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The Polish Recovery Plan: a careful step toward energy transition

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Theme

The Polish National Recovery and Resilience Plan (NRRP) amounts to €35.97 billion, of which more than €21.8 billion (60% of the funding) is allocated to 'Green energy and reducing energy consumption' (€14.31 billion) and 'Green, smart mobility' (€7.51 billion). The plan is more conservative on climate action than these figures suggest but will advance the Polish energy transition and impact Polish energy policies.

Summary

The Polish National Recovery and Resilience Plan (NRRP) appears to have a two-fold approach towards green investments and climate change. On the one hand, it supports ambitious renewable projects like massive investments in the offshore wind sector and the development of local solar energy sources. On the other, it also facilitates a more moderate approach that focuses not only on climate but also on addressing social issues, such as supporting the construction of energy-efficient apartments for low- and middle-income households. The document does not pay much attention to international cooperation. However, the analysis of Poland's strategic documents (to which the Plan refers to) clearly shows that there will be many areas for such cooperation, eg, in renewables, the construction sector and clean transport. Furthermore, the NRRP also emphasises the need to update Polish energy and development strategies, so it addresses the issues related to post-COVID-19 recovery as well as the more ambitious EU climate policy.

This paper focuses on the key items that advance the energy transition and limit greenhouse gases emissions. At the time of writing, no English version of the plan was available. Therefore, Figure 3 (Appendix) contains the list of the items in the two components discussed in this paper ('Green energy and reducing energy consumption' and 'Green, smart mobility' plus a few items from other parts of the NRRP that have an impact on climate). The numbers in the square brackets are used in the original Polish Recovery and Resilience Plan to identify each item –Figure 3 can enable non-Polish speakers to browse through the Polish Recovery Plan–. Figure 2 shows key interventions in accordance with the recovery plan, including details and possible cooperation opportunities.

Analysis

The Polish NRRP is worth €35.97 billion, of which more than €21.8 billion is related to 'Green energy and reducing energy consumption' (€14.31 billion) and 'Green, smart mobility' (€7.51 billion). These sums are further split into grants and loans. 'Green energy and reducing energy consumption': €5,696 million in grants and €8,617 million in loans; and 'Green, smart mobility': €6.81 billion in grants and €700 million in loans. Up to 31.2% of the entire funding will be directed to the private sector, with 37.5% going to the state government and 31.2% to local governments.

The 'Green energy and reducing energy consumption' and 'Green, smart mobility' items will receive 60% of the funding. However, the NRRP estimates that the climate contribution will amount to 48.3% of the investments. The reason for this is that the climate tag for some of the items is below 100% according to the Rio markers used to evaluate the contribution of a specific item towards climate goals: 100% (significant); 40% (moderate); and 0% (insignificant). Therefore, the items with an insignificant impact on the climate objective (0%) are included in the full list of investments –shown in Figure 1 but not in Figure 2, as the latter focuses on the above-mentioned components–. It should, however, be noted that it is difficult to assess all the details of the items with the 40% tag; for instance, NRRP states that for item E2.1.1. (Investments in railways) 75% of the investment has a climate tag 100%, while for 25% of the investments the tag is at 40%. Beside the detailed list of actions presented in Figure 2. Some of the cooperation/investment opportunities are discussed below.

Another important factor is that the NRRP refers to other documents that are either already outdated and need to be amended (the Strategy for Responsible Development) or to texts that are still in the making (eg, a hydrogen strategy). In fact, the Strategy for Responsible Development is the core programme for Poland's future and the NRRP heavily relies on it. However, that document had been adopted back in 2017, not only before the COVID-19 crisis, but also before the European Green Deal and the new climate targets, which means it needs to be updated.

(1) The Polish Recovery and Resilience Plan – main details and objectives

Figure 1. General overview of the investments

NRRP part	Component	Investments	Amount (€ mn)	% of total
Green energy and reducing energy consumption	Improving the energy efficiency of the Polish economy	Energy efficiency and RES development by companies – investments with the biggest potential for GHG reduction	300	0.83
		Investments in heating / cooling sources in heating systems	300	0.83
		Replacing heating sources and improving energy efficiency in the residential sector	3,201	8.90
		Replacing heating sources and improving energy efficiency in schools	290	0.81
		Support for improving the energy efficiency of local community centres	67	0.19
	Increasing the role of renewable energy sources	Construction of offshore wind farms	3,250	9.04
		Energy storage	200	0.56
		Investments in hydrogen production, storage and transport technologies	800	2.22
		Development of transmission grids and smart grids	300	0.83
		RES development through energy communities	97	0.27
		Building terminal infrastructure for the offshore wind sector	437	1.21
	Adapting to climate change and limiting environmental degradation	Investments in a sustainable water-sewage system in rural areas	204	0.57
		Investments in the neutralisation of threats and revitalisation of	200	0.56

		large, degraded areas and the Baltic Sea		
		Investments for increasing the potential of sustainable water management in rural areas (including multipurpose hydrotechnical investments)	667	1.85
		Investments supporting a comprehensive green transformation of cities	2,800	7.78
		Investments in green multi-family buildings / blocks of flats	1,200	3.34
Green, smart mobility	Increasing the share of zero and low emission transport, preventing and reducing the negative impact of the transport sector on the environment	Support for a low emission economy – investments in the Polish supply chain for clean technologies	1,114	3.10
		Zero emission and low emission public transport (buses)	1,131	3.14
		Zero emission and low emission public transport (trams)	200	0.56
	Improving the accessibility of transport, its security and digital solutions	Investments in railways	2,392	6.65
		Passenger rolling stock (railway vehicles)	965	2.68
		Intermodal transport	175	0.49
		Transport digitalisation	341	0.95
		Regional passenger rolling stock (railway vehicles)	500	1.39
		Investments in road safety	700	1.95
Digital Transformation	Improving access to high-speed Internet	Ensuring access to high-speed Internet in ‘white spot’ areas	1,200	3.34
		Strengthening the potential of commercial investments in modern electronic connection grids	1,400	3.89

	Developing and consolidating e-services, facilitating the advancement of breakthrough digital technologies in the public sector, the economy and society, as well as facilitating the communication between public and civic institutions and businesses	E-public services, IT solutions for improving the functioning of the public administration and economy, as well as cutting-edge technologies in the public sector, economy and society	420	1.17
		Even out how schools are equipped with portable multimedia appliances	550	1.53
		E-competences	184	0.51
		Developing a digital environment for preschool and general education	700	1.95
	Improving security in cyberspace, securing data processing infrastructures and digitising the infrastructure of the agencies responsible for security	Cybersecurity – CyberPL and infrastructure for data processing and digital services	443	1.23
Resilient and Competitive Economy	Limiting the impact of COVID-19, and alleviating the consequences of the ensuing crisis being faced by businesses	Investments in goods, services, employees' competences and human resources related to the diversification of business for enterprises	500	1.39
		Supporting the preparation of investment areas to suit the needs of investments of key importance to the economy	300	0.83
		Reforming planning and spatial development processes	200	0.56

	Investments in diversifying and shortening the supply chain of agricultural and food products, as well as improving the resilience of the entities participating in the chain	1,267	3.52
Developing a national innovation system: strengthening coordination, stimulating innovation potential and cooperation between businesses and research organisations, including the area of environmental technologies	Investments supporting robotisation and innovations in businesses	450	1.25
	Investments supporting the implementation of environmental technologies and innovations (including the circular economy)	162	0.45
	Expanding and equipping competence centres (specialised centres for training, implementation and monitoring), and infrastructure for managing the traffic of unmanned aircraft	164	0.46
	Investments supporting research capabilities	490	1.36
	Investments to develop an exemplary centre for supporting creative industries (modernising a building, equipment, training)	95	0.26
	Expanding the national system of monitoring agencies, products analytical tools and services, as well as infrastructure that uses satellite data	150	0.42
Improving the education system, lifelong learning mechanisms, supporting adaptation to modern industry, increasing	Supporting modern vocational training, higher education and lifelong learning	400	1.11

	innovation, and increasing new technology transfers and green transformation			
	Making the labour market more structurally adjusted, efficient and resilient to crises	Supporting the reform of institutions in the labour market	52	0.14
		Improving the programmes financing nurseries and childcare for children aged 0-3 (nurseries, children's clubs and daily caregivers) as part of the MALUCH+ programme	381	1.06
		Programmes providing investment support especially focused on making a business grow, increasing its participation in providing social services and improving the quality of reintegration in social economy entities	45	0.13
		Supporting employees/businesses with investments that enable remote work	44	0.12
Better efficiency, access and quality of the healthcare system	Improving the efficiency of the healthcare system, access to and quality of medical services, including the key areas related to the epidemic threats, lifestyle diseases and demographic situation	Development and modernisation of infrastructure for highly specialised healthcare centres and other healthcare entities	2,119	5.89
		Accelerating the digital transformation of the healthcare system (development of e-services)	1,000	2.78
		Development and modernisation of local medical centres	150	0.42

	Developing healthcare staff and strengthening the potential of medical universities and healthcare entities that take part in training medical staff	Investments in modernising and providing new equipment for teaching centres, necessary after raising admission quotas to medical studies	700	1.95
	Advancing scientific research and developing the pharmaceutical industry in response to strengthening the resilience of the healthcare system	Creating specialised research and analytical centres for the medical sciences	273	0.76
		Developing the pharmaceutical industry in Poland, investing in the production of API (Active Pharmaceutical Ingredient)	300	0.83
TOTAL			35,970	100
of which:				
Green energy and reducing energy consumption			14,313	39.79
Green, smart mobility			7,518	20.90
Digital transformation			4,897	13.61
Resilient and competitive economy			4,700	13.07
Better efficiency, access and quality of the healthcare system			4,542	12.63

Source: the author.

Figure 2. Key interventions in Poland (investments and reforms)

Sector	Intervention	Amount € mn	Climate and environmental objective	Policy instruments with positive climate related impacts	Policy instruments with negative related impacts	Cross-border cooperation[1]
Energy						
Energy supply Heating / cooling	Investments in heating / cooling sources in heating systems - Investments in low-emission and RES-based installations: RES, gas fuels, cogeneration (except for coal), heat pumps, geothermal and others; these investments will make 85% of Poland's district heating sources energy efficient by 2030 - Investments to eliminate the most polluting household heat sources	300	Climate change mitigation	Public spending (grants)	Including low-emission sources	/-/

[1] The NRRP does not explicitly mention international cooperation. The section below was prepared based on the expanded analysis of Poland's strategic documents as referred to in the Plan, as well as on the analysis of the government's initiatives in each sector. Even when the row is left blank, this does not necessarily mean there are no options for cooperation (eg, foreign investments).

Energy supply Hydrogen alternative fuels	/	Creating better conditions for the development of hydrogen technologies (and other decarbonised gases) - Developing low-emission and RES based hydrogen - Adopting Polish hydrogen strategy until 2030 (and perspective until 2040) - Amending Polish legislation to remove the red tape, allow and encourage using hydrogen, eg, currently Polish law does not cover hydrogen use in transport - Encourage using electrolysis to produce RES based hydrogen - The Polish government will either amend numerous pieces of legislation or adopt a single hydrogen act - Amending legislation to allow biomethane generation	/-/	Climate change mitigation	Reforms	Low emission H_2 means that not only RES will be used to generate it (possibly also natural gas and nuclear energy)	/-/	
Energy supply Hydrogen alternative fuels	/	Investments in hydrogen production, storage and transport technologies	800	Climate change mitigation	Public spending (grants)		/-/	Poland's offshore wind potential can be used to produce hydrogen

	- Investment in electrolysers (especially RES based) to produce hydrogen - Development of transmission and distribution infrastructure for hydrogen - Development of infrastructure for transporting H_2 by road - H_2 storage development - Development of H_2 infrastructure allowing its use in road, rail and water transport systems					
Energy supply Renewable energy sources	Facilitating RES development - accelerating the increase of RES capacities: changing the 10H rule[2] to speed up the construction of new onshore wind farms - Removing legal barriers for local energy initiatives	/-/	Climate change mitigation	Reforms	/-/	Investment opportunities for the wind industry

[2] The so-called 'distance law' (or 10H rule/proximity act) of 2016 set the minimum distance between wind farms and houses or protected areas at no less than 10 times the turbine height. In practice, it blocked the development of new onshore wind farms in Poland.

	(energy clusters, energy cooperatives, prosumers) - Ensuring the legal framework for developing RES is stable to encourage long-term and better-planned investments in RES - Drafting new legal solutions to improve existing solutions and introduce new models of energy community					
Energy supply Renewable energy sources	RES development through energy communities - Financial support to aid the emergence of energy communities that will also receive help with drafting plans and strategies, preparing business models, conducting due diligence and drafting technical documentation - Financial support for specific investments will focus on the most promising initiatives, including, eg: RES sources, metering	97	Climate change mitigation	Public spending (grants)	/-/	Possibly the exchange of know-how on energy communities (as the Recovery Plan itself states that their development is at a very early stage)

	infrastructure, energy storage					
Energy supply Renewable energy sources	Building infrastructures for the offshore wind sector - Financing will focus on creating the value chain / local content in Poland for the offshore wind sector - This will include developing the Łeba and Ustka harbours so that they can provide maintenance services for offshore wind farms (Pomerania)	437	Climate change mitigation	Public spending (grants)	/-/	Opportunities for cooperation with companies with significant experience in offshore wind farm construction
Energy supply Renewable energy sources	Support for investments in Polish offshore wind farms - Introducing regulations on the requirements for infrastructure connecting wind farms with the grid		Climate change mitigation	Reforms	/-/	/-/
Energy supply Renewable energy sources	Construction of offshore wind farms - Financial support for offshore wind farm construction in the Baltic	3,250	Climate change mitigation	Public spending (loans)	/-/	Opportunities for foreign investors: state support for up to 5 GW of offshore wind capacities between 2025 and 2028

	Sea; Poland wants the farms to yield 8-11 GW by 2040						
	Rebuilding the capability of towns and cities to facilitate the green transition - Adapting the building sector to meet emissions standards	/-/	Climate change mitigation Climate change adaptation		Reforms	/-/	/-/
Storage	Energy storage - Investment in large pumped-storage hydroelectricity as well as home battery storage - The plan assumes that €123 mn in aid will help to finance 28,000 storage units, with a 4-5 kWh capacity each	200	Climate change mitigation		Public spending (loans)	/-/	Energy storage investment opportunities
	Regulatory framework for the development of energy storage - Amending the Polish Energy Law to include regulations on power storage	/-/	Climate change mitigation		Reforms	/-/	/-/
Energy efficiency	Clean air and energy efficiency	/-/	Climate change mitigation		Reforms	/-/	/-/

	- Municipal facilities and households are the main source of emissions in Poland					
	Support for improving the energy efficiency of local community centres - The main challenge is to improve the energy efficiency of buildings like libraries and cultural centres	67	Climate change mitigation	Public spending (grants)	/-/	/-/
Energy transmission	Development of transmission and smart grids - Smart grid investments and grid digitalisation; developing a modern grid for distributed generation - Connecting the northern regions of Poland (where large offshore wind capacities will be located) with the rest of the country - Creating a central information system on the energy market to boost competition and transparency	300	Climate change mitigation	Public spending (grants)	/-/	Possibly new cooperation opportunities with neighbouring countries to create a regional electricity market (interconnectivity).

Buildings						
Households	Replacing heating sources and improving the energy efficiency of the residential sector	3,201	Climate change mitigation	Public spending (grants)	/-/	/-/
Households	Investments in green multi-family buildings - Support for the construction of apartments with a good energy performance for people with low and average incomes (eg, social flats, council flats)	1,200 + an additional 1,200 from the state budget[3]	Climate change mitigation Climate change adaptation	Public spending (loans)	/-/	/-/
Schools	Replacing heating sources and improving the energy efficiency of schools - Support for schools with the worst energy efficiency (insulation, replacing heating sources) with cleaner and more efficient ones	290	Climate change mitigation	Public spending (grants)	'Cleaner' energy sources might not be the cleanest ones	/-/

[3] The additional funds from the budget will be used to build cheap flats for rent: see 'Stakeholder acceptance and political viability'.

Industry / business							
Energy use in the business sector	Making it easier for energy companies to meet the requirements on energy saving - Improving the energy efficiency certificate-issuing system (white certificates), so that it is open to more innovations	/-/	Climate change mitigation		Reforms	/-/	/-/
Energy use in the business sector	Energy efficiency and RES development in companies – investments with the biggest potential for GHG reduction - The plan assumes that financial support will help to save 125 toe of energy in various companies - Support will focus on the expansion and modernisation of existing industrial production installations and appliances - Investing in the enterprises' own RES-based energy sources: wind turbines, solar panels, small hydro stations,	300	Climate change mitigation		Public spending (loans)	/-/	/-/

	geothermal energy and heating pumps, as well as energy storage - Investing in low-emission and cogeneration capacities - Insulation of buildings					
Green technology	Investments supporting a comprehensive green transformation of cities - Improving air quality in cities, particularly by investing in RES, distributed energy and energy clusters - Nature-based solutions - Sustainable management of rainwater - Eliminating urban heat islands - Redirecting urban traffic from city centres - Energy saving in streetlighting - Building bicycle lanes; development of zero-emission transport integrated with public transport - Investing in smart city technologies	2,800	Climate change adaptation	Public spending (loans)	/-/	One of the aims is to attract private capital, which could open up opportunities for international cooperation

		- Revitalisation projects - Attracting private capital, eg, by debt financing of projects						
Environmental protection								
Reclamation environmental protection	/	Support for sustainable water-sewage system in rural areas - Change in support schemes for the support of water-sewage systems: aid will be directed to areas whose finances were impacted by COVID-19 - Easing procedures for small-scale water management investments on agricultural lands	/-/	Climate change adaptation	Reforms	/-/	/-/
Reclamation environmental protection	/	Investments in the sustainable water-sewage system in the rural areas. - The development of water-sewage systems in rural areas with the greatest shortcomings	204	Climate change adaptation	Public spending (grants)	/-/	/-/

Reclamation environmental protection	/	Support for environment improvement and securing against hazardous waste - Amending national law, so that the removal of hazardous waste from the Polish part of the Baltic Sea will be better coordinated (currently competences are dispersed among different state authorities) - Removing red tape, so that the negative impact of large-scale post-industrial areas can be better handled	/-/	Climate change adaptation Pollution prevention and control	Reforms	/-/	According to the Recovery Plan, international cooperation will be the key to success in removing waste in the Baltic Sea
Reclamation environmental protection	/	Support for the sustainable use of water resources in agriculture and in rural areas (reforms)	/-/	Climate change adaptation Pollution prevention and control	Reforms	/-/	/-/
Reclamation environmental protection	/	Investments in the neutralisation of threats and the revitalisation of large, degraded areas and the Baltic Sea	200	Climate change adaptation Pollution prevention and control	Public spending (loans)	/-/	/-/

Reclamation environmental protection	/	Investments for increasing the potential of sustainable water management in rural areas (including multipurpose hydrotechnical investments)	667	Climate change adaptation Pollution prevention and control	Public spending (loans)	/-/	/-/
Reclamation environmental protection	/	Limiting the impact of COVID-19 and the crisis it has caused in enterprises - Spatial planning and land use management reform (reforms)	/-/	Climate change adaptation	Reforms		
Transport							
Rail transport		Investments in railways - Investments in both TEN-T and non-TEN-T regional lines - Electrification of around 114km of railway lines and installing the European Train Control System in 40 km - Preparing the documentation for transport infrastructure for the planned CPK (*Centralny Port*	2,392		Public spending (grants)	/-/	/-/

	Komunikacyjny – Central Communication Port)					
Rail transport	Passenger rolling stock - Modernisation of passenger train transport; support will be directed to zero-emission trains: electric, hybrid (electric + other zero emission sources) and trains with an ERTMS[4] system	965	Public spending (grants)	/-/		/-/
Intermodal transport	Intermodal transport - Increasing the number of terminals and trains for intermodal transport	175	Public spending (grants)	/-/		/-/
Public transport	Zero emission and low emission public transport - Investments in trams	200	Public spending (loans)	Apart from zero-emission transport, this also includes low-emission solutions		/-/
Public transport	Zero emission and low emission public transport (buses)	1,131	Public spending (grants)	Apart from zero-emission transport, this	Opportunities for cooperation with EV battery producers	

[4] European Railway Traffic Management System (ERTMS) is the European command and control system for railway transport.

	- Zero- and low-emission public transport (buses) - Increasing the number of zero-emission buses (in cities) and low-emission ones (LNG, CNG, LPG[5] or meeting EURO VI norm) in suburban areas			also includes low-emission solutions	
Public transport	Wider use of environmentally friendly transport	/-/	Reforms	/-/	/-/
Transport	Support for low emission economy - Investments in Polish supply chains for clean technologies (industry, mobility and energy)	1,114	Public spending (grants)	/-/	/-/
Transport	Regional passenger rolling stock - Investments in zero-emission trains	500	Public spending (loans)	/-/	/-/
Transport	Transport digitalisation	341	Public spending (grants)	/-/	/-/

[5] LNG: liquefied natural gas; CNG: compressed natural gas; LPG: liquefied petroleum gas.

Other (transport)	- Amending traffic regulations to improve safety on roads - Increasing the role of zero- and low-emission transport	/-/	Reforms	Apart from zero emission transport, it also includes low emission solutions	/-/

Source: adapted from Vivid Economics (2020).

(1.1) NRRP – selected details and extended analysis

The development of offshore wind energy remains one of the priorities of the Polish government, according to the Polish NRRP. While onshore wind development sparked some controversies among local communities (and was de facto blocked by the so-called distance law –see below–), offshore wind energy is not subject to such disputes, it enjoys government support and is embraced by both Polish and foreign companies. The development of offshore wind energy is one of the key elements of the Polish energy strategy up to 2040. The first offshore wind farms will add up to 5.9 GW of installed capacity in 2030, and around 11 GW in 2040 (currently the entire capacity of the energy system is around 41 GW). It will create new opportunities for international cooperation, as stakeholders from Sweden, Denmark, Norway and Germany are involved in the projects in the Polish section of the Baltic Sea. In the first phase, the projects of 5.9 GW installed capacity will receive state support (contracts for difference)[6] based on the administrative decision of the Polish regulator, URE. In the next phase the support will be granted via competitive auctions (the current support was set at PLN319.6/MWh – around €70.5/MWh–). In May the EC approved the Polish support scheme for offshore wind.

Due to controversies among local communities related to wind farm construction, the government introduced the so called 'distance law' (or 10H rule) in 2016. The legislation set the minimum distance between wind energy farms and houses or protected areas at no less than 10 times the turbine height. In practice, this blocked the development of new onshore wind farms in Poland. Currently, the government aims to relax these regulations to advance the development of RES, and this is included in the plan. It is estimated that the amendments will help to add 6-10 GW of wind capacity within 10 years (the current onshore wind capacity is at around 6 GW). The changes will give local authorities the flexibility to decide about the distance between wind farms and houses. The bill was undergoing public consultation, which ended at the beginning of June 2021.

Transporting wind energy from the Baltic Sea to other parts of the country will require investments in the power grid. It will also imply a more liquid energy market and energy trade in the region, including with Lithuania, Latvia and Estonia, whose grids will be synchronised with the EU through Poland (via Harmony Link).[7] This creates opportunities for cooperation with the Baltic States, as well as with other neighbours like Germany, the Czech Republic and Slovakia. The Polish energy strategy also emphasises the importance of such cooperation, which will allow a better management of demand and supply in the Baltic Sea region. Poland is also a member of the Baltic Energy Market Interconnection Plan (BEMIP), whose members (Poland, Denmark, Estonia, Finland, Germany, Latvia, Lithuania and Sweden) signed a declaration on the development of offshore wind farms in September 2020.

Apart from huge 'centralised' investments, Poland has also seen dynamic growth in the solar panel capacity of individual households. Between 2019 and 2020 the installed

[6] Under this support scheme, if the pre-agreed strike price of energy is lower than the market price, the government pays the company the difference. If the market price is higher, the company must pay the difference to the government.

[7] Harmony Link is a submarine electricity interconnector between Poland and Lithuania. The final investment decision was made on 31 May 2021 and the interconnector with 700 MW capacity will be completed in 2025. The project will be crucial for the synchronisation of the grids of Lithuania, Latvia and Estonia with the EU.

home PV capacity increased by 2.6 GW (to around 3.9 GW) thanks to government subsidies. Poland aims to reach 14.5 GW of installed solar capacity in 2030 (the subsidies for PVs from July 2021 onwards are reduced, though). Furthermore, the plan also aims to support local and home power storage, which could help to develop such local RES sources, and to manage supply and demand. The plan recognises the potential of energy communities.[8] However, their development is still at a very early stage with no experience or proved business models. For that reason, the financial support will focus on the pre-investment stage of the initiatives: business plans, legal analyses, projects documentation and so on.

Investments in wind energy and renewables are crucial to the development of clean hydrogen, which will be used in industries that are difficult to decarbonise, as well as in the transport sector. However, Poland's stance is a mix of the ambitious and the conservative. The draft of the Polish hydrogen strategy sets the goal for electrolysers using renewable energy at 2 GW in 2030, but leaves the room for low emission hydrogen, generated, eg, from natural gas with CCS/CCU or nuclear-based electrolysers[9] (Poland ranks as the 5th global producer of hydrogen for industrial purposes). Interestingly, the Polish draft hydrogen strategy calls on shifting the discussion on hydrogen from the arbitrary classification based on colours to one based on the estimate of the CO_2 footprint generated in the entire production process. The recovery plan sets the goal of adopting a Polish hydrogen strategy and a draft of the document was published in January 2021. The vehicle filling and charging stations will be developed across the Trans-European Transport Network (TEN-T). Hydrogen will also be used as a maritime fuel, and the recovery plan mentions investments in bunkering infrastructure. While few details are given, the existing LNG terminal in Świnoujście and the investment in FSRU at the Gdańsk Bay (and the proximity of offshore wind farms) will create opportunities for a wider use of green hydrogen in maritime transport. Apart from infrastructure investment, the Polish legislation would have to be amended to allow hydrogen use in the transport sector.[10]

The recovery plan also emphasises the role of electromobility. While Poland is no automotive powerhouse, it has a significant potential in the EV market. Support for electromobility creates opportunities for Polish-based companies like Solaris (owned by Spain's CAF), which already exports electric buses to Europe. Poland is currently the largest e-bus exporter in the EU, with a 46% market share, and in 2025 will most likely have the 3rd largest e-bus fleet in Europe. Poland also wants to develop its own EV brand, Izera. The state-owned company ElectroMobility Poland is to invest in an EV plant in

[8] Energy communities, as defined by the European Commission, 'organise collective and citizen-driven energy actions that will help pave the way for a clean energy transition... By supporting citizen participation, energy communities can moreover help in providing flexibility to the electricity system through demand-response and storage'. An energy community may take the form of, eg, solar energy investments for local neighbourhoods. See https://ec.europa.eu/energy/topics/markets-and-consumers/energy-communities_en.

[9] This means room for green hydrogen, as well as blue (produced from natural gas with the use of carbon capture and storage), pink (using nuclear energy for the electrolysis) and turquoise (pyrolisis method).

[10] There are numerous legal acts that must be amended to develop the H2 market for the transport sector: the act on the fuel quality monitoring and control system; the energy law; the building law (requirements for H2 filling stations); renewable energy law and others. The government aims to include all the necessary changes in a single hydrogen act. It should be adapted in the third quarter of 2021.

Jaworzno (Silesia). It will receive state funding, but in theory the recovery funds could be used for this as well. Poland is also the largest EV battery producer in Europe and a member of the European Battery Alliance initiative.

Energy efficiency improvement is an important part of the recovery plan and covers industry as well as the housing sector. One of the regulatory initiatives that aims to improve the efficiency of companies and encourage innovations is the reform of the white certificates issuing system.[11] Currently, the certificates are issued only to a narrow set of efficiency improvements and must pass an audit afterwards. According to the Polish NRRP, such an approach undermines the introduction of innovative solutions and should be changed. Improving energy efficiency of buildings is another relevant issue in Poland's NRRP. The plan focuses on the thermal insulation of schools, as well as the support for the construction of apartments with a good energy performance for low- and middle-income households (eg, social flats and council flats). Apart from €1.2 billion grants for investments in green multi-family buildings, the NRRP mentions that another €1.2 billion will be spent on this from the state budget.

(2) Framing, viability and governance

In Poland the discussion on the recovery plan is framed more on building up the economy after the COVID-19 pandemic, rather than on energy transition and decarbonisation. Nevertheless, the green transition is present in the public debate, because of the deep and widespread concerns about growing energy prices, the coal phase out (currently ~70% of Poland's energy is generated in coal-fired power plants) and the soaring costs of CO_2 emission allowances. Moreover, the 'green' components of the plan sparked a lively debate during the public hearings (see below).

Regarding its feasibility, no significant obstacles to the implementation of the Polish NRRP have been identified. Some of its parts do not focus on the 'greenest' paths or leave room for flexibility, eg, by promoting not only zero- but also low-emission solutions (eg, in the transport and energy sector). Therefore, lowering NRRP's ambitions in the future is highly unlikely, and the pace of the energy transition and some of the planned goals will depend on –among others– removing red tape for the industry (the case of onshore wind energy) or coal phase-out (which has recently been negotiated with the unions and forwarded to the EC, whose approval of state aid will be crucial for this plan).

Just transition and equity are also key for the NRRP's stakeholder acceptance and political viability. The transition towards a low-emission economy and decarbonisation is the key goal of the NRRP as well as a big challenge for the Polish economy. The National Plan for a Just Transition is currently being prepared, and the situation around just transition in Poland is dynamic. The Polish Energy Policy until 2040 (PEP2040) sets the goal of phasing out hard coal production by 2049 and signing a social contract with the mining industry. The deal with the mining unions was reached on 28 May 2021 (around a month after drafting the latest version of the Recovery Plan) and will need to be negotiated with the European Commission and then enshrined in Polish law. The

[11] A white certificate is issued by an authorised body to confirm that specific energy savings were made thanks to a certain investment/upgrade, etc.

agreement includes, eg, social security benefits and a Transition Fund for the Silesia region.[12] The PEP2040 estimates that in 2040 coal power plants will be responsible for 56% of the energy produced in Poland (and possibly as little as 37% if the prices of CO_2 allowances are high), down from the current ~70%. Coal power plants should be gradually closed with natural gas being the transition fuel. PEP2040 does not specify what 'high CO_2 allowance prices' mean; however, one of the annexes includes a forecast of future prices: €21 in 2025, €30 in 2030 and €40 in 2040 (while this year the prices of the allowances did not drop below €30 and recently traded even above €60).

From a political perspective, the Polish NRRP was adopted by the Polish parliament with 290 votes for, 33 against and 133 abstentions (and the next elections will be held in the autumn of 2023). Part of the opposition, which eventually supported the NRRP, demanded a bigger budget for, eg, district hospitals as well as support for constructing cheap flats for rent. Public surveys show that Poles expect bipartisan support for the NRRP.[13] Therefore, the political viability of the Polish plan is high.

There are, however, challenges related to the implementation of the NRRP. One such challenge is the effective cooperation between central and local governments. The local governments expect NRRP to, for instance, direct more grants instead of loans to them and a stronger role for the Monitoring Committee (see below) in distributing NRRP resources. These issues are being discussed and negotiated at the time of writing, which shows that the biggest challenge for the Polish plan might be to clarify it and translate it into specific action (that is, its implementation).

As part of the public consultations the government published an online survey where the interested parties could express their concerns or add their ideas to the plan. There were also five online hearings, one for each of the main components of the NRRP.[14] After the hearings some changes were introduced into the Plan and the debate on the green energy component of the NRRP was the liveliest one.[15] The most significant changes in the NRRP after the consultations are:

- An additional €200 million in loans for energy storage.
- €3.25 billion in support of offshore wind-farm construction (in the previous version €437 million was to be spent on creating Polish local content for the offshore wind sector).
- New reforms supporting the development of the onshore wind sector.
- €300 million additional funds for railway lines and €566 million for passenger rolling stock (railway vehicles).

[12] Ministerstwo Aktywów Państwowych, *Umowa społeczna dla górnictwa podpisana*, 28/V/2021, https://www.gov.pl/web/aktywa-panstwowe/umowa-spoleczna-dla-gornictwa-podpisana [Ministry of State Assets, Social contract with the mining industry signed on 28/V/2021].

[13] 'Sondaż: Polacy negatywnie oceniają ugrupowania, które nie poparły ustawy ws. Funduszu Odbudowy', RMF, https://www.rmf24.pl/fakty/polska/news-sondaz-polacy-negatywnie-oceniaja-ugrupowania-ktore-nie-popa,nId,5215236#crp_state=1.

[14] See the transcript in Polish: *Wysłuchania dotyczące projektu Krajowego Planu Odbudowyi Zwiększenia Odporności. Zapis spotkań, 22 –30 marca 2021*, https://uploads.strikinglycdn.com/files/ba7c212c-999e-48e6-8b8b-0426082e94e7/wysluchania_KPO_zapis_final.pdf.

[15] See 'Proces konsultacji społecznych' ('Public consultation process') in the Polish NRRP.

Finally, in relation with its governance, the Ministry of Development Funds and Regional Policy is a coordinating institution, responsible for, among others, managing, supervising and reporting on the Plan, coordinating the process of selecting investments and representing Poland during talks with the EC. Also, the respective ministries will be responsible for implementing reforms in each specific area. The Ministry of Development Funds and Regional Policy will appoint a committee that will monitor the correct implementation of the Recovery Plan. Its members will include institutions involved in implementing the Plan, representatives of unions, employers, social organisations, local governments and others.

Local governments will play a significant role as they will be involved in all of the local initiatives (31.2% of the plan). The local governments want to strengthen the role of the committee in deciding on the distribution of the resources, as well as grant more power to local authorities in the plan's implementation.

Conclusions and recommendations

Translating the proposals in the NRRP into practical actions will be an important issue. Some of the immediate challenges and recommendations for Poland include:

- Updating the strategic documents[16] so they reflect the current challenges related to post COVID-19 recovery, a more ambitious EU policy and recent trends in the energy sector (eg, the development of the hydrogen industry).
- NRRP policies to include both zero-emission and low-emission solutions, which means the government has room to decide which options will actually be pursued.
- One of the biggest challenges will be achieving the phase-out of coal and the dynamic situation surrounding it. This will determine the future scale and ambition of Poland's energy transition. There are also other significant developments, regarding, for instance, onshore and offshore wind energy.

Before these expectations are met and the basic documents receive their final updates, it might be important to follow the policies of Poland's biggest state-owned energy companies, which are an important indicator, as they cannot be detached from what the government is planning. They are a good measure of where Poland's energy strategy is going.

The implementation of the projects and initiatives included in the plan will be a complex process; the document refers to other strategic papers, some of which are yet to be adopted, like the hydrogen strategy, or need to be updated, like the Strategy for Responsible Development. According to the NRRP, the latter is a basic national strategy, to which the NRRP refers to. However, the document was adopted in 2017, not only

[16] The single most important document is *The Strategy for Responsible Development until 2020*, adopted back in 2017, before the EU's Green Deal, more ambitious climate targets and the COVID-19 pandemic; the hydrogen strategy and the hydrogen law are to be adopted this year. Apart from that, other changes in the Polish energy sector (like the development of wind energy and the phasing out of coal) mean that some other documents/strategies may be updated or prepared.

before the COVID-19 crisis but also before the European Green Deal, which set new climate targets, as well as before a spike in the price of CO_2 allowances.

While the NRRP supports many green investments, it should be noted that in some cases the recovery plan focuses not only on zero emission technologies (that promote an ambitious energy transition), but also leaves room for the less ambitious low-emission technologies, as in the case of hydrogen production or transport (see Figure 2). It emphasises Poland's cautious approach to energy transition: Poland reached an agreement to phase out coal and will invest in wind and solar energy on the one hand, but on the other will use natural gas as a transition fuel, focusing on low-emission technologies and social challenges. At the same time, this means a door has been left wide open for a more ambitious climate policy in the future, with some 'enablers' being worked out as, for instance, the distance law on onshore wind farms.

It is difficult to assess the exact, measurable impact of the NRRP on Poland's GHG reduction and energy transition. Such projections will most likely be included in the updated versions of Polish strategies mentioned above. However, comparing the NRRP investments to some earlier initiatives might help to put the former's impact into perspective. For instance, in February 2021 it was announced that the *Nowa Energia* ('New Energy') programme would support hydrogen technologies with PLN300 million (more than €60 million), while the NRRP's budget for investments in hydrogen production, storage and transport technologies amounts to €800 million. The NRRP will allocate €3.25 billion for the construction of offshore wind farms. To put this figure into perspective, the Polish state-owned PGE company, a major investor in offshore wind farms in Poland, assesses that the cost of offshore Baltic wind farms Baltica-2 and Baltica-3 will reach around €2.9 billion per 1 GW. Assuming similar costs, NRRP would help to add 1.12 GW of offshore wind capacities.

While international/cross-border cooperation is rarely mentioned in the Polish NRRP (with the exception of transport, but without many details), the proposed projects and initiatives will almost certainly entail such cooperation and create opportunities for foreign partners (moreover, 31.2% of the funding will be directed to the private sector). This conclusion can be also drawn from the analysis of strategic documents to which the Polish recovery plan refers to. Furthermore, the volume of certain investments (eg, €3.25 billion in offshore wind farms and €1.2 billion in green multi-family buildings) could offer opportunities for foreign stakeholders in some sectors, even if such a collaboration is not mentioned.

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Appendix

Figure 3. The Polish NRRP – a quick guide

Component	Type	€ mn	Goals
Green energy and reducing energy consumption	Grants	5,696	Improving energy efficiency of Polish economy [B1 section of the plan][17] - Clean air and energy efficiency (reforms) [B1.1] - Investments in heating/cooling sources in the heating systems (investments – €300mm) [B1.1.1] - Replacing heating sources and improving energy efficiency of the residential sector (investments – €3,201mn) [B1.1.2] - Replacing heating sources and improving energy efficiency of schools (investments - €290mm) [B1.1.3] -Support for improving energy efficiency of local community centres (investments - €67mn) [B1.1.4] Increasing the role of renewable energy sources [B2] - Creating better conditions for the development of hydrogen technologies (and other decarbonised gases) (reforms) [B2.1] - Facilitating RES development (reforms) [B2.2] Investments in hydrogen production, storage and transport technologies (investments – €800mn) [B2.1.1] Development of transmission grid and smart grid (investments – €300mn) [B2.2.1] - RES development through energy communities (investments – €97mn) [B2.2.2] - Building terminal infrastructure for the offshore wind sector (investments – €437mn) [B2.2.3] Adapting to climate change and limiting environmental degradation [B3] - Support a sustainable water-sewage system in rural areas (reforms) [B3.1] - Investments in a sustainable water-sewage system in rural areas (investments – €204mn) [B3.1.1]

[17] The square brackets refer to the specific part of the Polish NRRP, while the round brackets are used to determine whether the action is a reform or an investment.

	Loans	8,617	Improving energy efficiency of Polish economy [B1] - Making it easier for energy companies to meet the requirements on energy saving (reforms) [B1.2] - Energy efficiency and RES development at companies – investments with the biggest potential for GHG reduction (investments – €300mn) [B1.2.1] Increasing the role of renewable energy sources [B2] - Support for investments in Polish offshore wind farms (reforms) [B2.3] - Regulatory framework for the development of energy storage (reforms) [B2.4] - Construction of the offshore wind farms (investments – €3,250mn) [B2.3.1] - Energy storage (investments – €200mn) [B2.4.1] Adapting to climate change and limiting environmental degradation [B3] - Support for the improvement of the environment and protection against hazardous waste (reforms) [B3.2] - Support for the sustainable use of water resources in agriculture and in rural areas (reforms) [B3.3] - Rebuilding the capability of towns and cities to facilitate the green transition (reforms) [B3.4] - Investments in neutralisation of threats and revitalisation of large degraded areas and the Baltic Sea (investments – €200mn) [B3.2.1] - Investments for increasing the potential of a sustainable water management in rural areas (including multipurpose hydrotechnical investments) (investments – €667mn) [B3.3.1] - Investments supporting a comprehensive green transformation of cities (investments – €2,800mn) [B3.4.1] - Investments in green multi-family buildings / blocks of flats (investments – €1,200mn) [B3.4.2]
Green, smart mobility	Grants	6,818	Increasing the share of zero- and low-emission transport, preventing and reducing the negative impact of the transport sector on the environment [E1] - Wider use of environmentally friendly transport (reforms) [E1.1] - Support for low emission economy – investments in Polish supply chain for clean technologies (investments – €1,114mn) [E1.1.1] - Zero emission and low emission public transport (buses) (investments – €1,131mn) [E1.1.2] Improving the accessibility of transport, security and digital solutions [E2] - Improving the competitiveness of the railway sector (reforms) [E2.1] - Investments in railways (investments – €2,392mn) [E2.1.1] Passenger rolling stock (railway vehicles) (investments – €965mn) [E2.1.2] - Intermodal transport (investments – €175mn) [E2.1.3] - Improving safety on roads (reforms) [E2.2] - Transport safety (investments – €700mn) [E2.2.1][18] - Transport digitalisation (investments – €341mn) [E2.2.2]

	Loans	700	Increasing the share of zero- and low emission transport, preventing and reducing the negative impact of the transport sector on the environment [E1] - Increasing the role of zero- and low-emission transport; preventing and reducing the negative impact of transport on the environment (reforms) [E1.2] - Zero-emission and low-emission public transport (trams) (investments – €200mn) [E1.2.1] Improving the accessibility of transport, its security and digital solutions [E2] - Increasing the availability of transport and digital solutions as well as improving safety (reforms) [E2.3] - Regional passenger rolling stock (railway vehicles) (investments – €500mn) [E2.3.1]
Resilient and competitive industry	Grants	/-/	Limiting the impact of COVID-19 and the crisis it caused for enterprises [A1] - Spatial planning and land use management reform (reforms) [A1.3.1]
Digital Transformation	Grants		Improving cybersecurity, the security of data processing infrastructure and digitalising the infrastructure of the services responsible for security [C3] - Improving the security of information systems and upgrading data processing infrastructure – 40% (reforms) [C3.1] - Cybersecurity – CyberPL, data processing and digital services infrastructure (investments – €443mn) [C3.1.1.]

Source: the author.

[18] 0% climate tag.