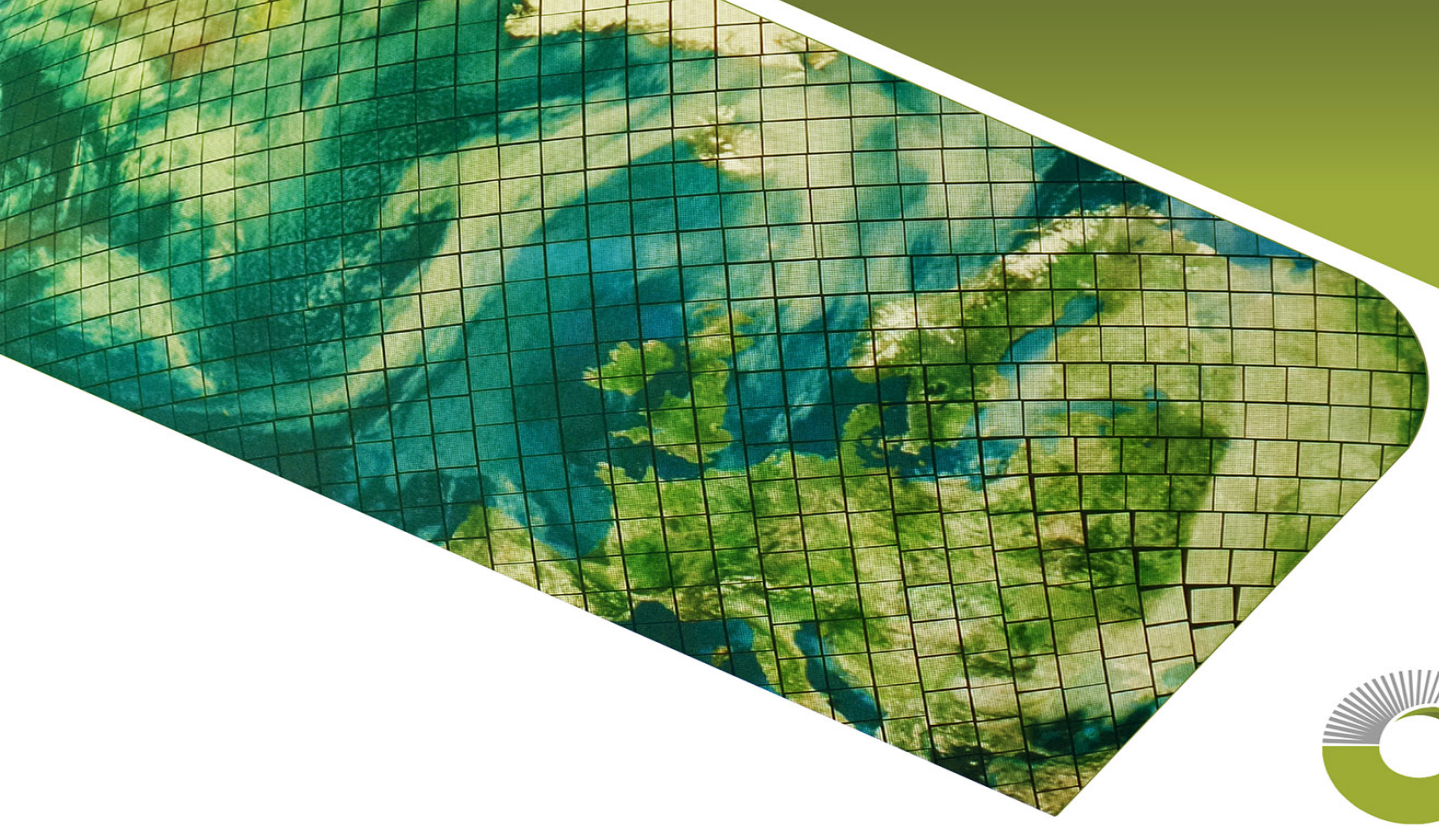

PARIS REINFORCE

Pathways to climate neutrality in Europe with a spotlight in Greece, Athens, June 30, 2022

Co-Creating Transformative Policy Mixes for the Power Sector in Greece

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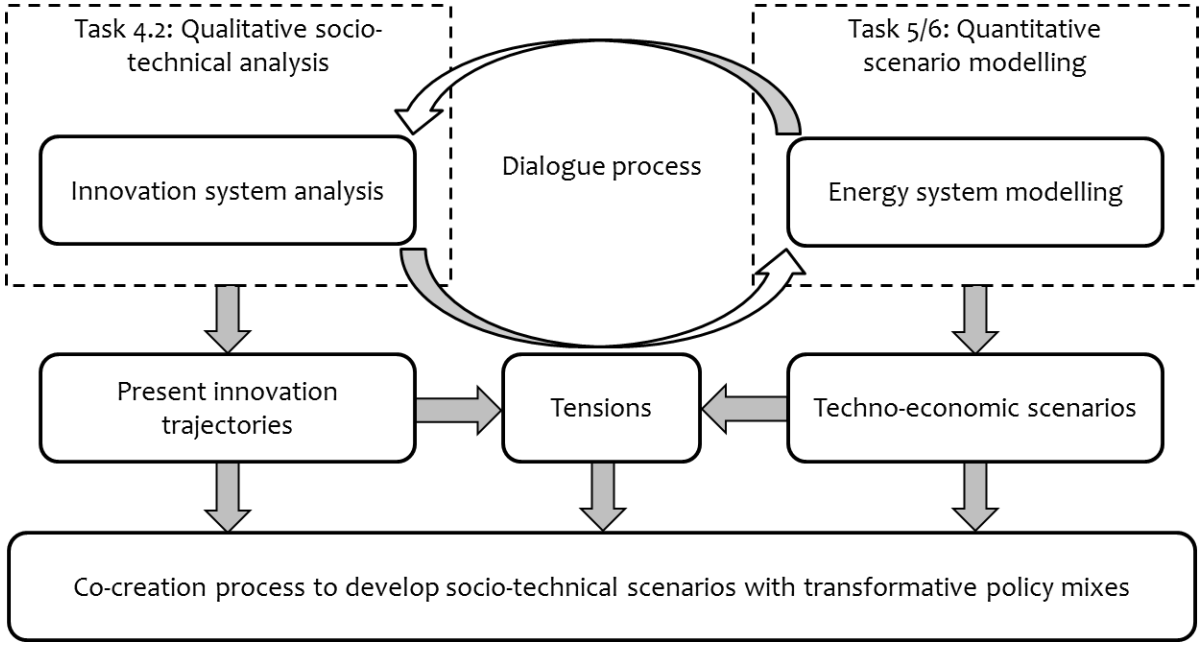
Co-creating Transformative Policy Mixes in PARIS REINFORCE

Our objective within PARIS REINFORCE:

To extend quantitative techno-economic scenarios in line with the Paris targets to socio-technical narratives by describing a transformative policy mix based on innovation system analyses



Sources: own representation

Approach: Identify transition bottlenecks and co-create transformative policy mixes

- Bottlenecks are derived from tensions between modeled scenarios and present innovation trajectories.
- Scientists and stakeholders co-create socio-technical narratives exploring how to overcome these.
- A *transformative policy mix* is obtained by describing policy mix guidelines over time

5 case studies

- Energy sector transformation in Greece
- Energy-intensive industries (steel, cement, chemicals) in Germany + the UK
- Transport sector in Brazil and Canada

The PARIS REINFORCE project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 820846.

Conceptual background:
Transformation bottlenecks + policy mix elements

	Transformation bottlenecks (generic examples!!)	Relevant policy mix elements (generic examples!!)
Social feasibility	• lack of acceptance by important groups • deviation from societal trends + norms • required behavioral changes	• **Inclusive policy making:** Processes that foster dialogue,, new ways of thinking or interaction modes, societal experimentation, user spaces or demonstration projects, e.g. roundtables, living labs, ... • **Flexible governance:** adaptive mechanisms that reflect power structures btw. governments, market actors + civil society, public private partnerships, ... • **Systemic instruments:** linking different elements (stakeholder and activities) of innovation systems, , e.g. institutionalized niche markets
Political feasibility	• established power structures • limitations of current political system. • deviation from political targets + strategies	
Technological feasibility	• transformation of physical infrastructures • required technological maturity of certain technologies not yet available	• **Technology push:** Instruments that pay attention to innovative technology options, e.g. grants for demonstration projects, investment loans • **Demand pull:** Mechanisms that stimulate the demand side (economic or regulatory): quotas, contracts for difference, • **Systemic instruments:** mechanisms that foster the provision of the required infrastructures, e.g. regulation of discriminatory-free access
Economic feasibility	• mobilizing needed investments • need of importing certain goods. • deviation from current market trends	
Socio-economic impacts	• job losses • price increases deemed unacceptable	• **Systemic instruments:** mechanisms that tackle structural change and social inequalities as well as socio-ecological impacts • **Inclusive policy making:** processes that foster participation of 'dormant' stakeholder
Socio-ecological impacts	• additional uses of land and other natural resources deemed unacceptable	

Source: Wachsmuth, J.; Jackwerth-Rice, T.; Seus, S.; Warnke, P. (2021): Outlining a Methodology for Co-Creating Transformative Policy Mixes. Full paper at the IST 2021 conference.

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Greek Power Sector: Market liberalization and RES uptake

Window of opportunity:
Liberalisation of the market

Window of opportunity: Historically low RES electricity generation prices

Second Period (2009-2017)

		2009	2017
Lignite	This further decrease resulted from the increased penetration of RES and the high emissions prices. 8 lignite plants shut down and no new ones were constructed.	52%	Further reduced to 34%
Oil	This fall was led by the installation of RES power plants and the interconnection of some islands with the mainland grid. Moreover, the few oil plants operating in the mainland grid shut down.	16%	Further reduced to 10%
Hydro & RES	Hydro comprises 10% of Greece's electricity generation in 2017. The remaining 15% results from the significant increase of wind and solar power plants.	10%	Further increased 25%
Natural gas	More natural gas plants were constructed replacing the reduced lingite electricity production.	22%	Further increased to 31%

Nowadays (not thoroughly examined in the MLP)

		2017	2020
Lignite	According to the NECP's target for complete delignitisation by 2028, many lignite plants have already been shut down with the rest being shut down by 2022, except the new Ptoleimada V plant that will be converted to a natural gas plant by 2028).	34%	Significantly decreased to 12%
Oil	Still many islands are not interconnected with the mainland grid.	10%	almost steady at 10%, slightly decreased
Hydro & RES	Hydro comprises 7% of total energy generation. RES are accountable for 32% of electricity generation, mainly due to the hisotrically low prices. Moreover, the reduction of lignite usage is also contributing to the rise of RES energy generation.	25%	Significantly increased to 39%
Natural gas	More natural gas plants were constructed substituting for the reduced lingite electricity production.	31%	Further increased to 39%

PPC divided into various entities responsible for the production, transmission and distribution of electricity

2020 NECP, aiming on total delignitisation by 2028

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Source: Nikas et al. 2020

- Employment effects of natural gas are comparably low
- Power generation from lignite coal has high employment effects, in particular in the mining sector and during operation.
- Employment effects of wind and PV power generation can even be higher, but different skills are required.

Lignite Coal	Direct employment (Job-years/TWh)	Indirect employment (Job-years/TWh)	Induced employment (Job-years/TWh)	Total employment (Job-years/TWh)
Power Plant Construction	14.6	9.0	4.5	28.1
Lignite mining, processing & transportation	119.5	39.3	84.8	243.6
Plant Operation	104.3	19.8	54.2	178.3
Total	238.4	68.1	143.5	450.0

Natural Gas	Direct (Job-years/ TWh)	Indirect (Job-years/ TWh)	Induced (Job-years/ TWh)	Total (Job-years/ TWh)
Construction	4.0	2.5	1.2	7.7
Operation	51.3	9.7	26.0	87.0
Fuel extraction and transportation	-	-	-	
Total	55.3	12.2	27.2	94.7

Wind power plant	Direct (Job-years/ TWh)	Indirect (Job-years/ TWh)	Induced (Job-years/ TWh)	Total (Job-years/ TWh)
Power Plant Construction	160.3	88.2	66.3	314.8
Operation	136.9	61.6	74.7	273.2
Total	297.2	149.8	141.0	588.0

PV power plant	Direct (Job-years/ TWh)	Indirect (Job-years/ TWh)	Induced (Job-years/ TWh)	Total (Job-years/ TWh)
Power Plant Construction	612.2	333.7	255.6	1201.5
Operation	146.8	56.4	98	301.2
Total	759.0	389.4	353.6	1502.7

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Source: Nikas et al. 2020

Transformation bottlenecks for the energy sector in Greece

	Bottlenecks for more ambition in the power sector decarbonisation (literature-based, ELABORATED DURING THE WORKSHOP)
Social feasibility	• Opposition to wind power expansion • Lignite sector still seen as guarantors for economic growth + labor • …
Political feasibility	• Target of the coal & NG phase-out not shared by all actors • Regulatory hurdles to small-scale renewable electricity generation and inclusion of prosumers • Potential Lock in due to high investment into (L)NG infrastructure • …
Technological feasibility	• Upscaling of technologies in unprecedented way required • Solutions for non-interconnected islands needed • Lack of green hydrogen infrastructure for storage • Maturity&Uptake of novel RES solutions (CSP, Ocean energy, offshore wind …) • …
Economic feasibility	• High costs of grid adaption to RES requirements • …
Socio-economic impacts	• Expected job losses esp. in lignite dependent regions • Required reskilling of labour forces • …
Socio-ecological impacts	• Potential negative impacts of RES expansion on ecosystems

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Source: own representation of Nikas et al. 2020, Wachsmuth et al. 2021, expert knowledge

Thank you for listening!

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