

National policy roadmap for Poland

Summary

This roadmap aims to provide practical and policy recommendations for Polish policymakers and decision-makers to enable community bioenergy in Poland. It is based on various insights gathered through decision-maker workshops, expert interviews and surveys, and reviews of policy documents. The roadmap includes an outline of the initial situation, challenges, targets, and recommendations, as well as a timeline and sequence of recommended actions.

The roadmap provides specific policy recommendations. These include increasing social awareness, improving legal frameworks, developing bioenergy-related district heating infrastructure, introducing new funding schemes, and speeding up local diffusion of bioenergy.

The proposed timeline suggests a focus on transposing EU directives, including the Renewable Energy Directive II, into national legislation, and raising awareness, building capacities among the public and businesses about the benefits of bioenergy, and simplifying legal requirements and procedures to establish energy communities and cooperatives by 2030. By 2050, efforts should continue to promote bioenergy by setting concrete targets and promoting district heating networks.

The roadmap acknowledges the complexity of transitioning to bioenergy communities and emphasises the importance of proper legislation and support for local initiatives. Tailored frameworks, financial risk mitigation, and awareness campaigns are needed to promote the growth of bioenergy communities in Europe. Engagement, clear communication, and access to information are crucial for successful implementation.

Purpose and development of the roadmap

The community bioenergy potential in Poland is untapped, despite its potential to decarbonise the economy, lower energy bills and increase energy independence.

The purpose of this policy roadmap is to provide practical and applicable policy recommendations for national policymakers, regional authorities and bioenergy community actors based on insights and findings of the BECoop project. This roadmap outlines the opportunities of community bioenergy for Poland to meet national energy and climate targets and increase energy security and independence. Furthermore, the roadmap intends to open the policy debate around the regulatory promotion of community bioenergy in the country.

The policy roadmap has been developed based on three main methods: policy analyses, stakeholder consultations, and two expert workshops. First, key policy documents at national level were reviewed to identify the policy frameworks and enabling mechanisms for bioenergy communities in Poland. We reviewed Polish National Energy and Climate Plans (NECP) and other policies and legislations, including directives on renewable energy, for their policy objectives and measures on bioenergy and community energy. The analysis enabled the development of draft policy recommendations to unlock the community bioenergy potential in Poland.

Secondly, we surveyed stakeholders and participants working with the BECoop network, to understand the findings of other relevant policy work within the project and beyond, and to compile insights into the structuring of strategic templates and recommendations.

Thirdly, two national policy workshops were organised (Figure 1). The aim was to gather input for a policy roadmap on how to unlock the potential of bioenergy to be presented to European/National policymakers. The first policy workshop took place in Kuraszków, Poland, on 12 April and brought together 2 speakers and 16 representatives from municipalities, NGOs and the bioenergy sector. The workshop started with an introduction to the policy roadmap and its development, followed by a discussion of the policy measures identified in the policy analysis. The workshop identified awareness raising and capacity building for bioenergy communities, and the development of business models, and the establishment of pilots as key next steps. Missing policy actions were then added, different actions were prioritised and a timeline for action was developed.

A second policy workshop was held in Jelenia Góra, Poland on 12th June 2023. This was attended by 47 stakeholder representatives from different municipalities, waste management, and energy industries. The workshop started with the presentation of the policy roadmap and a catalogue of topics for discussion on energy production, before participants were divided into groups to work on concrete actions and timelines. Key actions identified included the need to build new partnerships, optimise supply chains and launch a promotional campaign.

The experience of regional actors who have implemented or want to implement community (bio)energy has also influenced the development of the policy roadmap. The BECoop network also provided useful feedback on previous versions of the policy roadmaps.

The roadmap is structured as follows: Firstly, it outlines the initial situation of community bioenergy in Poland – where we stand today. Secondly, it presents the targets and visions for (community) bioenergy in 2030, and 2050 – where we want to go. Thirdly, it draws concrete policy recommendations to unlock the community (bio)energy potential in Poland – how do we get there by 2030/2050. A timeline with concrete measures and their prioritisation and sequencing is provided.



Figure 5 - Participants at the Polish national policy workshops.

Community (bio)energy – current state of play

Community energy is defined in Polish law as the production of electricity or biogas, or heat in renewable energy sources installations and balancing the demand for electricity or biogas or heat, only for the own needs of the bioenergy community and its members, connected to an area-defined power distribution network with a rated voltage lower than 110 kV or a gas distribution network, or a district heating network.

The current law foresees restrictions on community energy:

- Restrictions on installed capacity - the total installed capacity is limited to 10 MW in the case of electricity, 30 MW in the case of heat; for biogas plants, the annual capacity of all installations within one renewable-energy cooperative cannot exceed 40 million m³ for biogas;
- Location restrictions - it has to be located in an area of no more than three rural or rural/urban-rural communes directly adjacent to each other, in the area of one distribution system operator electricity or gas distribution network or heating;
- The threshold for meeting the energy demand of cooperatives - renewable-energy cooperative must cover the energy needs of their members at a minimum of 70%;
- The number of the energy cooperative members cannot exceed 999 participants;
- Ban on the sale of excess energy produced by renewable-energy cooperatives⁴.

⁴ Monitor of Poland, Act of 19 July 2019 amending the Act on renewable energy sources and certain other acts. Warsaw, Poland, 2019. <https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20190001524>.

Status of community (bio)energy projects in Poland

In 2020, when the BECoop project started, there was no energy cooperative in Poland. In May 2021, the first energy cooperative was founded by two business entities using solar energy as a source of energy and registered by the National Support Centre for Agriculture (KOWR). Today, registered energy cooperatives with photovoltaic installations are focused solely on electricity production (Table 4), with a total of 18 registered co-operatives across the country⁵. The number of members is still low. There is no bioenergy cooperative in Poland that uses biomass for electricity or heat generation.

Table 4 - General characteristics of selected renewable energy cooperatives in Poland

Registration date	Location (Voievodenship)	Number of members	Number of installations	Cumulated power of the RESCoop	Kind of installation
11.05.2021	Mazowieckie	4	2	20 kW	PV
21.12.2021	Śląskie	7	7	51 kW	PV
30.01.2023	Lubelskie	1	11	40 kW	PV
09.02.2023	Wielkopolskie	3	1	0.99 kW	PV
17.02.2023	Podlaskie	3	7	157 kW	PV

Nevertheless, there are potentials to establish bioenergy cooperatives/communities based on wood and agricultural residues.

Approximately 13% of the domestic biomass potential can be allocated for energy purposes without causing adverse effects in the form of soil degradation and a decrease in the supply of food, while complying with the environmental protection requirements under the Common Agricultural Policy⁶.

The energy potential of agricultural biomass in Poland, which includes both special purpose crops and agricultural and agri-food-processing industry by-products, is ca. 900 PJ annually⁷. The most commonly available raw material to be used for energy purposes is straw. On average, the yearly straw yield for energy purposes in Poland amounts to approximately 10.3 million tonnes, depending on cereal yields in a given year⁸. Biomass stocks from energy crops are estimated to range from 120,000 to 130,000 tonnes of dry matter, and orchard wood stocks are estimated to amount to ca. 88,700 tonnes annually⁹. Along with the development of the agricultural biogas production sector, the importance of the use of agricultural by-products and agri-food industry residual products has been increasing. Their use in 2017 reached approximately 3.8 million tonnes. The energy potential of the agri-food processing industry regarding the production of agricultural biogas is estimated to exceed 7.8 billion m³ annually.

However, to unlock the (community) bioenergy potential, several barriers must be overcome.

⁵ <https://www.gov.pl/web/kowr/wykaz-spoldzielni-energetycznych>

⁶ As assessed by the Institute of Agricultural and Food Economics (Instytut Ekonomiki Rolnictwa i Gospodarki Żywnościowej – IERiGŻ) of the National Research Institute (Państwowy Instytut Badawczy – PIB) in a study prepared at the request of the Ministry of Agriculture and Rural Development.

⁷ Estimates of the Institute of Agricultural and Food Economics (IERiGŻ).

⁸ Central Statistical Office. "Preliminary estimate of the main agricultural and horticultural crops in 2022". Warsaw, 2022.

⁹ <https://stat.gov.pl/obszary-tematyczne/rolnictwo-lesnictwo/uprawy-rolne-i-ogrodnicze/wstepny-szacunek-glownych-ziemioplodow-rolnych-i-ogrodniczych-w-2022-roku,3,16.html> (accessed on 9 March 2023).

⁹ The presented solid agricultural biomass estimates are based on crops harvested every year, having regard to the demand for it in agriculture.

Key barriers and challenges to community bioenergy

1

Society's environmental awareness is insufficient.

Citizens have a generally low environmental intelligence and a low awareness about opportunities for or co-benefits of community (bio)energy. In contrast, price matters to most people.

Inhabitants, especially those with low incomes, do not care for the environment and often burn very low-quality fuels or even rubbish in domestic boilers (tires, PET bottles, MDF furniture boards, etc.). Fossil fuels (in direct and indirect form) are still the dominant source of energy, especially in rural areas.

2

Lack of knowledge about bioenergy.

Citizens have minimal knowledge of solid fuel properties and their behaviour during combustion, as well as how to burn them properly in the heating boiler. Little is known about the emission of pollutants into the atmosphere from coal-fired boilers, which are incredibly harmful and hazardous compounds. There is no widespread education related to energy-saving techniques in households. For example, some sceptics may obstruct operations among the local community by spreading rumours about the harmful effects of building a bioenergy community.

Not only local communities but also many representatives of local government and state authorities still have a low level of knowledge about energy cooperatives, their business model as well as regional benefits they can provide, especially in terms of biomass utilisation for energy purposes in rural regions.

3

Problem with the processing of raw biomass material.

The lack of sufficient ecological awareness or knowledge by final biomass users regarding proper processing and utilisation leads to the combustion of wet biomass and significant pollutant emissions to the atmosphere. This is due to the unappropriated processing and storage of biomass caused by a lack of appropriate knowledge about biomass storage or processing among local people. Little is known about the processed biomass, such as pellets or briquettes, their properties, storage requirements and combustion procedures.

4

Culture of coal and lack of alternatives.

Poland has a long tradition of generating heat from coal. Coal is a cheap heating fuel.

There is still a lack of knowledge about the potential of local biomass, its properties and practical possibilities of using it for heating purposes. Specifically, there is a lack of knowledge about biomass pellets as a good alternative to hard coal, which can easily replace coal. Moreover, every coal fired boiler (fed manually or automatically) can be replaced by biomass (in the appropriate form).

5

The reluctance of local society towards cooperatives.

The negative experience of rural residents with the concept of the cooperative, the effects of which can also be observed today, is related to the experiment of the communist authorities' attempts at forced collectivisation of agriculture. The idea was associated with the nationalisation of agriculture and state control of all independent social initiatives, including cooperatives. Farms were forcibly taken from people to nationalise them. The exploitation of workers and corruption of heads of work units often took place in state-collective farms. Thus, the term has negative associations among citizens.

In addition, there is a lack of mutual social trust to create such bottom-up initiatives among communes, especially for those requiring joint financial resources.

6

Discouragement of the population with the decline of activities related to the local renewable-energy developments.

In 2017, five municipalities near Wrocław: Prusice, Oborniki Śląskie, Wisznia Mała, Wołów and Żmigród created the Renewable Energy Cluster of Trzebnickie Hills. As part of their activity, photovoltaic and bio-power plants were to be built. However, it collapsed due to a failure to obtain external funds for its development. The communes were not sufficiently involved in applying for external funds, hence the effect.

Poland has no experience with a functioning energy cooperative, in particular those based on biomass. It makes people question the feasibility of such community initiatives. The society is also reluctant as there are no good practises and examples of bioenergy cooperative in Poland.

7

Insufficient governmental support.

Several legal and legislative obstacles to the creation of energy cooperatives exist, such as long formalisation of the existence of renewable-energy cooperatives by legal authorities, complicated registration procedure of the cooperative, lack of templates of documents necessary for the functioning of renewable-energy cooperatives (e.g. status of the cooperative, renewable-energy cooperatives contract with the energy distributor), lack of assigning the initial costs of creating cooperatives to the appropriate entities (it is not known who covers, among others, costs of legal assistance, stamp duty). There are also inconveniences regarding the form of financing cooperatives in Poland. In fact, in February 2023, a first dedicated fund, “Energy for Rural”, was initiated by the national government to support the development and creation of renewable-energy cooperatives. It covers only financial support for energy cooperatives based on wind and solar energy (loans up to 100% of eligible costs), or energy from biogas and water (loan up to 100% of eligible costs or 20% non-repayable subsidy)¹⁰. Thus, there is a non-uniform form of co-financing. In addition, installations based on biomass combustion were not included, which is also a critique of the incompleteness of the financing program. Such installations must use indirect forms of support like Clean Air program to subsidize the replacement of obsolete heating devices with low-emission boilers. Moreover, these are periodic recruitments, and it is unknown what these types of funding will look like in the future.

Only limited funds and a small number of programs support the creation of energy cooperatives in Poland. It lacks incentives or discounts to create heat-producing energy cooperatives.

8

Infrastructural limitations.

There is a lack of district heating networks in most of the rural areas (communes). For example, this has been found to be a main barrier to the BECoop OBS PILOT AREA, because there are no good local practices on which renewable-energy cooperatives could draw inspiration, alongside wider problems connected to the lack of industrial demand for these services.

There is a large dispersion of heat consumers in rural areas, which makes local heat supply without distributed grids challenging.

¹⁰ National Fund for Environmental Protection and Water Management. Priority Program “Energy for Rural”. Warsaw, 2022. <https://www.gov.pl/web/nfosigw/energia-dla-wsi>.

9

The rise of energy poverty.

The low income of a significant group of inhabitants of rural areas limits their investment opportunities, which also blocks their interest and activity in this area.

Scientists from the University of Szczecin, in a study of the impact of the COVID-19 pandemic on the phenomenon of energy poverty in Poland¹¹, confirmed that in 2020 (up to and including May), the share of expenditure on energy carriers in relation to disposable income per person increased by an average of 1.3% compared to 2019. Following a higher share of expenses on energy carriers, in relation to disposable income, according to the authors, energy poverty in 2020 (until May) increased to 21.4%, i.e., by 13.7% compared to 2019 and it was compounded by job loss and reduction earnings, especially for those with the lowest and middle income. Other sources indicate 30% of energy poverty in Poland. It can be expected that the scale of the phenomenon could be even more significant. Many people have lost their jobs and cannot pay their energy bills regularly. Not to mention invest money in the energy transformation of the region¹². In addition, the fuel and energy crisis caused by the war in Ukraine, which resulted in cutting off fuel imports from Russia because of the imposed sanctions, has had a large impact on the rise of energy poverty. Also, the growing inflation in the country (close to 20%), and thus increases in the prices of necessities, does not encourage investing money in renewable energy, including bioenergy.

Entry points for the adoption of community bioenergy

However, there are also entry points for the adoption of (community) bioenergy in Poland.



Citizens are used to burning solid fuels in domestic boilers. Here, a fuel switch is possible.



There are tax reductions for bio-based electricity production but not for heating. The existing scheme could be expanded to support heating with bioenergy. This makes sense considering the significant local biomass potential in most of the rural communes.



Value and supply chains are closely related to the bioenergetic cooperative. It enables efficient delivery of the product (in the case of bioenergy cooperative fuel or energy) to the end customer by organising all processes related to transport, storage and processing of materials. In the case of Poland, however, there is no logistic chain related to the bioenergy cooperative because there is no renewable-energy cooperative powered by energy from biomass. It will be created only with the launch of the first cooperative of this type.



After the start of the war in Ukraine, a slow increase in the interest of municipalities in energy cooperatives was observed. Some rural municipalities began to look for information on renewable-energy cooperatives. This growing interest could be used to target information about the potential for (bio)energy communities and opportunities to increase local energy security and energy independence. During the current energy crisis, energy prices have been rising. Energy poverty in Poland is another topic currently high on the political agenda and a “favourable driver” in initial discussions about the idea and concept of an energy cooperative.

¹¹ <https://www.mdpi.com/1996-1073/13/18/4977>

¹² Polish Economic Institute. COVID Energy Bill. Economic Weekly 2021 19, p. 8-9. https://pie.net.pl/wp-content/uploads/2021/05/Tygodnik-Gospodarczy-PIE_19-2021.pdf.

Policy targets for, and visions of, community bioenergy for 2030 and 2050

Currently, bioenergy in Poland is considered mainly as the production of pellets (on a small scale) and the use of biomass by large power plants. This is coupled with a growing awareness of high temperature corrosion, slagging and other operational issues. The actor supporting the development of our pilot installation was until recently the mayor of the city of Trzebnica (the district in which Oborniki Śląskie is located) and he declared his support. His main expectation was favourable economic indicators such as the reduction of the cost of energy supplied to recipients (cooperative members) through a shorter logistics chain, or the possibility of generating additional revenues for the commune budget from taxes resulting from the activation of local entrepreneurs.

Bioenergy communities in the National Energy and Climate Plans (NECPs)

Bioenergy communities are not specifically mentioned in the 2019 NECP¹³, nor in the 2010 NREAP. The NECP, however, outlines different financial measures to support the development of bioenergy in Poland:

- Funds of the National Fund for Environmental Protection and Water Management, including: Energia Plus, District Heating - pilot, Agroenergy, HEAT FLAT, Clean Air Program - for actions improving energy efficiency, low-emission energy sources, including renewable energy sources and high-efficiency cogeneration system heating ecological education and other green investments;
- European funds - operational programs in the financial perspective 2021-2027 - for the support of RES, energy efficiency in buildings, energy efficiency in enterprises, heating networks, high-efficiency cogeneration;
- InvestEU - for low-emission infrastructure;
- LIFE programme - activities for environmental and climate protection;
- Norwegian Financial Mechanism, EEA Financial Mechanism - activities for high-efficiency cogeneration, modernisation of networks and sources in district heating systems;
- Loans from international financial institutions (e.g. World Bank, European Investment Bank, Council of Europe Development Bank) - support for anti-smog activities related to the transformation and modernisation of the energy sector, improvement of energy efficiency.
- New national program "Energy for Rural" - first direct funds to support RESCoop in Poland.

¹³ The update of the 2019 NECP is still underway and is was not available on the site of the European Commission at the time of publishing this report.

Due to the use of financial support, the Polish NECP considers two development scenarios of Polish energy sector.

SCENARIO 1

- **With the application of the policies and measures contained in the NECP**, in 2015-2030, solid biomass purchases are expected to increase by about 56% and by 63% by 2040. Demand for biomass will increase in all sectors. Together with the increase in CO₂ emission allowance prices, the profitability of biomass use in the power and heat sectors is expected to increase in dedicated boilers and hybrid systems as well as in coal-fired plants. In households and the service sector, the use of biomass will be more strongly associated with the replacement of old coal-fired stoves with modern pellet-fired stoves. An important risk element in this context is the introduction of biomass certification from 2021 to confirm compliance with EU-wide sustainability criteria. By 2030, biomass consumption for heat generation in heating plants is expected to increase almost tenfold to 346 ktoe (in 2015, 36 toe of chemical energy from solid biomass was consumed in all heating plants in Poland, in 2016 and 2017 it was 58 and 66 ktoe, respectively). Due to limited biomass resources, it will probably be necessary to introduce mechanisms that promote the use of this raw material in plants with the highest production efficiency, i.e., primarily in CHP plants and boilers.

Biomass will become the most important renewable energy source for heating in Poland, especially in rural areas. In the municipal and private sectors, considering the measures planned in the framework of smog abatement, no widespread increase in the use of biomass for heating purposes is expected, although it is noticeable. However, a much wider use of biomass in CHP plants is assumed.

An important element in the development of the national grid is the expansion and modernisation of distribution. Currently, approximately 65% of municipalities in Poland have access to natural gas, with the gasification rate expected to increase to approximately, 77% in 2022 and to be further increased in subsequent years in line with market needs. In rural areas, it is assumed that biomethane (purified biogas upgraded to natural gas quality) from local biogas plants (if there is potential for its production in the region) will be used instead of natural gas.







SCENARIO 2

- **Without the application of the policies and measures contained in the NECP**, in 2015-2040, solid biomass purchases are expected to increase by 34% - this is a moderate increase that makes limited use of the national potential. Current trends towards the development of power plants and cogeneration units with dedicated boilers of less than 50 MW_{el} and 150 MW_{th}, as well as low-capacity decentralised units using local resources, are expected to continue. The maximum overall pace of construction of biomass power plants and CHP plants until 2020 was assumed to be 30 MW, and in the following years 75 MW/year, while the minimum pace of construction was assumed to be 50% lower. For biogas, the assumed growth of this technology (minimum 30 MW/year, maximum 50 MW/year) was set based on historical data and the auction volumes proposed so far. Primarily, an increase in the use of agricultural biogas is assumed, as the potential of untreated organic waste from landfills and wastewater treatment plants is limited. The resources of wet household waste biomass of agricultural origin that can be used on-site for energy production in agricultural biogas plants should reach a production level of about 4.4 TWh in the 2030 perspective and up to 5.1 TWh in 2040, for the significant development of agricultural biogas plants producing heat energy in cogeneration. The heat generation potential is estimated at 45 PJ in 2030 and 105 PJ in 2040.

The Polish NECP does not deal directly with the issues of energy communities, but the NECP plans to identify obstacles and support the development of energy sustainable areas at the local level. Therefore, it is planned to identify obstacles to the implementation of local investments - especially those resulting from the lack of social acceptance necessary to implement the development of local distributed energy and their reasons, e.g. the lack of acceptance for biogas plants, biomass CHP plants, etc. activities aimed at explaining and introducing possible metering of energy facilities that may emit noise, odours and other negative aspects, influencing the reluctance of local communities to this type of investment. The NECP discusses the social benefits of socialising renewable energy sources in relation to energy communities. The document states that the greatest values resulting from the existence of self-organisation at the local level are the contribution it makes to the development of specific regions, local economies and the development of the local labour market. The document also explains the reasons for such action, which is the management of locally available resources in the form of energy substrates, energy carriers as well as human and financial capital. The Plan does not discuss energy poverty alleviation in relation to energy communities.

A policy scorecard was developed for Poland, based on the available data in the 2019 NECP, taking into account broader policy developments, stakeholder views, and the state of the art in bioenergy community development. The policy scorecard identified several areas for potential improvement (Table 5).

Table 5 - A policy scorecard for bioenergy community support – Polish NECP

Element	Poland
Overall regulatory framework and support for biomass development	 Reasonably well-developed tools to biomass and energy communities as a whole
Economic benefits of bioenergy community development	 Well-developed suite of economic measures
Social benefits of bioenergy community development	 Need for further development of measures to support the social benefits of bioenergy communities
Environmental benefits of bioenergy community development	 Detailed overview of the environmental benefits of biomass use
Poverty alleviation (bioenergy communities)	 Link between energy poverty and bioenergy communities insufficiently developed
Energy community support	 Bioenergy communities specifically receive limited attention and support in the NECP

Other policy strategies and their impact on bioenergy

Beyond the NECP, there are other policy strategies and plans that support the development of bioenergy communities.

The Energy Policy of Poland until 2040 (EPP2040) set some targets for the development of local bioenergy markets and energy communities, such as:

- Increase the share of renewable energy sources in heating and cooling by about 1.1% per year between 2020-2030.
- The use of biomass is to play a key role in this (due to the availability of the fuel and the technical and economic parameters of the plant).
- By 2030, the number of energetically sustainable areas is to increase to 300.
- The creation of regional local heating systems should have a positive impact on the local labour market, improve transport infrastructure, generate tax revenues for local budgets and increase the overall economic development of the region.
- Generation plants using biomass should be located close to their production (i.e., in rural areas) to minimise environmental impacts and transport costs.

Policymakers set a goal in EPP2040 to create hundreds of energy-sustainable territories, but the document does not define measures on how to achieve this¹⁴.

Also, the strategic document, the National Environmental Policy 2030, contains goals related to the development of Polish bioenergy, such as:

- Preserving and, if possible, rationally increasing the availability of forest biomass (including energy wood) to meet local energy self-sufficiency needs.
- Promoting the idea of using wood waste as a raw material for energy, according to the principle of cascade use of wood.
- Introducing legislative changes that facilitate trade in wood biomass¹⁵.

Furthermore, the amendment to the Renewable Energy Sources Act of 2021 constitutes the solutions analysed in BECoop¹⁶.

Finally, developments at the EU level are driving developments at the national level. These include the Energy Union and the EU Green Deal, both of which emphasise the role of citizens in the energy transition and the need to leave no one behind.

Recent policy debate for the role of (community) bioenergy change under the war in Ukraine

The war in Ukraine has shown that energy security is a major priority. The sense of society that the local energy economy provides this security has grown. This was confirmed during numerous conversations with potential participants of the pilot energy cooperative in Oborniki Śląskie. The second important argument that increases the value of solutions such as BECoop is the military security of distributed generation. Small energy centres are much more difficult to destroy than centralized sources based mainly on hard coal.

¹⁴ Ministry of Climate and Environment. Energy Policy of Poland until 2040 (EPP2040). Warsaw, Poland, 2021. <https://www.gov.pl/web/climate/energy-policy-of-poland-until-2040-epp2040> (accessed on 9 March 2023).

¹⁵ Ministry of Climate and Environment. The 2030 National Environmental Policy. Warsaw, Poland, 2019. <https://www.gov.pl/web/climate/the-2030-national-environmental-policy--the-development-strategy-in-the-area-of-the-environment-and-water-management> <https://www.gov.pl/web/climate/energy-policy-of-poland-until-2040-epp2040> (accessed on 9 March 2023).

¹⁶ Ministry of Climate and Environment. Act of 17 September 2021 amending the Act on renewable energy sources and some other acts. Warsaw, Poland, 2021. <https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU20210001873> (accessed on 9 March 2023).

Threats for future bioenergy community development

It is important to note that there are several threats to the future development of the bioenergy community that need to be overcome to reduce negative environmental impacts and other potential risks.

- **Risk of biodiversity reduction.**

There is a potential risk of reducing biodiversity with the introduction of energy plant monocultures in case of the significant increase in biomass usage for energy production and lack of control of energy crops development.

- **Extensive deforestation.**

Biomass harvesting should be realised sustainably. Uncontrolled woody biomass acquisition from forests due to the increase of biomass demand can lead to deforestation.

- **Development of new nuclear energy plants by the Polish government.**

The Polish government plans to build new nuclear power plants that can compete with the development of (municipal) bioenergy if government subsidies lead to low energy prices that attract energy consumers.

- **The risk of problems with boiler operation.**

Boiler is too large for the heat supply demand

Biomass boilers are designed for a long period of operation. If a biomass boiler is too large, it only has to burn for a very short time to meet the heat demand placed on it. This results in many short firing periods during operation, called cycles. When a boiler is cycled regularly, it goes through several start-up and shutdown periods that are known to reduce efficiency, increase emissions, increase component wear and increase electricity consumption for components such as fans that run at higher speeds than in continuous operation. For boilers with automatic feeding, excessive cycling means that the boiler does not reach its most efficient operating state and the temperatures required for optimal combustion and heat transfer are not achieved. This leads to increased emissions.

Poor quality fuel

Biomass combustion is strongly influenced by the type and quality of fuel burned in the boiler. The biomass boiler should be designed for clean and efficient combustion of a specific type and quality of fuel. This will be specified by the manufacturer. The use of inferior fuels will result in increased emissions, lower efficiency, component failures, increased repair costs, high running costs and poor performance of the system. Fuels with a high moisture content can cause difficulty in maintaining the operating temperature, resulting in an increase in particulate emissions, incomplete combustion, loss of efficiency and even damage to the boiler or chimney.

Poor adjustment of boiler and system controls

Well-adjusted controls ensure the safe, efficient and optimal operation of the biomass boiler while meeting the heating needs of the site. If the control is unavailable, incorrectly set or not regularly checked, the performance of the biomass system can suffer. Poor control can result in the boiler operating when there is little demand for heat. This leads to multiple start-up and shut-down phases, known as cycles. This leads to an increase in electricity consumption. In many systems using solid fuel combustion, the heat tank is often too small to meet current requirements related to Eco-Design standards.

Recommendations for key policy measures – in the NECP and beyond

We propose five key policy areas to unlock the community bioenergy potential in Poland and to increase energy security and independence.



Increasing social awareness and building capacities

- ✓ Empower farmers and citizens to actively engage in community (bio)energy projects through targeted information campaigns and capacity building programmes. Capacity should be built about what energy cooperatives are, what benefits they offer, and who can be a member etc.
- ✓ Increase the involvement of Polish local authorities in the development of energy cooperatives to increase the knowledge among local governments and municipal officials.
- ✓ Support the creation of a Polish community energy network that can bring different experts and interested parties together to share experiences and best practices.
- ✓ Increase awareness that domestic burning of coal is a primary source of local pollution and has a measurable impact on carbon dioxide emissions. Compared to coal, the use of biomass significantly reduces the negative effects. Therefore, campaigns are needed to explain the procedures for storing, transporting and burning processed biofuels (pellets).
- ✓ Strengthen a sense of responsibility for the environment through education, campaigns, generally available monitoring of air quality in the region, and the introduction of charges for pollutant emissions.
- ✓ Create awareness of the need for cooperation between local communities in the energy sector. This will facilitate a rebranding of ‘cooperatives’ into opportunities for regional economic value creation, decision-making and financial participation.
- ✓ Empower agricultural advisory units to actively participate in energy cooperatives.



Low-carbon heating sector transitions

- ✓ Introduce incentives for energy cooperatives to produce heat or heating fuels for their members.
- ✓ Promote district heating and integration of community (bio)energy.
- ✓ Remove the obligation to have a heat network in connection with heat generation, which significantly restricts distributed energy production (direct heating).
- ✓ Abolish coal-fired heating units by replacing them with biomass boilers (over 50% of households in Poland are still heated with coal).
- ✓ End the support for fossil fuels, in particular coal, as it will help residents in the search for new energy sources, including biomass.



Regulatory measures and changes

- ✓ Transpose related EU directives, including the Renewable Energy Directive, into national law. This must include a clear definition and scope of activities for energy communities.
- ✓ Clarify the definition of a legal energy cooperative and the subject of activity, stating that its subject of activity is the production of electricity or biogas or agricultural biogas, or biomethane, or hydrogen, or heat from renewable sources in renewable energy source installations, and then trading them or their storage only for the own needs of the energy cooperative or its members.
- ✓ Reduce or eliminate the minimum requirement to cover the energy needs of members by their energy cooperative (currently the minimum share is 70%).
- ✓ Remove the cap on the number of members in an energy cooperative (currently no more than 999 members).
- ✓ Clarify the issue of contracts concluded by the energy seller with individual members of the energy cooperative, as well as with the operator of the power distribution network.
- ✓ Develop a uniform agreement between the energy cooperatives and the distribution network operator (currently there is no such agreement).
- ✓ Extend the tax reduction for community (bio)energy from electricity generation to heat generation to identify additional benefits.
- ✓ Provide tax relief to raise awareness of cooperatives in the renewable energy sector.
- ✓ Develop simple procedures and agreements related to the creation and establishment of renewable-energy cooperatives.



Implementing financial support schemes

- ✓ Introduce a dedicated programme of targeted financial support for the establishment of energy cooperatives in Poland. Provide simple subsidies and other forms of support (loans, grants).
- ✓ Introduce transparent and earmarked funds to support the establishment of energy cooperatives. This fund should cover costs related to the feasibility study, settling formal and legal matters, etc.
- ✓ Create both legal and economic incentives for energy cooperatives, net metering and other actions (including promotional activities) to encourage conscious consumer behaviour.
- ✓ In order to achieve the target set in the Polish NECP (about 300 energy-sustainable areas at the local level in the country by 2030), the relevant authorities should launch a promotional campaign with financial incentives for these types of energy solutions.



Speed-up local diffusion

- ✓ Facilitate the process of establishing an energy cooperative to encourage individuals to participate. A public position or institution should be established to assist in the establishment of energy communities and cooperatives.
- ✓ In the biomass sector: Enable the use/transfer of the full potential of biomass produced in state forests by local residents or local energy cooperatives.
- ✓ Promote and finance community bioenergy pilot projects to demonstrate that this is economically and socially feasible in Poland.
- ✓ Promote energy crops, namely locally produced biomass to supply alternative district heating systems and enhance local crops with high added value.
- ✓ Collect Polish experiences and best practices based on the renewable energy cooperatives that are currently emerging and functioning, on the basis of which a set of “best practices” for Polish conditions should be created (including models of existing solutions with well-described technologies, costs and formal and legal procedures).
- ✓ Disseminate knowledge about energy cooperatives, e.g., through local promotional campaigns.
- ✓ Improve the quality of the existing electricity grid (avoiding grid bottlenecks and enabling fast connections to energy cooperatives).

Timeline of measures

Based on the background analyses and consultations leading to the roadmap, we would propose the following sequencing of measures (Figure 6):

- **Immediate action: Education and sharing of knowledge** about energy communities are crucial to raise social awareness about opportunities and benefits of energy communities and to overcome reservations in Poland. Targeted **communication campaigns** and **capacity building programmes** can be a means to engage citizens, business and local authorities.
- **Until 2025:** The **Renewable Energy Directive** must be effectively transposed into national law to give energy communities **specific legal recognition and support**. This must include a **clear definition** of renewable energy communities and energy cooperatives to enable a clear understanding of eligibility requirements and encourage investment decisions.
- **Until 2025:** Support the creation of an institutionalised **Polish community energy network** that will assist interested parties and people to explore ideas, find partners and set up bottom-up initiatives. The network, or organisation, could collect “**best practices**” from across Poland that can be scaled and replicated. Furthermore, it can enable collaboration between distribution network operators and energy communities.
- **Until 2025: Ease legal requirements and procedures for energy cooperatives**, including the maximum number of members and the minimum requirement to cover the energy needs of members by their energy cooperative. Specific legislations and enabling frameworks tailored to **bioenergy and heating** are needed.
- **Until 2025:** The introduction of **new financing mechanisms** and the expansion of **tax reduction from the electricity to the heating sector** are critical to increasing the share of bioenergy communities and of heating in particular. Concrete **funding models** must be made available and information about funding options disseminated to raise awareness of the possibilities. **Financial support for concrete pilot projects** can make it possible to demonstrate the social and economic feasibility in the context of Poland. It is necessary to quickly gather practical experience, e.g., examples of business models that prove profitable under Polish conditions.
- **Until 2030:** Promote **district heating** as it offers opportunities for the integration of biomass as a heat source. It should be considered as a **priority infrastructure**.
- **Until 2030 and 2050:** Set concrete **targets for the establishment of (bio)energy communities** to promote their recognition for the Polish energy transition. We propose that Poland should have 100 operating energy communities by 2030. By 2050, there should be at least one energy community in each commune to support the scaling of the approach at local and regional level.

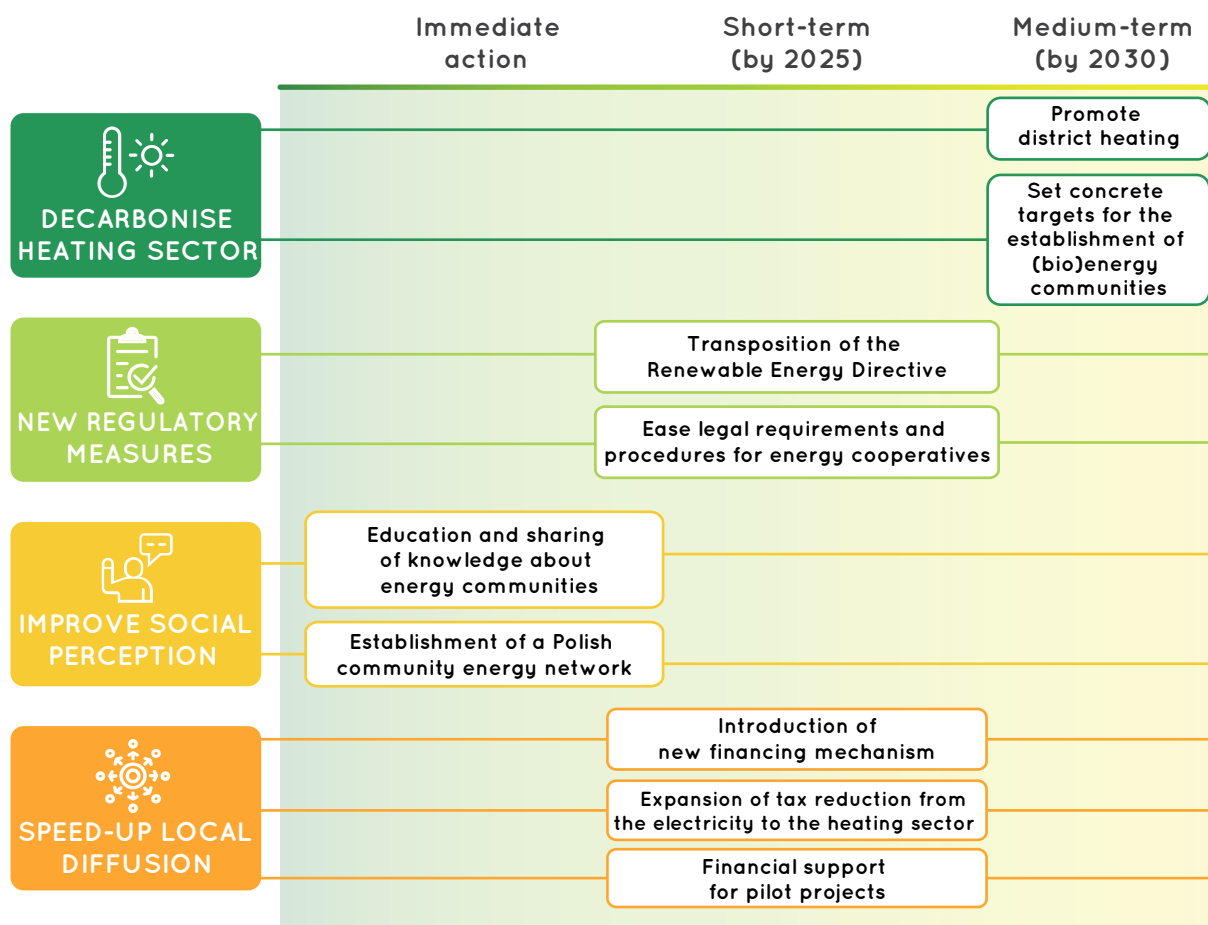


Figure 6 - Proposed policy roadmap for the acceleration of bioenergy communities in Poland.

Conclusions

In summary, lack of incentives and low awareness of the use of local bioenergy have completely halted the development of municipal bioenergy in Poland. Regulatory changes, communication campaigns and capacity building are crucial to unlock municipal bioenergy potential. Clear definitions and legal frameworks must form the basis for the introduction of bioenergy communities. Special financial support is needed for the successful establishment of pilot projects for bioenergy communities. Subsidies and tax exemptions are crucial incentives to accelerate local diffusion. The use of the bioenergy community as a tool for energy poverty alleviation is a further area of action, and one which has received very limited attention within the NECP.

Community bioenergy could make a significant contribution to clean and locally independent energy production in Poland. Overall, the Roadmap recognises the complexity of the transition to bioenergy communities, the need for appropriate legislation and the intensification of efforts to support local initiatives.