 likely to set an all-time high value

Examples for local voluntary carbon markets see https://www.cityforestcredits.org/

Example of global voluntary market: Carbon Offsetting and Reduction Scheme for International Aviation ("CORSIA")

Green Public Procurement and ESG to generate green finance

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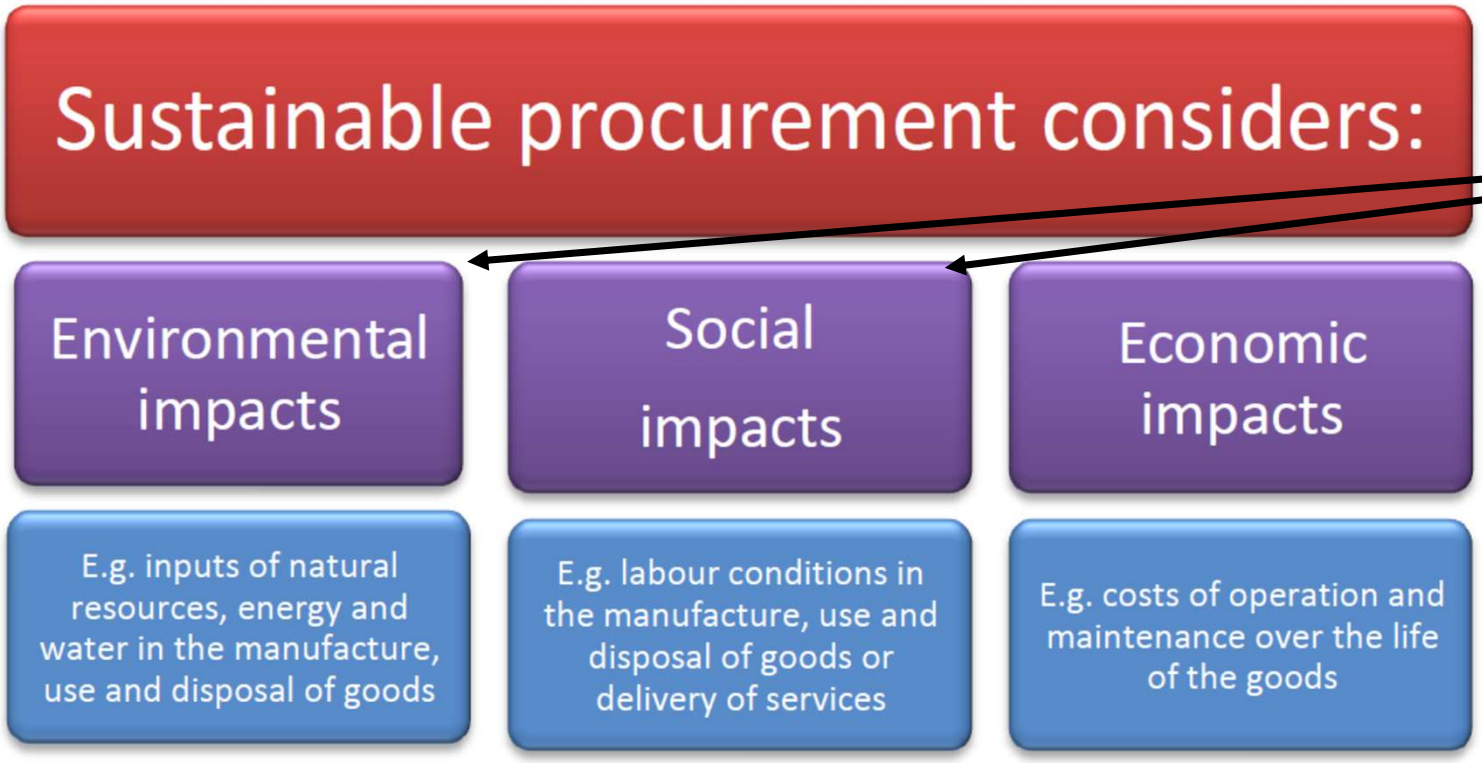
1) GPP Green Public Procurement (supplier relations)



Common example: Portfolio standards

2) ESG Environmental, Social, Governance (investor relations)

Feed-in-Tariffs (FIT)

15 – 20 year contract between a renewable energy producer and utility. Tariffs depend on technology (PV, wind, ….) and size of production installation.
Three forms

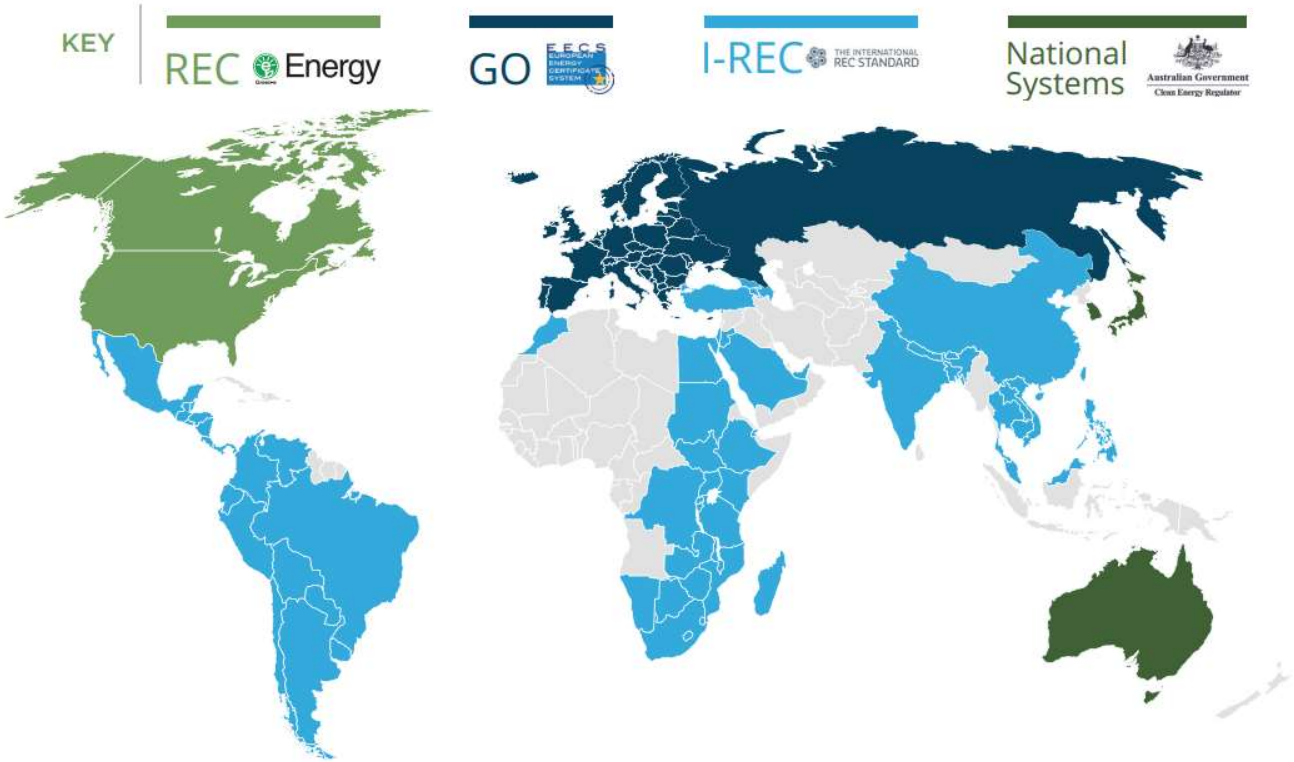
- Fix price FIT
- Degressive FIT, taking into account technological progress
- FIT premium above market price, taking into account of market situation
- Problem: **FIT usually do not include associated storage**

FIT are by far the most successful instrument of favouring renewable electricity generation.

Examples of **municipal** feed-in tariffs:
Anaheim/California:
https://www.anaheim.net/651/Feed-In-Tariff-Program

South Africa,
https://www.solarenergylife.co.za/municipal-feed-in-tariffs-on-solar-power-feedback-into-the-grid/

Renewable Energy Certificates REC and Guarantees of Origin GO



Natural Capital Partners

Renewable energy producer may emit and sell a certificate for each MWh produced.

RECs originate in America, GOs in Europe.

I-REC Standard established in 2014 in the Netherlands operates a single global registry through which energy products from renewable sources can be certified through the electricity supply chain.

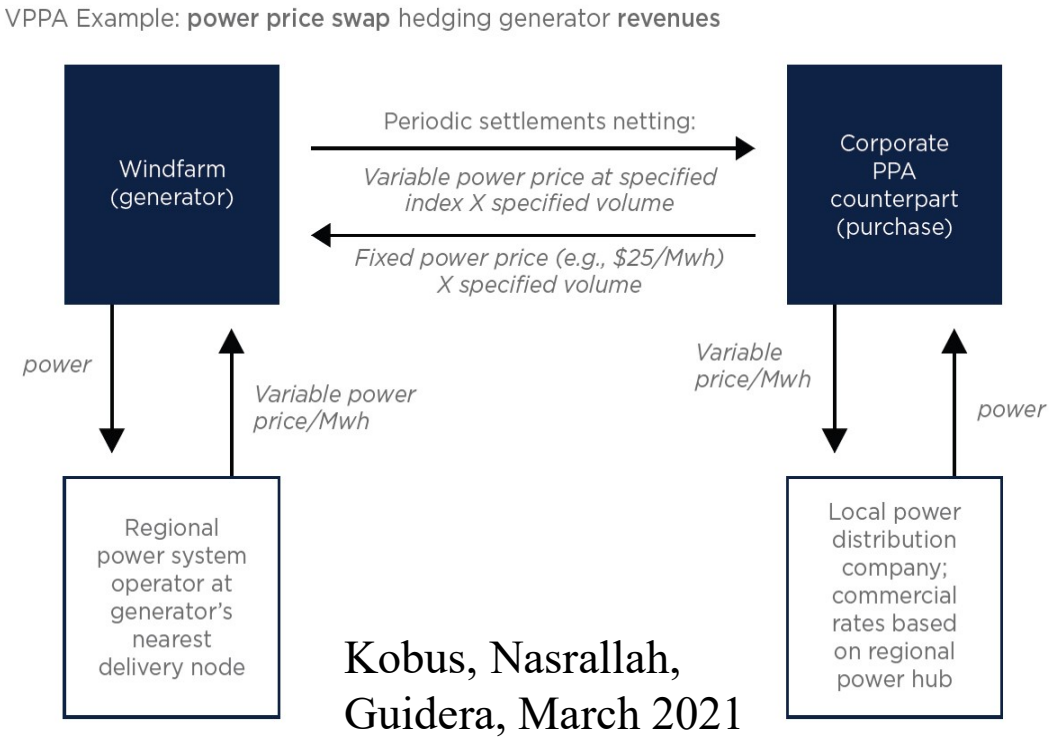
Power Purchasing Agreements PPA

Traditional Power Purchase Agreement ("PPA") is a contract between the public and private sector parties which underpin a power sector **PPP**.

It is typically between a public sector purchaser "offtaker" (often a state-owned electricity utility, in jurisdictions where the power sector is largely state operated) and a privately-owned power producer.

Traditional PPA is often combined with a BOT or concession agreement.

Virtual PPA for energy transition: combined with price hedging clause



Kobus, Nasrallah, Guidera, March 2021

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- Financing Needs of the Energy Transition
- Increasing Returns of Green Investments
- **De-Risking Green Investments**
- Conclusions

Guarantees for green investment

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Green Investment Guarantees should be adapted to cover the specific risks of green investments

Objective: attract capital for an economy-scale green investment plan

Example: Interamerican Development Bank, 2014
"Guarantees for **Green** Markets: Potential and Challenges"
https://publications.iadb.org/publications/english/document/Guarantees-for-Green-Markets-Potential-and-Challenges.pdf

Not (yet) created: **risk mitigation tool for solar power**, https://terrawatt.org/ (1000 Billion USD scheme)
Process**: Solar Risk Mitigation Initiative SRMI**, launched at COP 24 in 2018 https://isolaralliance.org/work/affordable-finance-scale
Solar Deployment Guidelines + e-Tendering platform;

In force: Sweden's state credit guarantees for investment in **green** industry, June 2021

- Issued by Swedish National Debt Office
- Covers loans > SEK 500 Mio
- Guarantees up to 80% of loan
- Maturity maximum 15 years

See IEA policies data base
https://www.iea.org/policies/12452-budget-2021-government-credit-guarantees-for-green-investments?topic=Renewable%20Energy

Insurance for green investments

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Example: Insurance for environmental liability

Prerequisite: legislation must state the civil liability of an industrial enterprise for specified types of environmental damage, and the maximum amount of liability for each type of damage.

Examples: Oil spills, nuclear accidents.

Private insurers will then offer insurance coverage.

Net-Zero Insurance Alliance NZIA, formed in July 2021 by the 8 global leading insurers signed to "Commit to transitioning its investment portfolios to net-zero GHG emissions by 2050 consistent with a maximum temperature rise of 1.5°C above pre-industrial levels …", https://www.unepfi.org/net-zero-alliance/

NZIA was convened under the UNEP Finance Initiative's Principles for Sustainable Insurance (PSI), https://www.unepfi.org/psi/

See also: Net-Zero Banking Alliance NZBA, created in April 2021 by 43 founding banks representing over 40% of global banking assets, https://www.unepfi.org/net-zero-banking/

COP 26 Glasgow Nov 2021: Glasgow Financial Alliance for Net Zero (GFANZ): 450 leading firms and financial institutions, can deliver an estimated $100 trillion of green finance

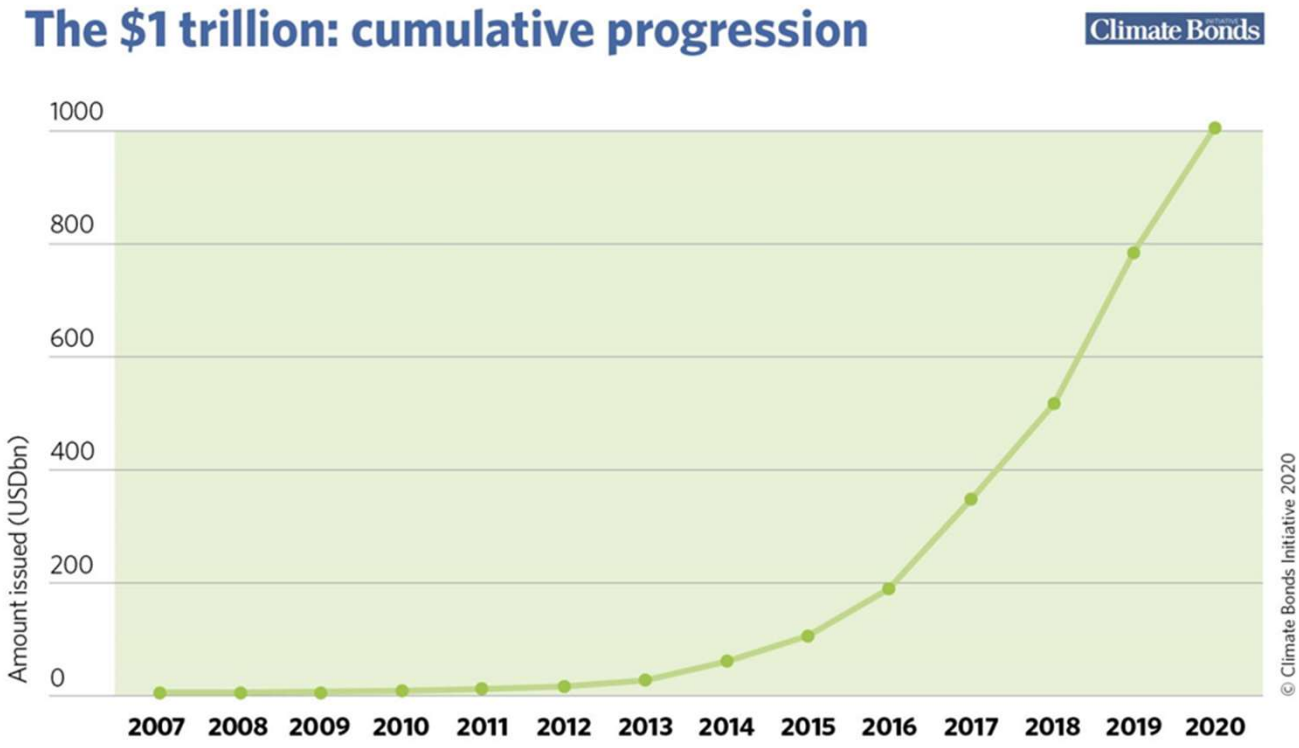
Green bonds

Most green bonds are using general (grey) assets and earmarking them for climate and environmental (green) projects.

First issued by World Bank and EIB in 2007

2013 first green bond issued by a Swedish property company
2013 first municipal green bond issued by Massachusetts
2016 first sovereign bond (Poland)
Today >67 economies issuing green finance instruments

NB: global green finance requirement: **USD 4 trl per year**



Climate Bonds Initiative

Green loans

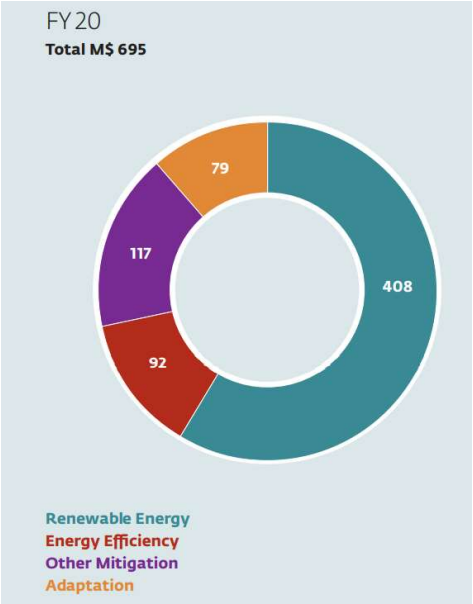
Green loans use general (grey) assets to channel them to climate and environmental (green) projects.

World Bank's International Finance Corporation (IFC) is today the largest provider of green loans

Loans are much smaller than bonds
Loans are done in private operation
Loans are not listed on an exchange

Green Loan Principles (Dec 2018): Voluntary recommended guidelines; 100% of proceeds to be used for the specified purpose
https://www.lma.eu.com/application/files/9115/4452/5458/741_LM_Green_Loan_Principles_Booklet_V8.pdf

Total green loans outstanding at IFC: USD 33 bln, of which only USD 1.6 bln to developing economies



New IFC green loans 2020: Adaptation as a new major component

Green loans from IFC: Case example Mexico

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2019/2020 | IEnova (Mexico): $541 million
In Mexico, IFC structured and mobilized a $541 million, 15-year Green Loan facility to support Infraestructura Energetica Nova (IEnova). The green loan will finance the construction of **five solar plant projects in Mexico** with a total installed capacity of 526 MW. These solar projects will displace carbon-intensive thermal generation in the country and eliminate approximately 793,000 tCO2eq per year. By financing IEnova's first solar power generation projects, IFC is seeking to support IEnova's transition towards a greener business model. Following IEnova's adoption of the Green Loan Principles, this investment became the first certified IFC Green Loan in Mexico.

Green loans from IFC: 2020 Loans to projects in China

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Green bond climate sector	Project short name	Project ID	Economy	Type	Project description	Climate loan committed USD millions	Anual energy produced MWh	Annual Energy Savings kWh	RE capacity constructed/ rehabilitated MW	Green building impact M2	Other impact	Expected annual reduction in GHG emission tCO2eq/ year	Sustainable development goals
Solar	Linyang En	41370	China	RE	IFC's loan will finance the construction of the first grid-parity* solar projects in China which will help to reduce GHG emissions and meet increased electricity demand	11	368,456	N/A	299	N/A	-	273,989	SDG7 SDG8 SDG13
Green banking	Lionbridge Green	41378	China	Other mitigation	IFC's loan will finance expansion of leasing finance services for electric vehicles to truck drivers. This will enable the reduction of GHG emissions through the promotion of leasing finance for environmentally friendly electric trucks.	20	N/A	N/A	N/A	N/A	-	122,419	SDG8 SDG9 SDG12 SDG13
Agri business and forestry	Alpha Feed	41835	China	Adaptation	IFC's loan will finance the aquaculture industry upgrades through the expansion of the extrusion technology-based aquafeed capacity in response to the increasing risk of eutrophication** due to higher water temperatures. This alternative process for aquaculture feed production will increase digestibility and functional properties of the aquaculture feed, such as water stability and	7	N/A	N/A	N/A	N/A	N/A	-	SDG8 SDG14 SDG15

Green equity

Rapidly growing since COP 26
Using equity to promote sustainable development
Multi- and bilateral financial institutions are revising their policies or positions on equity investing

- European Investment Bank is consulting publicly on a new Standard 11 on Intermediated Finance
- Asian Development Bank (ADB) is currently reviewing its Energy Policy, which addresses FI investing
- International Finance Corporation (IFC) is reviewing its Approach to Greening Equity
- Asian Infrastructure Investment Bank(AIIB) began a review of its Energy Sector Strategy in December 2021.

- GCF has accelerated its support for equity investments, primarily through its Private Sector Facility (PSF). Equity investments, including the most recent approval of GCF equity investment support for two large private equity funds supporting adaptation, make up 22.1% of GCF private sector investments and focus on de-risking private sector climate infrastructure projects and programs and structuring anchor investments in climate equity/debt funds.

Remark: as equity has “junior” status compared to debt (bonds, loans), investing in green equity is a way to de-risk the debtors

How to engineer catalytic effects of public investment

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Public investors (foundations, high net-worth individuals, government and development finance institutions) to invest in so-called catalytic first-loss capital (subordinate categories of debt):

- Grants, incl. to cover a set amount of first loss
- Equity: the most junior equity position in the overall capital structure
- Guarantees: A guarantee to cover a set amount of first-loss capital; is like a grant but has a cost.
- Junior subordinated debt: The most junior debt position in a company

In doing so, the public sector de-risks senior categories of debt or equity
This helps attracting low-risk investors

Example of a catalytic fund: Catalytic Capital Consortium (2019) https://www.macfound.org/programs/catalytic-capital-consortium/ :The Catalytic Capital Consortium, or C3, aims to demonstrate the power of this form of investment to extend and deepen the reach of the impact investing field, helping to address the annual funding shortfall of $5 trillion to $7 trillion that is hindering the world from reaching the UN Sustainable Development Goals.

IEA Sustainable Recovery Plan 2021 – 2023: increase global investment in clean energy by about USD 1 trillion per year over three years, equivalent to 0.7% of global GDP in 2019, **70%** from the private sector, **30%** from public sources.

Example of catalytic funding for provinces/cities: Shandong Green Development Fund SGDF (ADB / GCF)

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Part of Beijing – Tianjin – Hebei (Jing Jin Ji) area
Population 100 Million, 3,000 km coastline, Rank 8th (GDP / Capita)
Highly industrialized => Representative area of PRC
Largest energy and coal (10%) consumer area

Proactive Provincial Climate Change Policies:
Decarbonize the economy: Industrial Transformation
Peaking CO_2 emission by 2027 (3 years ahead of NDC)

Transformational: H2; Green Corridor, Circular economy…
Advanced Benefits: Biomass; Renewable Energy, Green Procurement (EU Guidelines)
Good Practices: Climate positive subprojects in line with Government Regulation

$1.5 billion public funds will leverage $12 billion private funds.

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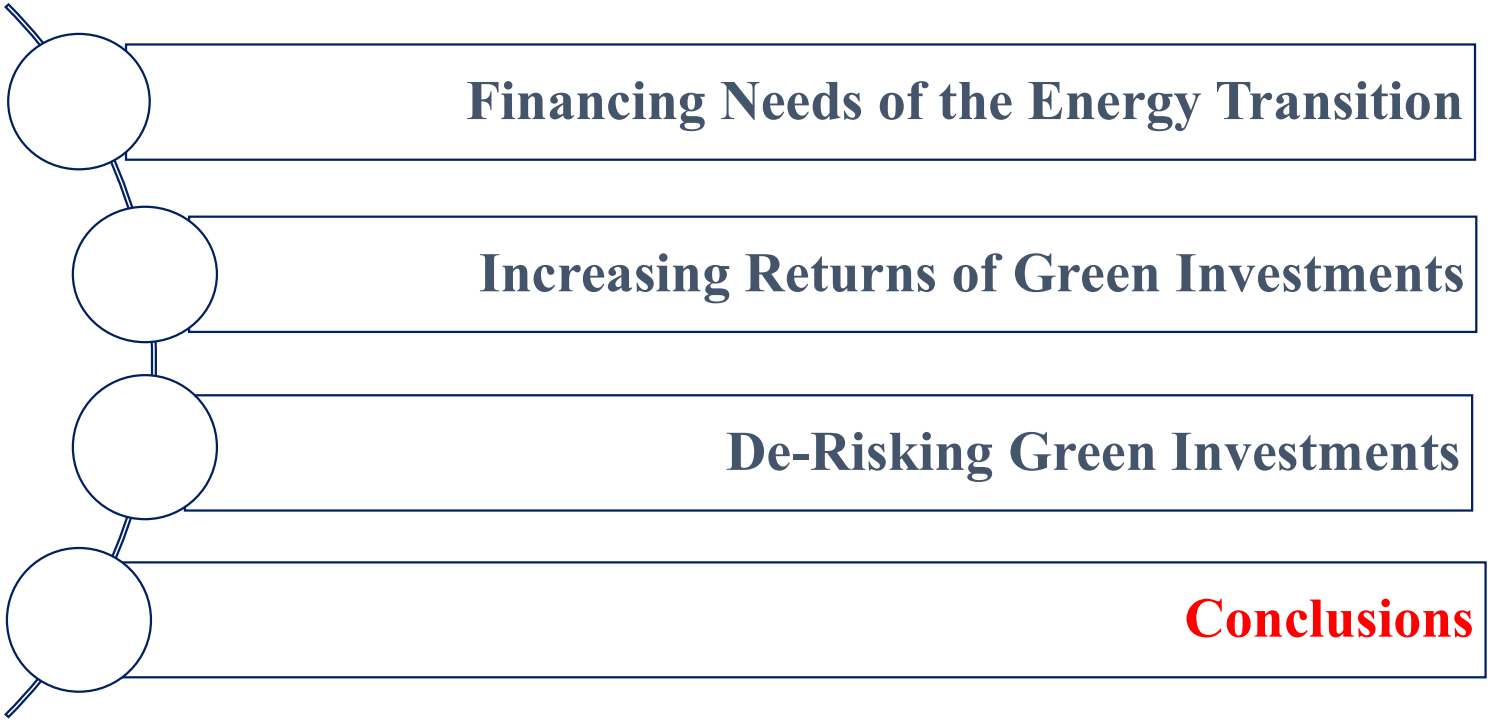

Main take-aways (1)

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- Technically, the 1.5-degree goal can still be reached, but only a narrow pathway with around 400 milestones can lead to this goal
- Global investment gap huge (quadruple global annual investment)
- In emerging and developing economies: six-fold increase; huge benefit as costs in developing and emerging economies are less than half of costs in advanced economies
- Role of public investment to be increased; more equity, less debt
- Measures must be taken to 1) increase the returns and profitability of green investments and 2) diminish the risks
- Main economic instrument: set a carbon price, either by means of a carbon tax, or by means of an emission trading scheme (ETS).
- Accelerate the phase-out of fossil subsidies, phase-in of RE support

Main take-aways (1)

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- Economic support measures: FITs, RECs/GOs, PPAs
- Cities to use all of them, depending on their powers
- Instrument of choice: PPPs combined with PPAs to promote local objectives (renewables share, portfolio standards, GPP, ESG)
- Financial instruments for de-risking:
  - Guarantees (still waiting for a global de-risking guarantee announced by the ISA)
  - Green bonds: developing rapidly; cities have used them; > US$ 1 trl
  - Green loans: examples by IFC in China and Mexico
  - Green equity: Trendy after COP26
- How to catalyse public investment.
  - Example of Jing-Jin-Ji

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THANK YOU FOR YOUR ATTENTION!

"Joining Hands Toward Sustainable Energy Development in the Asia-Pacific Region."