The *BRIDGE* study: “Belt and Road Initiative and the Development of Green Economies” - Challenges and opportunities for a Green BRI

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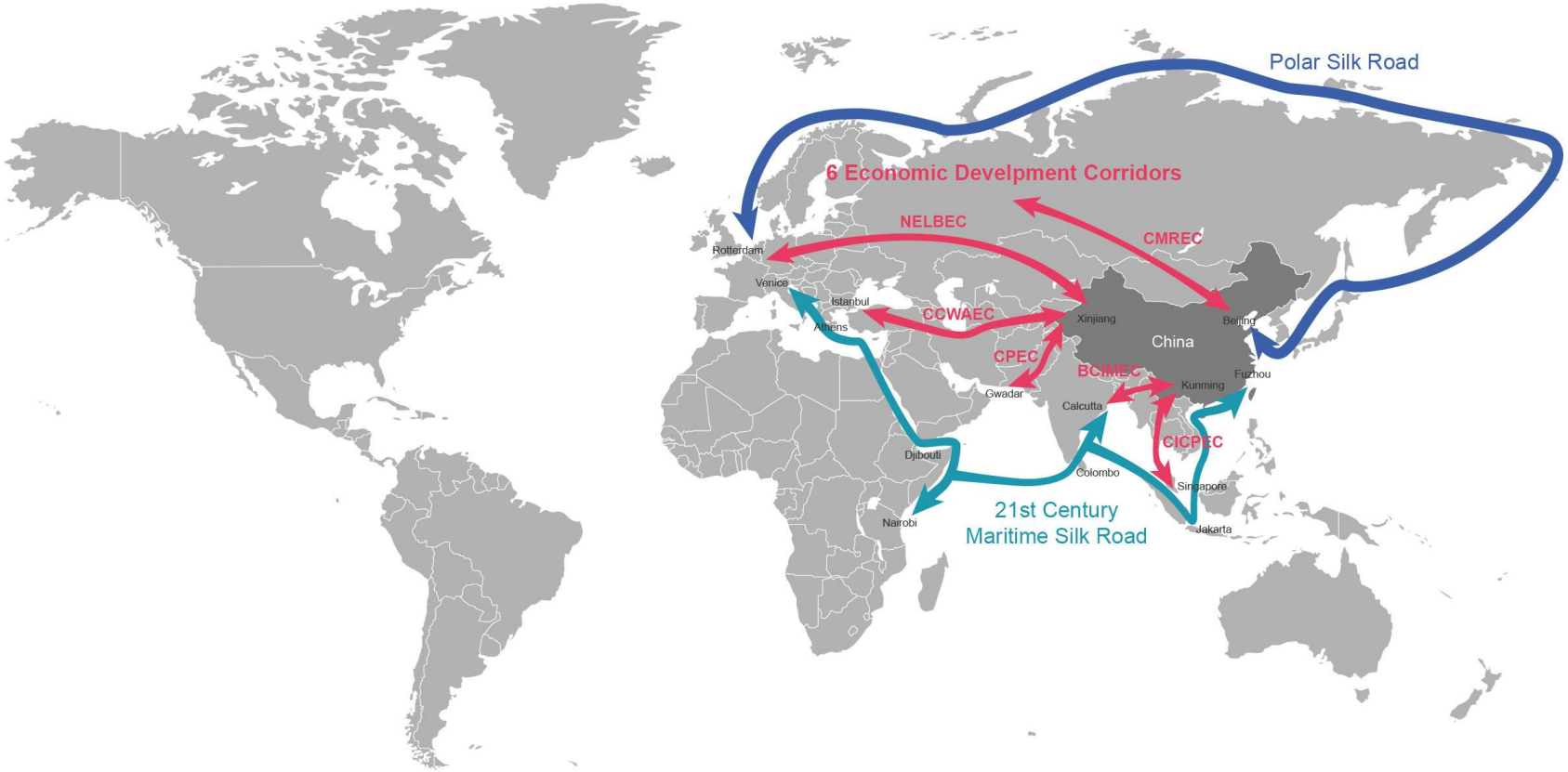
Core tools: TIMES-CAC (blue, 4 countries), MAPLE (orange, 1 country)

The BRIDGE study

- Multi-country analysis of scenario pathways for low-emissions economic development of identified areas along "East-West corridors" (BRI)
- Harmonised key "supranational" dimensions and basic storylines
- Insights from a comparative analysis → Models integration
- Regional climate ambitions *VS* BRI funds / Potentials *VS* Demand
- A "green" BRI (high share of renewables, deep mitigation for industry and transportation) calls for regulations/standards

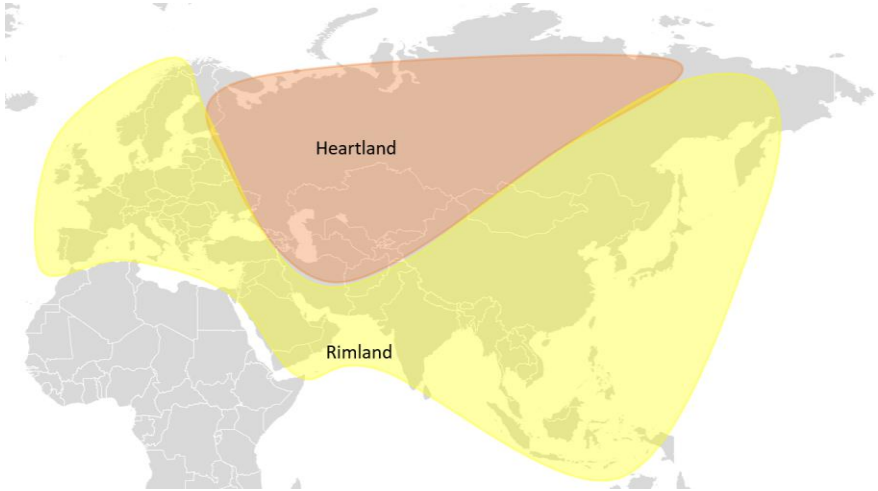
The Belt and Road Initiative: overview

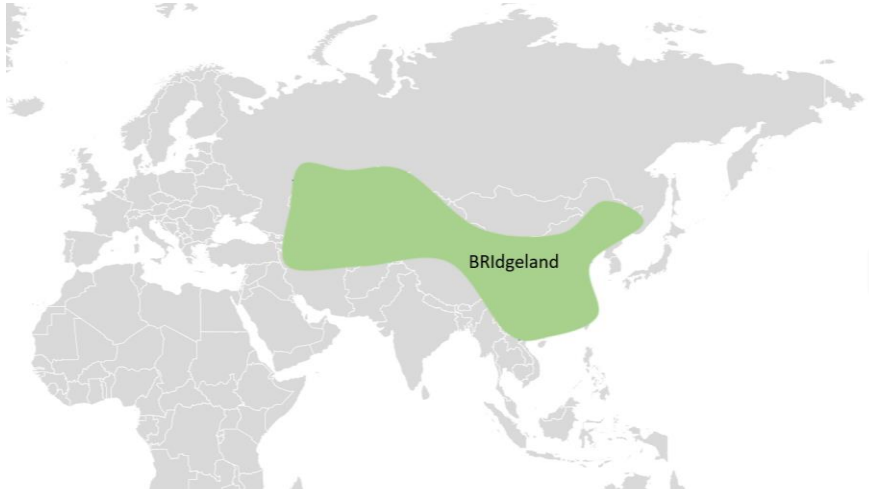
Beltroad-initiative.com



- Complex China transcontinental long-term policy and investment program (2013)
- Aims: infrastructure development and acceleration of the economic integration of countries along the route of the historic Silk Road
- Silk Road Economic Belt (land routes) comprising six development corridors
- "Energy" dimension of BRI: energy security issue (China) *vs* opportunity for increasing system energy efficiency (beneficiary countries) and some cons.

From “geopolitics” to “connettography” to “modelling”





The “*BRIdgeland theory*” (De Miglio, Cassetti)

Exploring an energy-economy-climate “connected system” rather than political (homogenous) entities

Key words of the integration: RES, H2, efficiency, “trades”

MAPLE model

(China)

http://paris-reinforce.epu.ntua.gr/detailed_model_doc/maple

- BaseYear: 2015- Horizon: until 2050 (5-year step)
- (Intra-annual) time slots: 4 seasons * 2 day-night slots for electricity supply and demand
- High level of technology/activity explicitness (supply and demand side)
- Sectors: upstream; secondary transformation and generation, demand sectors (buildings, industry, agriculture, transport)
- Multi region buildings module (31 provinces of China)
- Trades with RoW
- Emissions coverage: GHGs and local pollutants
- Dynamic least-cost optimisation model (and linked with a CGE model)

The Central Asian Caspian model

TIMES-CAC model

(Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan)

http://paris-reinforce.epu.ntua.gr/detailed_model_doc/times_cac

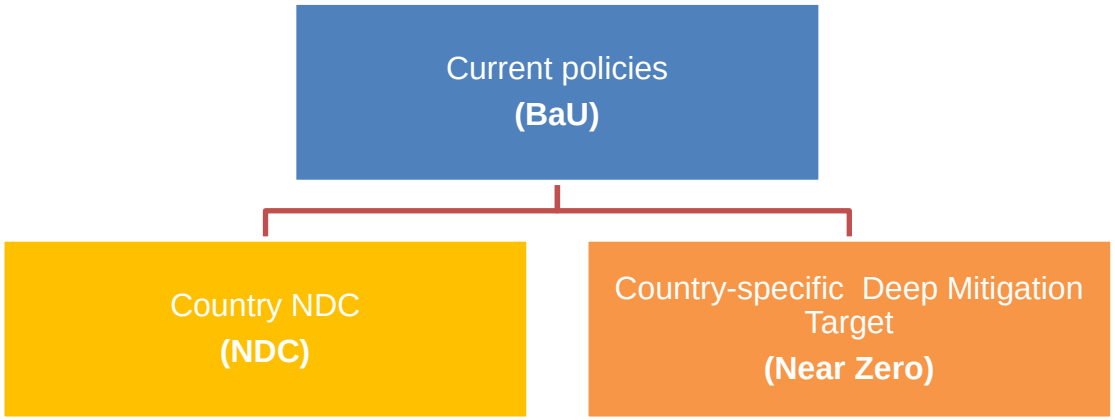
- BaseYear: 2017- Horizon: until 2050 (2017, 2018, 2020, 2025, 2030, 2035, 2040, 2045, 2050)
- Built based on “bottom-up reconstructed” National Energy Balances
- (Intra-annual) timeslots: up to 24 slices as a first proposal (4 seasons * 6 intraday slots)
- Sectors: mining/upstream; secondary transformation and generation, demand sectors (residential, tertiary, industry, agriculture, transport)
- High level of technology/activity explicitness (supply and demand side)
- Trades with RoW (particular attention to the trades with Kyrgyzstan and Tajikistan)
- Emissions coverage: GHGs (Fuel combustion activities A1-A4, Fugitive emissions from fuels)
- Dynamic Partial Equilibrium model formulated in MILP

Scenario outputs-China-1

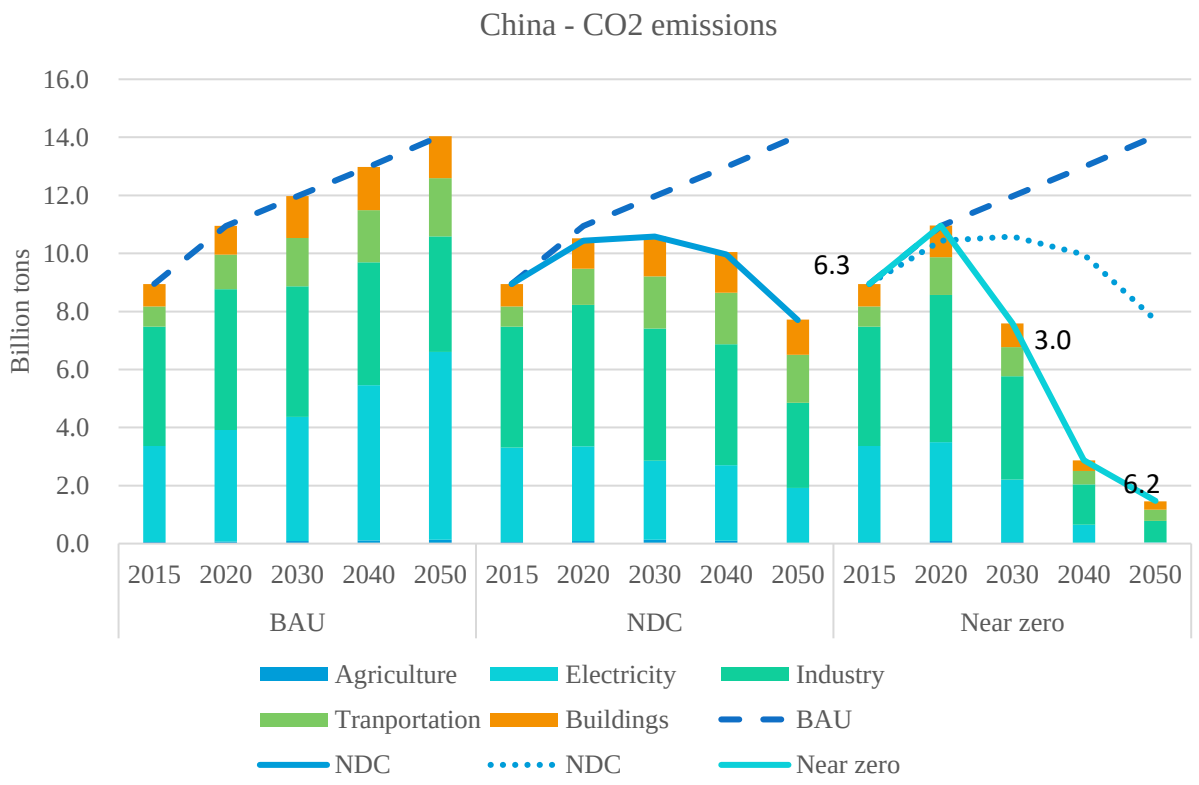
Exploratory runs (MAPLE model)

- References (business as usual)
- Nationally Determined Contribution
- Deep Mitigation (nearly-zero)

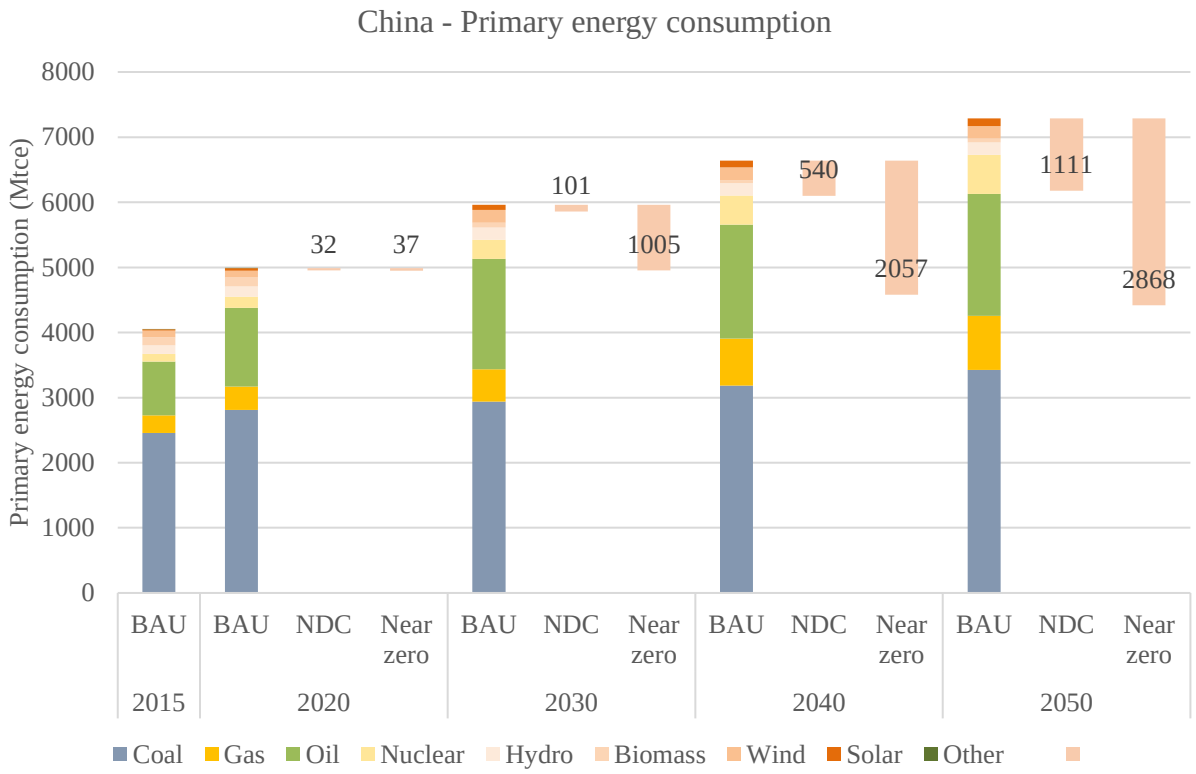
→ **"Learning by comparing" (benchmark)**

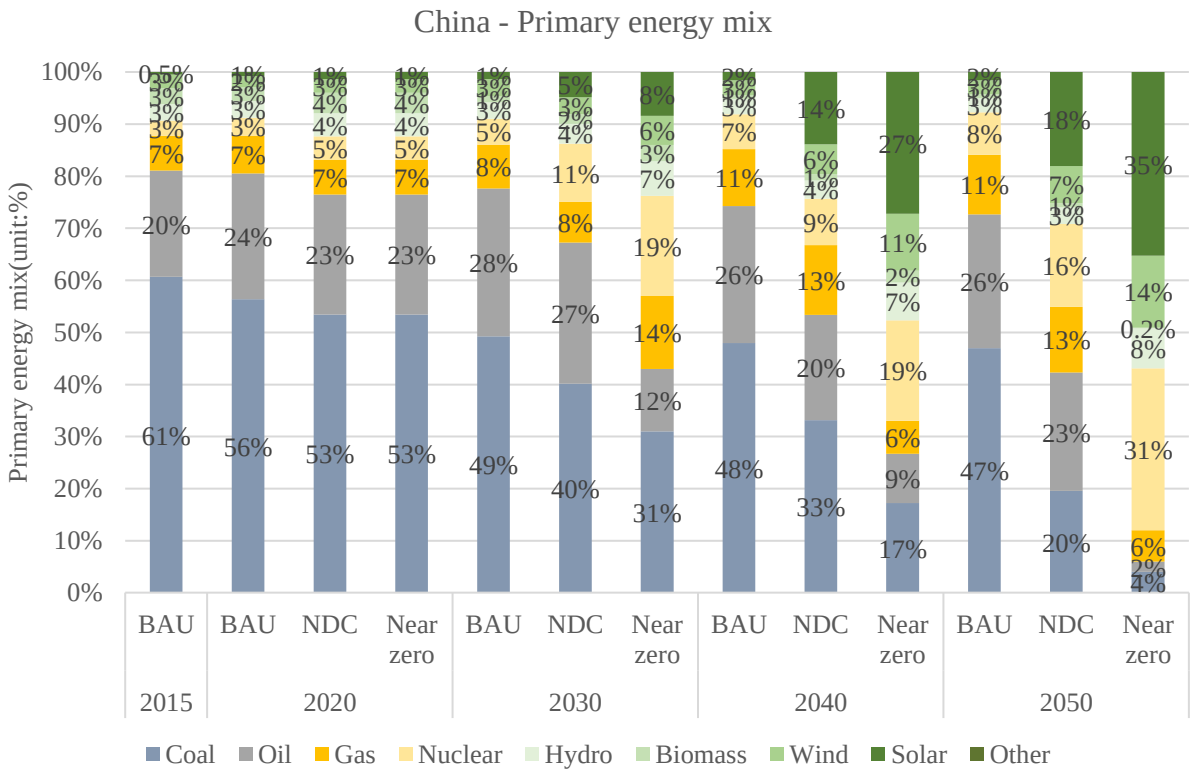


China announced an ambitious and stimulating goal to hit peak carbon emissions before 2030 and achieve carbon neutrality before 2060.
The pathway towards the ambitious target is evaluated in this study.



Insights from the modelling exercise of China





- *Electricity*: electrification of FEC (above 35% in the NDC, above 55% in the NZ case)
- *Natural gas*: mainly to the power sector (limited share in FEC) - *Coal*: no full phase-out (by 2050)
- *H2*: NDC targets not sufficient to trigger the (domestic) H2 chain

Interpretation of the BRI projects in the Central Asia Caspian region

Total amount in million US dollars of financed projects per country and subsector (5 years plan)	Kazakhstan	Uzbekistan	Turkmenistan
Industry	4410	440	
Transport	3810	100	
Agriculture	400	180	
Residential	180	720	
Oil	2090		
Gas		190	600
Renewable energy (not specified)	480		
Solar energy		150	
Wind energy	160		
Hydro	1500		
	+ ~14 B$		

Identification of the key BRI elements and KPIs → Creation of BRI related storylines → Modelling rationale, implementation and runs → Outcomes/Findings

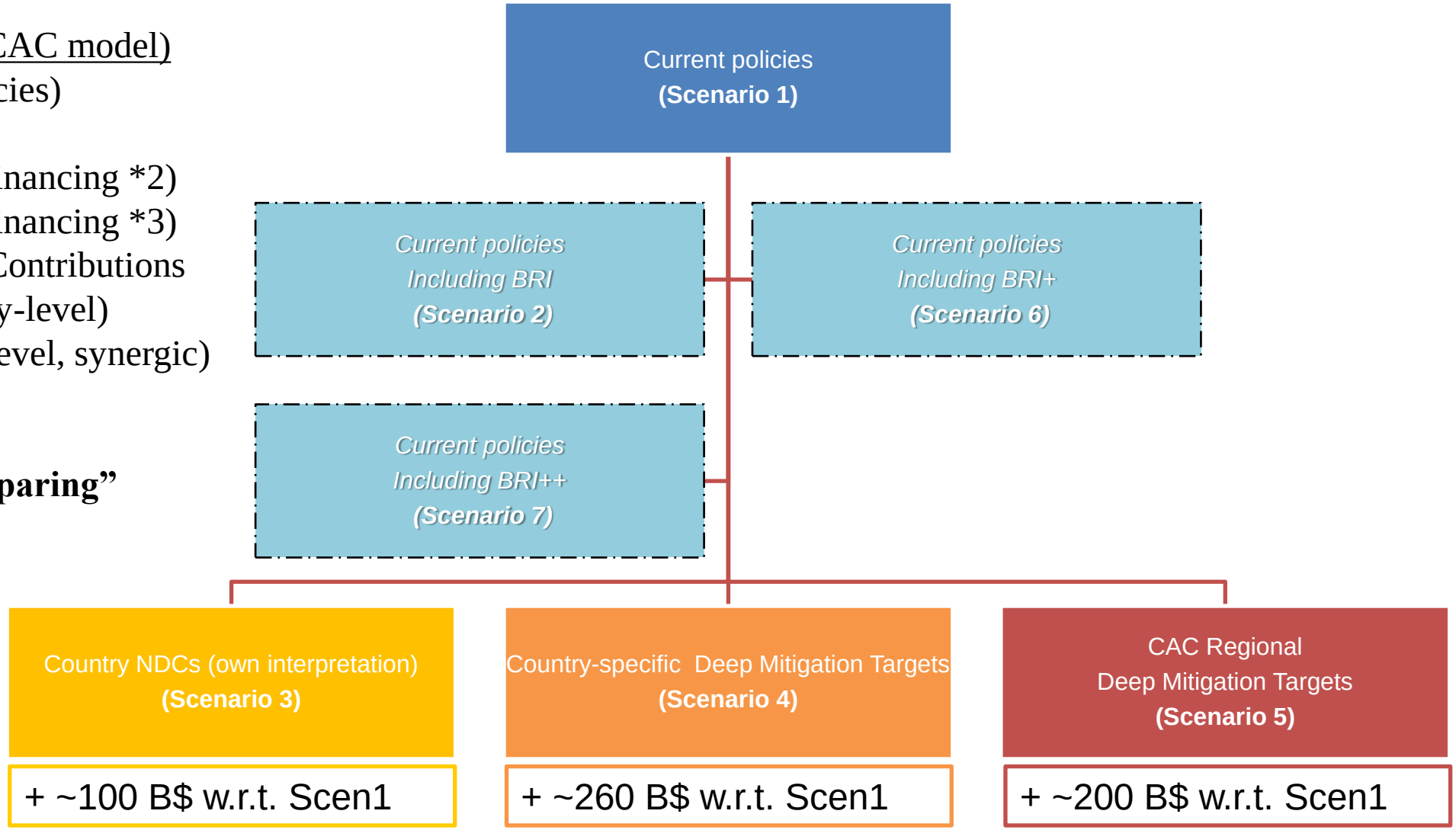
→ *Impacts of an optimised "budget" allocation in the CAC region* → *Is this enough to "trigger" green changes in the CAC area?*

Scenario tree - CAC

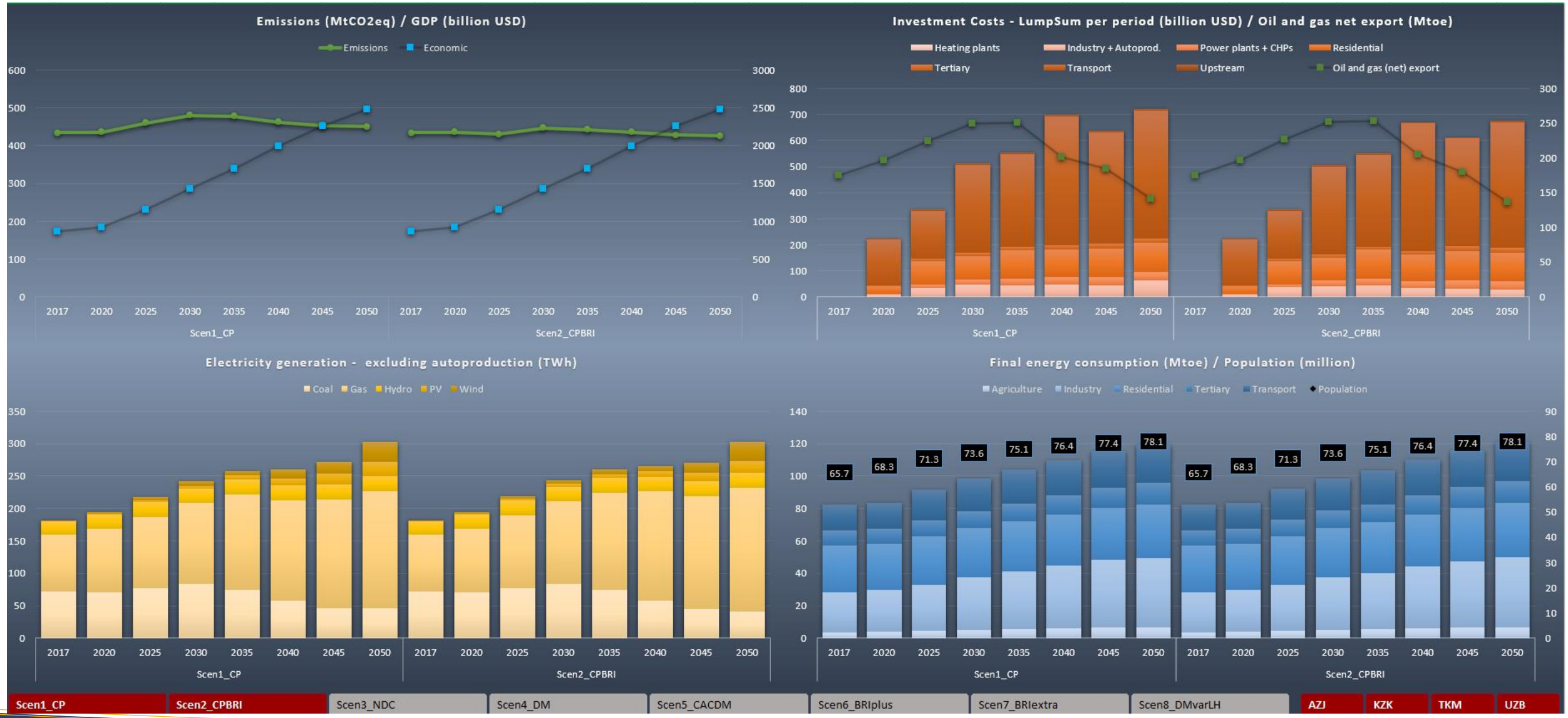
Exploratory runs (TIMES-CAC model)

- References (current policies)
  - Reference + BRI
  - Reference + BRI (financing *2)
  - Reference + BRI (financing *3)
- Nationally Determined Contributions
- Deep Mitigation (country-level)
- Deep Mitigation (CAC level, synergic)

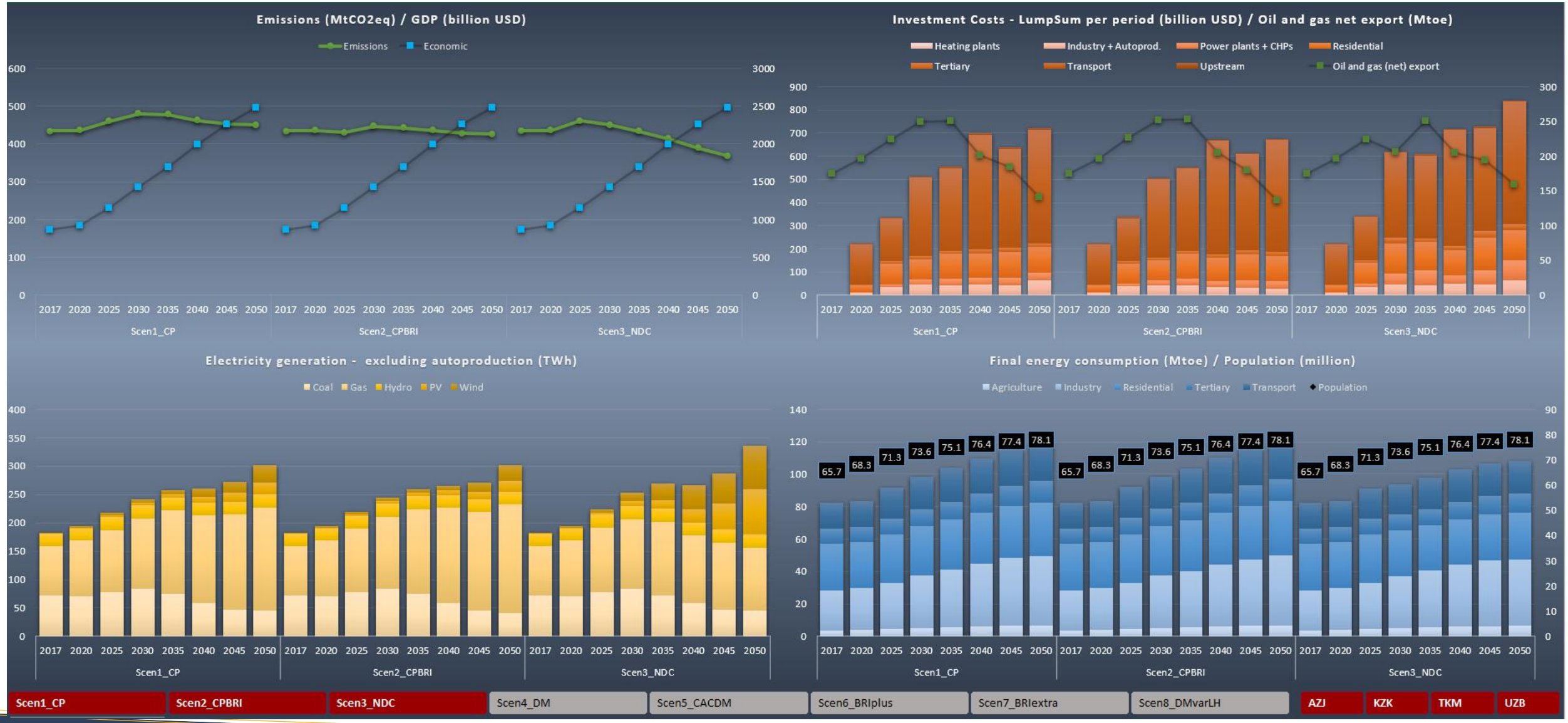
→ **"Learning by comparing"**



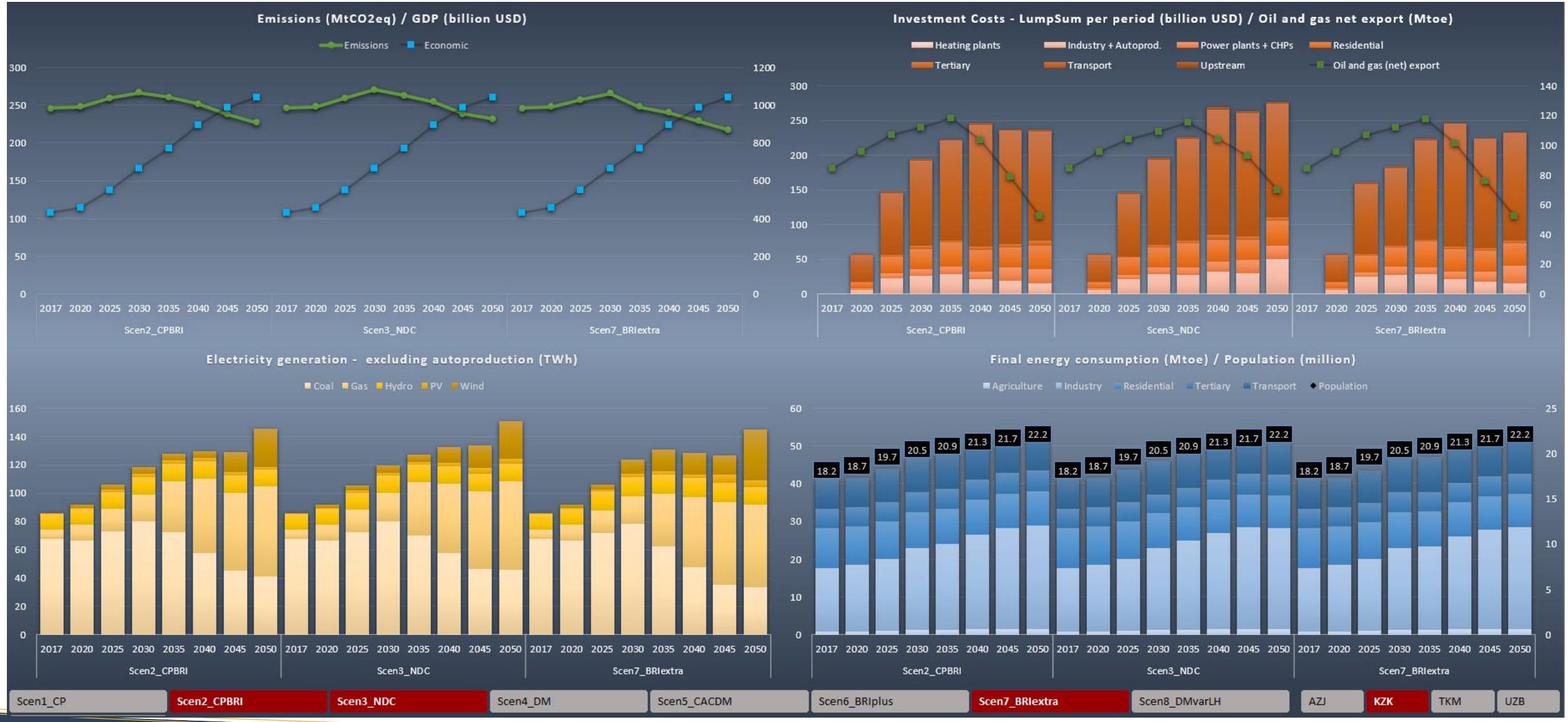
Outputs-CAC-1



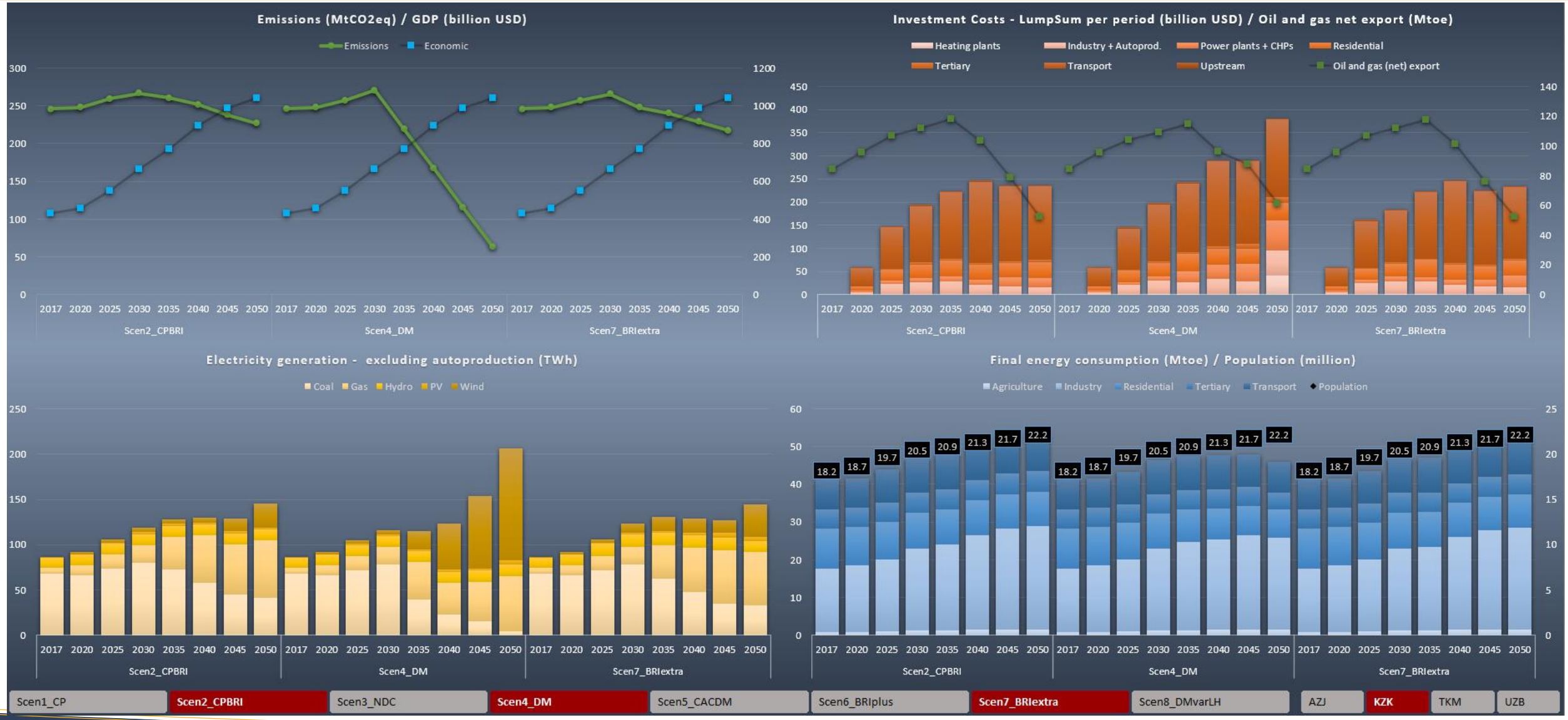
Outputs-CAC-2



Outputs-CAC (KZ)-3



Outputs-CAC (KZ)-4



Findings and next steps

Central Asia Caspian

- Important opportunities for the region
- Controversial impact → (uncertainty) "budget" allocation; mainly short-term impact!!
  - Not enough to turn the CAC system towards the reduction of emissions in the medium-long term
  - "Risk of relocation / stagnation": BRI investments without a proper regulatory framework / standards (rewarding green/efficiency) have limited impacts!
  - Building sector is "neglected" (even though BRI is also supposed to be about "green" urbanisation)
  - Private transportation is not included, and funds along the chain are not strong enough to "activate the H2 chain"
- Country-specific responses (e.g. mix of interventions in Kazakhstan might have positive effects)

General

- Models are available to be used as test-beds for further analyses at regional / country level
- A dashboard was specifically designed to monitor the evolution of KPIs and engage local stakeholders

Next steps and objectives

- Deeper integration - with particular focus on "hydrogen" - is planned for the next months
- The Green energy Recovery after COVID-19 pandemic in Asia
- Asia's near-zero emission future in the 1.5 degree world
- CBA mechanism (impact on the regional heavy industries)

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Thank you!

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https://www.linkedin.com/posts/rocco-de-miglio_the-bridgeland-ugcPost-6706581225936707584-adyf

Questions?

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