

A tour in the Northern Italian mountains, to learn more about sustainable biomass use

This briefing was prepared by the BECoop project team, after traveling for a few days in the North of Italy, in the Trentino-Alto Adige / South-Tyrol regions, where we visited several forestry sites, sawmills, and district heating plants.



About this briefing

End of March 2023, the BECoop team spent a few days in the North of Italy, in the Trentino-Alto Adige / South-Tyrol regions, where we visited several forestry sites, sawmills, and district heating plants.

The whole team got inspired to discover how forest management is done with sustainability at heart, and how innovative technologies and organisational models such as renewable energy cooperatives can be used to generate energy while giving power to the people!

We saw first hand how the cooperatives, also known as RESCoops, can support, engage and bring together communities to invest in renewable energy projects, share the benefits and reduce reliance on fossil fuels.

Now, we take you on a tour with us to discover and learn more about the places we visited. Fasten your seat belts and enjoy the view!



Sustainable forest management

There are dozens of things that stroke us during this trip and our first steps in the Cavalese forests: we could cite the beautiful scenery and nature as far as the eye can see, the smell coming out from the trees or while walking in the forests, the peacefulness of the Fiemme valley.

These enchanting woods host more than 60 million trees and create a unique atmosphere down in the surrounding villages. Forest is here for long walks, act as a barrier to protect the valleys, and is, for many, a livelihood. The tourist industry coexists with forestry, agriculture, and handicrafts, and as an endangered resource, must be protected.

Wood in Italian forests indeed faces two issues: extreme climate events such as heavy rains and strong storms, as well as the “bostrico” or bark beetle, a parasite that sucks the trees’ lymph and is spreading much too fast in the Italian, Austrian and German forests. We were able to see first-hand the impacts of these two major problems.

Sustainable forest management is more than ever needed to tackle these issues and is a budget for the communes. The costs of not intervening would though be higher. Leaving trees (especially after a storm where so many have fallen) creates an hydrogeologic risk and increases the risk of fires. Trees have a key role in mountains, retaining mud and stones during avalanches for instance. If the natural protective role of trees is missing, costly interventions are required. In South Tyrol (Alto Adige), 58% of the forest area is classified as protected forest. We present in this briefing what the Alto Adige and Trentino regions are implementing, for instance creating local supply chains for local companies to collect and process the timber. That creates financial resources that the province uses to build at least 30% of public buildings each year. Between 700 and 800,000 cubic meters of timber are taken from the woods every year.

Forestry site visit in Fassa Valley

Cable line, wood chipper, processor, logistics

Our tour kicked off with the visit of the sawmill and forest managers Ferrari Legnami and the explanations of how they deal with wood in secluded areas (hard-to-reach). Mattia and Piero Ferrari take us for a day. How does it work? Communes pay Ferrari Legnami per square meters to “clean the forests” from sick or fallen trees and manage forests. We mentioned the two recent events which have a daring impact on forests:

- The Vaia storm in October 2018, that was characterised by strong winds (over 200 km/h), snow, precipitations (715,8 mm) during three days in Trento and Trentino Alto Adige. This [article](#) documents, in Italian, the roots of the storm and its relations with climate change. The trees recovered are already ‘too old’ and go 100% for energy use.

- The trees, probably linked to this storm, are weaker and in water stress (due to hot temperatures / dry weather), making it easier for bark beetles / bostrico parasites to attack them. Forming galleries below the bark, they suck the trees’ lymph. 60% of the Italian Northern forests will be affected in 2023. The only solution to eradicate them would be 10 consecutive days of temperatures below 0, which is not likely to happen considering the weather forecasts. The forest area affected by the bark beetle is six thousand hectares and with a drought similar to 2022, **things do not look good.**



Ferrari's team needs to act fast or fallen trees rot and cannot be used. They collect 300m³ of wood per day, 10% are used as residues for biomass. Before going in the mountains to collect trees, cost and accessibility analyses are performed to see what is best:

- By road, with trucks. If roads do not exist or need to be prolonged, they are prepared by the communes.
- By helicopter for secluded areas. With 2 pilots on board, the helicopter goes very fast to pick and return the wood to a flatter area where a truck is preparing the trunks to be carried to the sawmill. Pilots stay 6h in the air with breaks every 40 minutes, also to recharge oil (and avoid having a heavy load on board). Then the sawmill owner does 3 more hours at the end of the day. This is done all year long as long as there is wood available to "clean". It could seem unsustainable to use trucks or helicopters but, as mentioned, the costs of

having sick forests is worse, having trees to decompose on forest floors causes CO₂ emissions.

- With a cable line, coming down the mountain from a truck and men on the ground to attach the trunks to the cable.

All these combined amount to a cost for the sawmill of 40€/m³. A keyword is optimization.

Wood transport is a challenge, Ferrari is now piloting a test to cut 15 meters-long trunks and transport them on wheels. These would be used for carpentry, construction.

What happens next?

Chunks are cut in different parts by the onsite machines and sold for different uses. 90% goes to the sawmill, 10% to energy use.

- Packaging use, pallets
 - Furniture for the best parts
 - And the remaining for energy
- ... this follows the cascading method. A camera on board the tractor allows to directly select the wood for its quality and assign to which use this is best to allocate it. Images are sent to the sawmill.



DID YOU KNOW?

"Mother trees" are selected and cut to make Stradivarius violins.



Cut trunks need to be maintained at a specific humidity level, to retain their quality, and sawmills generally use water from rivers that then flows back into them.



You can certify a forest, a tree and the pellets. To have certified pellets, you need to have the forest and tree certified. **District heating doesn't use certified wood.**



Key figures

- The cost per minute to fly the helicopter, including the pilot salary is 11€!
- Mattia is the 5th generation! His ancestors started carrying wood with horses.
- The head of the tractor, able to clean and cut the trunks, costs about **200 000€**.



All described above and more ancient methods can be seen in this [video](#) (in Italian, subtitles available). It includes images from the Fiemme sawmill.

<https://www.ferrarilegnami.com>





Visit to Magnifica segheria in Fiemme

Cable line, wood chipper, processor, logistics

Magnifica Comunità di Fiemme (MCF) boasts a thousand-year-old history. The sawmill belongs to the people of Fiemme, each citizen above 10 years old being a shareholder, giving it a great responsibility but also support to enhance the work. MCF manages a colossal collective estate: about 20.000 hectares of land, mountains, pastures and forests. The forests are mainly spruce (*Picea excelsis*) and are run in accordance with planning, stating when trees are to be felled or planted.

We heard there from the lumber processing chain steps, from log to processing residue management (trimmings, wood chips, etc.). Modern computer guided systems and skilled workers perform quality monitoring at every step of the production. For instance, bark is taken out, trunks are checked for metal pieces (that could date from hunting or war) as they could damage the cutting lines.

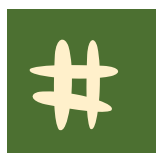
Various shapes are produced onsite, according to the final use. Stable products, cleaned from mushrooms or parasites are needed. Sawdust is produced, used compressed to make pellets and by-products.

Sustainable forest management

The sawmill only processes raw material coming from woods run according to strict management plans. They consider it “their capital” and only withdraw interests periodically: the annual quantity of wood that is felled is lower than the total annual growth of the forests.

The territory being very extended, it is partitioned in areas or districts; skilled foresters, like the Ferrari father and son, employed by Magnifica Comunità di Fiemme, draw and implement a management plan for each district. This continuous monitoring ensures that over the years the forests do not decrease in extension and value, and guarantees them protection, renewal and growth.

In 1996, Magnifica Comunità di Fiemme undertook a certification process according to FSC® standards; it was the first forest owner in Italy and in the Alps to do so. In 2002, the certificate was confirmed. In the meantime, the PEFC™ Programme for Endorsement of Forest Certifications schemes was set. In 2007, Magnifica Comunità di Fiemme appointed SGS Italy to obtain both certificates (FSC® and PEFC™) for its forest management and chain of custody. Once again, it was the first forest owner to reach this goal. FSC® and PEFC™ schemes have different methods and procedures, but the evaluating board assessed that Magnifica Comunità di Fiemme complies with principles and criteria set for both. Both certificates have a five-year term, their renewal undergoes an in-depth surveillance visit. Magnifica Comunità di Fiemme also achieved chain-of-custody PEFC™ and FSC® certificates, which vouch for the traceability of certified timber in all stages of production.



Key figures

- Magnifica Comunità di Fiemme owns **19.569** hectares of certified estate and is up to today the main owner in Italy certified according to FSC® scheme.
- 11.150 hectares of productive forests and 3.173 of protected woods. The remaining 5.246 hectares are middle-high mountain pastures or not productive land.
- MCF existence was first stated in the Gebardini Pacts, a document from **1111!**
- 3-4 months between delivery and processing of the trunks.
- 1 year of drying, sometimes done in ovens.



<https://www.mcfspa.it/>



BIOENERGIA TRENTINO

Visit to the district heating plant of Bioenergia Fiemme in Cavalese, with combined production of pellets and essential oils, and presentation of the Fiemme energy community

Roberto guides us through the district heating plant Bioenergia Fiemme in Cavalese, where his main role is to distil essential oils from the forest products (such as spruce, silver fir, etc.).

This is the first central heating in Trentino, using forest residues to provide clean energy to people in Cavalese through pellets. Their motto: **“everything deserves a second chance”**, ensures they find solutions to valorise everything their hands touch.

The plant we visit is self-sufficient, with solar panels ensuring electricity and hot water production through co-generation.



Transforming the waste concept into an opportunity

- Onsite, selected sorting is implemented, with green waste used for biogas.
- Using surplus heat to dry chips and make A1 pellets (the best quality), distributed in bags of 50kgs (1/3 of the production) or by silos in trucks for nearby villages (2/3).
- The emissions are strictly controlled by the local authorities, and electro filters in the chimneys remove ashes.
- People got shares into Bioenergia Fiemme and installations.
- For the essential oil and hydrolat production, Roberto chops the green parts from the trees and leaves about 400kgs to distil for 2h.

DID YOU KNOW?

The Italian government has reduced the VAT rate from 24 to 10% on energy products such as pellets, to reduce the prices impacted by the war in Ukraine.



Key figures

- 24-year old joint stock company, a team of 12 people.
- Cavalese: 4000 inhabitants.



Visit to the biomethane plant Bioenergia Trentino in Cadino (TN)

We then visited, guided by Michele, the organic waste biomethane plant of Cadino (Trentino), where two types of waste are collected:

- Organic waste / Compost (citizens and restaurants), from 230 000 inhabitants!
- Humid forest waste and urban prunings.

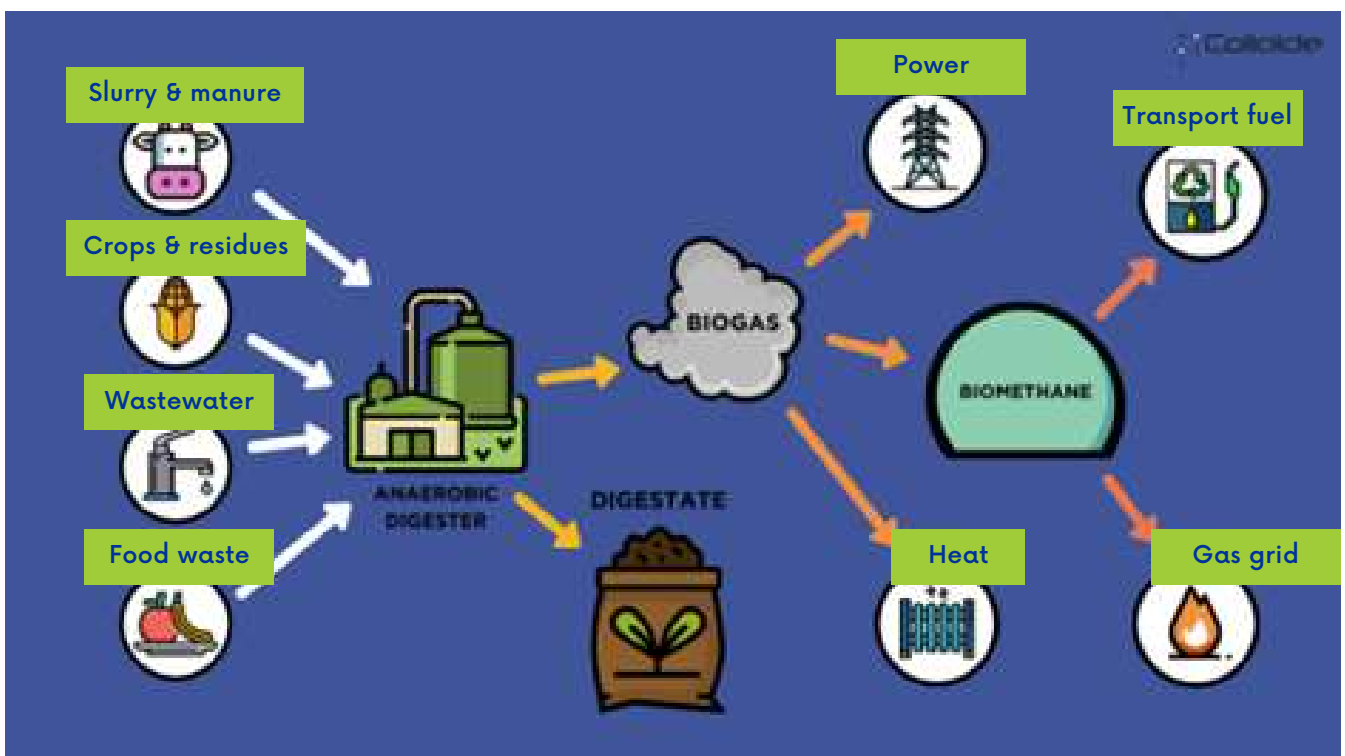
We were introduced to the supply chain: how does the organic waste collection, management and processing work onsite?

The waste collected is used to produce heat and electricity through anaerobic digestion. Biomethane is produced by removing carbon dioxide from the biogas and distributed for heat to the local population and the digestate left is sold as agricultural fertiliser (6€/ton) or distributed as soil conditioner for free to visitors (14 000 tons/ year). The power produced is used onsite.

The biomethane is rejected into the Italian natural gas grid.

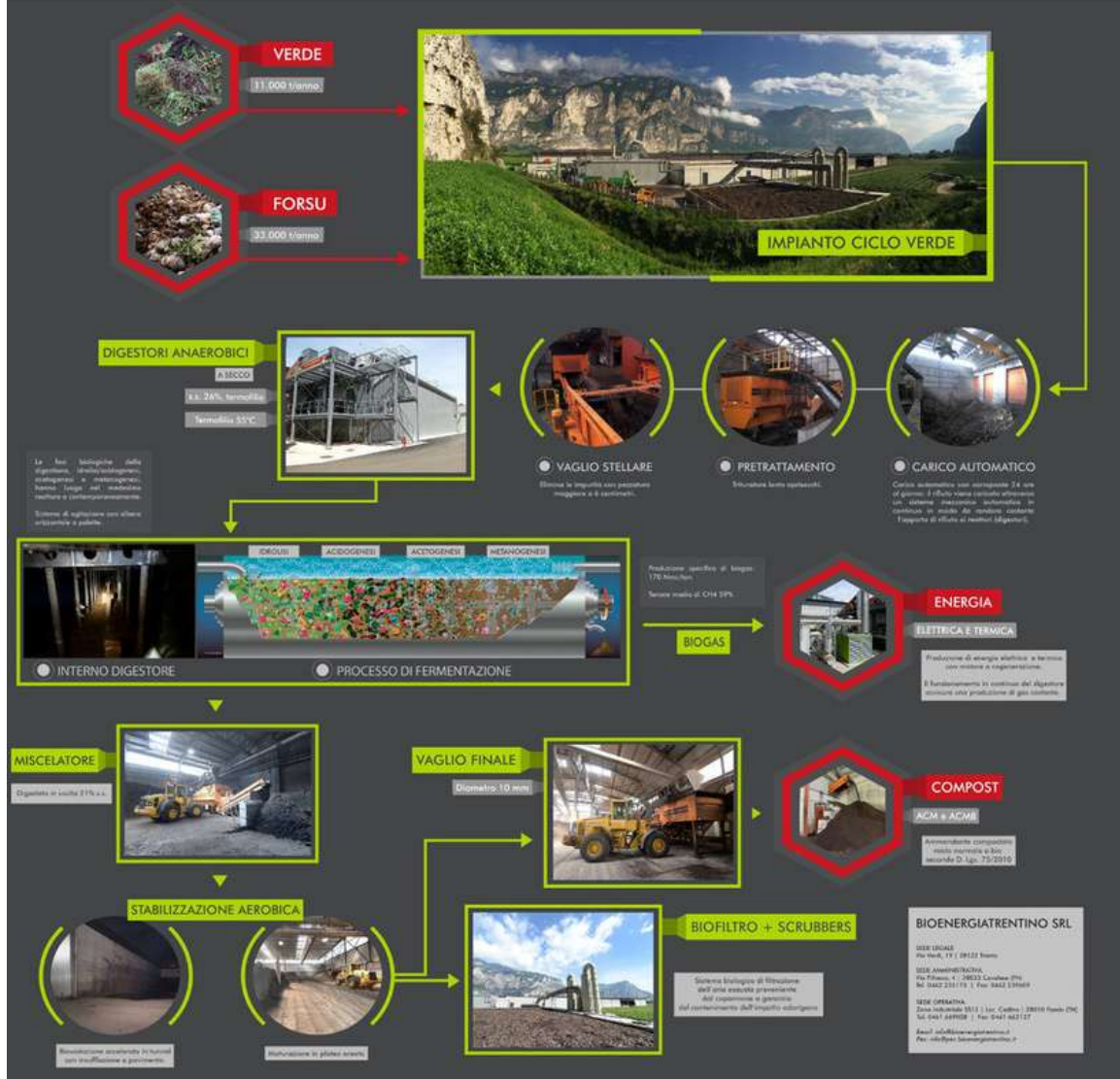


<https://bioenergiatrentino.it>



Source: <https://www.colloide.com/what-is-anaerobic-digestion/>

BIOENERGIATRENTINO



DID YOU KNOW?



The biological process operated here is a clear example of circular economy, the waste produced by the population in their homes is returned, after being ennobled, to agriculture to give life to a new food chain, contributing at the same time to production of electricity and renewable biomethane for vehicles.



It does not smell anything around the plant! Air purifiers made of a wood residues filter and a "cold shower" take away any bad scent. The filters are then composted after 2 years.



Key figures

Collection and recovery of 40,000 tons/year of organic waste and 14,500 tons/year of greenery and branches.



Guided Tour of E-Werk Prad by Vice-President Michael Wunderer

For a new day of our tour, Michael, VP of the cooperative and director, welcomes us in Prad!

A local cooperative on the way to an independent and environmental-friendly energy supply in the community of Prad, since 1923!

This is a classic consumer cooperative, in which members have joined forces to organise the production of electricity and heat locally and to distribute it at a favourable price. Everyone has a right to vote. There is a strong identification of members with the cooperative. The yearly General Assembly is one of the big gatherings in Prad.

E-werk Prad is working according to the basic principles of cooperatives: "What is not possible for the individual, many can do" Friedrich Wilhelm Raiffeisen (1818-1888), German social reformer and founder of the Raiffeisen cooperatives. Their mission is to produce this energy with locally available resources, and in a sustainable way. The power access fee depends on the power needed and is about 30€/kW.



Cooperatives have the possibility of combining production and distribution under one roof and work according to the cost price principle (LCOE). The profits are building reserves for future investments, there are no dividend pay-outs. The Prad cooperative has three pillars: supply of electricity and electric grid operation, heat, and broadband internet.



DID YOU KNOW?



Providing fiber optic internet including the infrastructure since 2012 is one of the investments made possible by reinvesting profits, for the benefit of members. Another feature is the prompt onsite service and advice on energy matters, and offer of e-mobility services through a fast charging station and a car-sharing scheme.



Historical cooperatives are exempt in Italy from "system costs" and can therefore offer electricity at a cheaper price.



Non residential or large consumers are excluded from the membership, the coop can only distribute as much as it produces!



Key dates

- In 1923, citizens decide to build their own hydropower plant, following the basic principle of “helping people help themselves”. It goes into operation 2 years later.
- 1926 – the cooperative of Prad is founded, with 47 citizens as members.
- A surviving coop: During WWII, the local bank is liquidated but private individuals cover the debts with their deposits, saving the coop! in 1975, a fire destroys the hydro powerplant generator.
- 1999 heat supply starts! The first combined heat and power plant goes into operation (a second follows in 2022). The first customers are supplied with district heating. Biogas purchased is used to produce heat and electricity.
- In 2022-2023, heating boilers are renewed as well as the hydropower plant.



Key figures

- 1443 members participate in the cooperative
- > 2000 grid customers
- 2 DH plants (biogas, woodchip and bio-oil) and one hydropower plant



Guided Tour of FTI - Fernheizwerk Toblach- Innichen

This thermo-electric district heating cooperative in the villages of Dobbiaco and San Candido was founded in 1994. We are this time guided by Hanspeter Fuchs, FTI's president as well as Peter Paul Steinwandter, construction manager.

This cooperative has nothing to envy to others: a free visitor route through the plant was developed in 2005, and the coop provides fibre internet to the villages since 2017.



Their motto: "All for one, and one for all".

DID YOU KNOW?



With a good insulation of piping and installation at a depth of approximately 60 cm under the ground, the water cools down by just approx. 0.5°C per km.



This is the lowest biomass DH price in all Italy, with a stable price for 20 years! When it comes to low heating costs, cooperatively produced district heating is now the first choice - especially in view of rapidly rising gas prices.



Carbon neutrality: using biomass to produce heat, electrical energy or fuel results in a balanced CO2 scorecard, because no more CO2 is released into the atmosphere than was previously bound biochemically.



Clean air: exhaust gases pass through an electrical filter, and, further downstream, a flue gas condenser unit to purify the gases of dust and particles, after which an induced draft fan draws the gases into the smokestack – white smock is the result.

How does the DH plant work?

1

A wheel loader is used to transport wood chips, bark and sawdust from the storage areas to what is referred to as a “moving floor”, where a scraper conveyor feeds the wood fuel to the furnace. On average, 30 loads are fed each day and as much as 100 in winter.

2

Thermal energy is produced using wood chips, through combustion of the biomass in the furnace. A special system controls combustion fully automatically, ensuring the highest level of combustion efficiency. Thanks to a combined system integrating an electric filter and flue gas condensation unit, exhaust emissions are reduced to the strict minimum.

3

The first ORC (Organic Rankine Cycle) module in South Tyrol and one of Europe's largest, producing 1500 kW of electrical power, was installed at the DH plant. Biomass is burnt in the combustion boiler, resulting in thermal energy that is used to heat thermal oil. This drives turbines that in turn power a generator, converting the mechanical power into electrical energy. The exhaust heat is used to supply the two communities with DH.

4

The DH grid consists of 2 insulated lines, the flow and the return. The flow transports the heating water to the individual DH customers.

5

Each customer has a heat transfer station that transfers the heat to the existing central heating system through which it is distributed in the usual way throughout the home. A controller allows fully automatic adjustment of the temperature in each home.

Advantages of "District Heating" supply

- ✓ Available at full capacity all year round.
- ✓ Only the energy actually consumed is billed and temperature is set by the consumer at home.
- ✓ The VAT rate is only 10% for private homes.
- ✓ No maintenance costs.
- ✓ No risk of explosion or fire.
- ✓ The heat-transfer station requires little space versus central heating systems with a tank room.



Key figures

- Around 7000 inhabitants are connected, 96% of the population.
- 1000 cooperative members.
- 3 biomass plants /boilers, an electrical power plant + a heat accumulator guarantees the service and covers peak demand since 2015.
- 900°C is the ideal temperature for burning wood chips.
- The network between Dobbiaco and San Candido is 49 375m long. Total grid length is 90 000m!
- 42% of South Tyrol is covered by forests.

[More figures available in this FTI poster](#)



What are the roles of SEV and fiper, BECoop partners, in all of this?

The South Tyrol Energy Association (SEV) is a 360° service provider, offering support, advice and information, trading, billing and reporting services, to over 304 members, 149 PV installations, 120 hydropower plants and 45 district heating ones. The Association represents power utilities and cooperatives as well as private companies and municipalities.

Fiper is the Italian pilot in BECoop. The Federation of Energy Producers from Renewable Sources represents producers of energy from woody biomass, forestry companies and associations and the forest-wood-energy chain. Since its establishment in 2001, the objective of the Federation has been to protect and promote the sector that produces heat and electricity (co-generation) from biomass, respecting the environment, the quality of the air, the soil and the territory.



Follow us and what we describe in the briefing with a short video!





For a fair and people-powered energy system, BECoop (2020-2023), a project supported by the European Horizon 2020 programme, aims at putting communities in charge of their local renewable (bio)energy generation, by providing the necessary conditions and support tools for unlocking the underlying market potential of community bioenergy and fostering new partnerships.



[@BECoopH2020](https://twitter.com/BECoopH2020)



[becoop-h2020](https://www.linkedin.com/company/becoop-h2020)



www.becoop-project.eu