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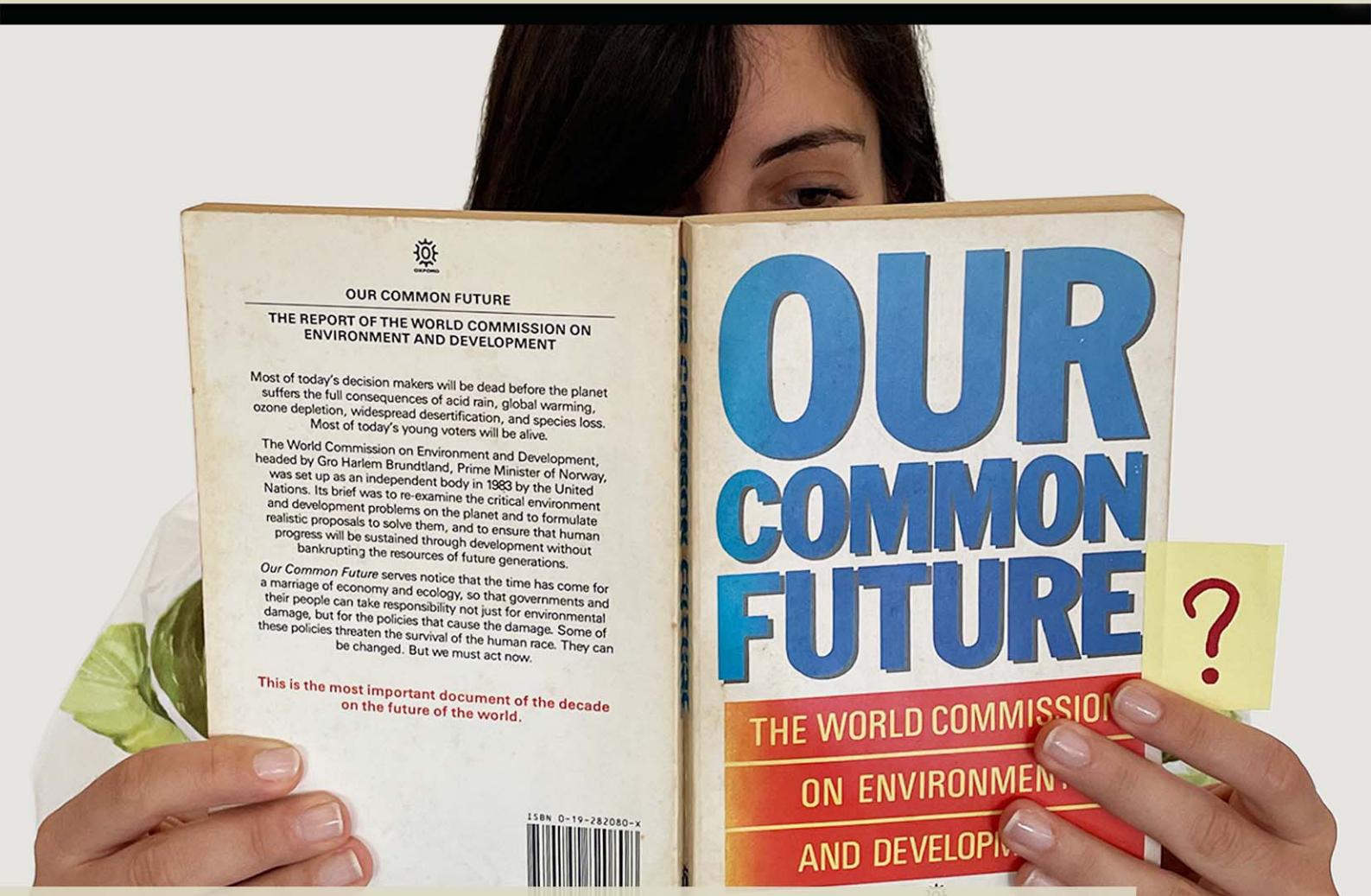
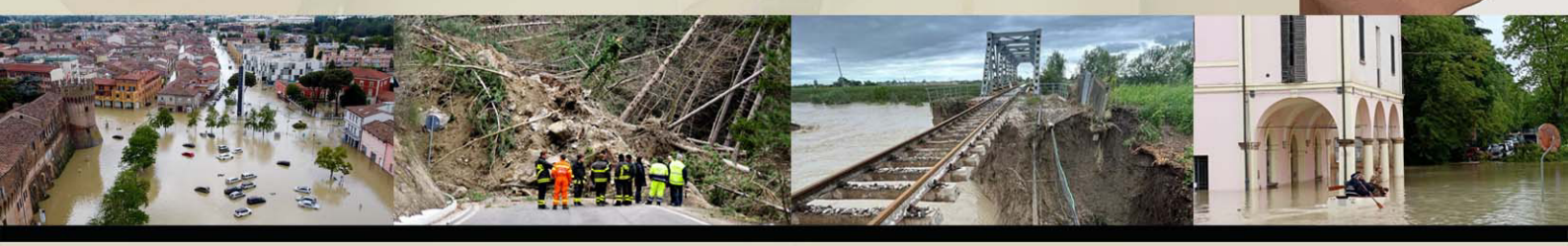


THE CITY CHALLENGES AND EXTERNAL AGENTS. METHODS, TOOLS AND BEST PRACTICES



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The cover image shows a copy of the 1987 UN report “Our Common Future – The report of the world Commission on Environment and Developments”. The picture has been taken in TeMA Lab in July 2023. On the bottom, there is a collage made up of four pictures of recent climate disasters (Source: Google images)

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REVIEW NOTE – Town Planning International Rules and Legislation

Policies and practices to transition towards Renewable Energy Communities in Positive Energy Districts

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Abstract

Starting from the relationship between urban planning and mobility management, TeMA has gradually expanded the view of the covered topics, always following a rigorous scientific in-depth analysis. This section of the Journal, Review Notes, is a continuous update about emerging topics concerning relationships among urban planning, mobility, and environment, thanks to a collection of short scientific papers written by young researchers. The Review Notes are made up of five parts. Each section examines a specific aspect of the broader information storage within the main interests of the TeMA Journal. In particular: the Town Planning International Rules and Legislation. Positive Energy Districts has entered the scientific and policy arena to accelerate urban transitions in Europe, however their implementation remains challenging in planning processes. The PED incorporates socio-economic, technological, environmental, political, and institutional challenges that need to be addressed simultaneously as part of a holistic urban strategy. The theme of PEDs finds its first application implications in renewable energy communities on a local scale. This review focuses its attention on Renewable Energy Directive Recast which also provides for financial support for the production and self-consumption of electricity from renewable sources and on the Italian legislation on renewable energy communities governed by the Milleproroghe decree.

Keywords

Urban sustainability; Positive Energy Districts (PED); climate neutrality; Renewable Energy Community.

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1. Energy districts and communities

The concept of Positive Energy Districts (PED) has recently emerged in the scientific and political debate to facilitate the energy transition and contribute to climate neutrality through the reduction of consumption and the efficiency of urban areas (Xiaomin & Chuanglin, 2023). Climate change and energy poverty are urgent concerns for urban systems and require increasingly sustainable yet reliable forms of organization (Hoang & Nguyen, 2021).

The data published by OIPE for 2020 report, for example, that Italy has 2.1 million households in energy poverty, or 11% of the population (just over 6 million people) according to Eurostat. On the other hand, Europe has set highly ambitious goals such as the 40% reduction in greenhouse gas emissions by 2030 compared to 1990, the achievement of the target of 32% penetration of renewable energy sources (RES) in energy consumption and the 32.5% reduction in consumption as a goal for energy efficiency, placing local consumers at the center and as the main protagonists of the energy transition. According to Urban Europe (JPI, 2020), each PED should find its optimal balance between three main components: the energy efficiency of the infrastructure, the local production of renewable energy and the energy flexibility within the district. Instead, to date in the scientific debate it is difficult to find an unambiguous definition of PED, leaving open the field of existence of the various integrations in planning processes (Koutra et al., 2022).

The transformation of the energy system within urban systems incorporates socio-economic, technological, environmental, political, and institutional challenges that need to be addressed concurrently and simultaneously as part of a holistic urban strategy (Gargiulo & Papa, 2021). The idea of PEDs does not appear to be entirely new and derives from studies such as (Net) Zero Energy Buildings, Energy Positive Neighborhoods, Energy Neutral Districts and Positive Energy Blocks (Brozovsky et al., 2021; Bossi et al., 2020). The common goal of these academic works is to propose methodologies for design, energy modeling and simulations of different scenarios as well as the dissemination of good practices aimed at meeting the energy needs from low-cost renewable sources at different scales from that of building to that of the neighborhood or district in accordance with the environmental sustainability standards to which cities today are called to respond (Gouveia et al., 2021; SET-Plan, 2018). In particular, the studies of Sartori et al., (2012); Omrany et al., (2022) aim to favor the high efficiency of buildings from renewable sources capable of generating electricity, or other energy vectors to compensate for the energy needs of users. Studies such as Monti et al. (2016); Ala-Juusela et al. (2014); they deal with studying how an area can generate more electricity and how much it consumes to identify Energy Positive Neighborhoods (EPN) areas. The authors investigate key defining characteristics of future energy systems that include the growing penetration of low-carbon electricity generation, electric heating, and transportation.

Finally, district-scale studies are still few, the PED concept has gained more attention in policy-oriented works. Some authors consider that the concept of PED is similar Energy Neutral District considering this new term ill-defined and with an ambiguous connotation (Hedman et al., 2021). First, "positive energy" refers to an energy surplus where (renewable) energy production exceeds consumption over a certain amount of time. Second, "district" refers to a larger area of the city, which is larger than a city block or neighborhood. According to Lindholm et al. (2021) three types of PED can be identified: autonomous, dynamic, and virtual. The difference between these different types is their ability to interact with energy networks, consumers, and producers outside their geographical boundaries. The autonomous PED refers to a district where the energy needs are covered by renewable energy that is generated internally and energy imports are not allowed. Dynamic and virtual PEDs are instead flexible in their interaction, go beyond geographical boundaries and are based on renewable energy systems and energy storage. Although PEDs may be a promising and compelling concept to accelerate decarbonization and urban transitions in Europe (Bruck et al., 2022; Pilogallo et al., 2019), however their implementation remains challenging with multiple limitations and at the same time partially

developed analyzes mainly focused on solutions and technological projects as well as the legislative body is still fragmented.

It remains remarkable that after many years' attention is paid to the issue of energy in urban areas at the district level but with limited results due to its complexity. Today, the theme of PEDs finds its first application implications in those territorial contexts where experiences of renewable energy communities have been introduced which, thanks to the association between citizens, commercial activities, local public administrations, and small/medium enterprises undertake to exchange and consume energy from renewable sources on a local scale (De Vidovich et al., 2023).

A recent study published in the scientific *journal Nature* surveyed energy communities in 29 European countries, including 26 EU member states. In the EU countries there are 9252 energy communities, although we can see large disparities between the member countries: more than half of these communities are in Germany, which has 4848 energy communities, with the other states of the Union following like the Italy with 198 up to countries such as Bulgaria, Malta, Romania, and Hungary which have just one. The key aspect of renewable energy communities continues to be the relationship with the territory to understand which the best ways are to make this relationship functional and mutually beneficial (Grignani et al., 2021). It is therefore necessary to know the specific characteristics of the territorial context in question and the resources and infrastructures it offers. The territory is not only the physical "support" for the construction of small/large-scale energy production and distribution plants with the aim of minimizing costs and maximizing efficiency.

The purpose of the energy communities is the inclusion in the territory and the satisfaction of the energy needs that it presents with a "distributive" objective within the local community (Atutxa et al., 2020). Private and public actors, cooperatives, foundations represent important models for the creation of local support towards energy communities such as the participation of experts with certain technical skills to allow energy innovation for the construction of new plants and new techniques. A further issue for the success of Energy Communities is social acceptability, which depends on several factors, including equity in the distribution of benefits and level of decision-making participation of the different stakeholders. In this direction, this review focuses its attention on the Renewable Energy Directive Recast, also known as RED II, which among the various regulations also provides for financial support for the production and self-consumption of electricity from renewable sources and on the Italian legislation on community renewable energy regulated by Milleproroghe Decree 162/2019 (converted with Law no. 8/2020 of 28 February 2020).

Renewable Energy Directive Recast (REDII)

In recent years, the European Commission has played a leading role on the issue of energy. Most of the legislative acts are contained in the Clean Energy Package which redesign the energy sector through measures for energy efficiency, renewable sources, the energy market structure. Legislative Decree 199/2021 (REDII) represents a significant leap in the promotion of renewable energy by defining the tools, mechanisms, incentives, and institutional framework for achieving the objectives of increasing the share of energy from renewable sources by 2030. Furthermore, it provides the provisions for the implementation of the measures of the National Recovery and Resilience Plan PNRR. The expected target in terms of installation of renewable sources is at least 70 GW of new power by 2030, of which at least 40 GW of photovoltaic and over 12 GW of wind. Another 3 GW should come from biogas (1.5 GW), hydroelectric; geothermal (0.2 GW) and other minor sources for 0.8 GW (solar thermodynamic, etc). The REDII is also an important step because it allows the Government to continue the bureaucratic simplifications already started with the Simplification Decree to make up for the significant delay accumulated in the transition towards the 2030 objectives and to unblock investments and to install the 70 GW of new renewable plants envisaged by the Green Deal. In detail, the document is based on two main guidelines. The first, on an aid scheme for the support, throughout the country, of renewable energy communities and individual and collective self-consumption configurations aimed at pursuing the decarbonization objectives by 2030; the second governs the conditions and methods for granting and disbursing

operating aid for the promotion of renewable energy communities and individual and collective self-consumption configurations.
The decree provides for incentives for renewable source plants through: (i) systems of individual remote self-consumption of renewable energy: systems that provide for the remote self-consumption of renewable electricity by a single end customer, without resorting to a direct line, i.e. using the existing distribution network to connect production sites and consumption sites; (ii) collective self-consumption systems from renewable sources: systems created by groups of self-consumers acting collectively; (iii) renewable energy communities: systems built by customers. The renewable energy communities constitute the first step forward because they encourage the sharing of the energy produced, however raising the power threshold of the plants to 1 MW (previously 200 KW), expanding the community to users (production and consumption) connected under the same primary substation (currently the secondary substation was envisaged) overcoming the constraint that required community participants to belong to the same medium voltage substation and opening up existing renewable plants to enter the community, provided they are not beneficiaries of other forms of incentive and for a total power not exceeding 30% of the total. The increase in plant power to 1 MW will therefore make it possible to build larger plants, potentially able to meet the needs of communities and no longer just a few families. The effectiveness of the promotion mechanism can be assessed when the value of the recognized tariff is known. The funding can be both a tariff incentive and a non-refundable grant. With regard to the tariff incentive, specifically, the share of energy shared within the CACER (Self-consumption configurations for sharing renewable energy) through the portion of the distribution network underlying the same primary substation is entitled to a incentive rate in the form of a premium rate. The tariff is paid by the Energy Services Manager GSE, which is the body managing the measure and which will be able to preliminarily verify the eligibility of the interested parties to guarantee the concrete possibility of accessing the benefits of the measure. As regards the non-repayable contribution of the PNRR matrix only in small municipalities, the measure that allows the disbursement of non-repayable contributions of up to 40% of the investment will only be up to the energy communities created in municipalities with less than 5,000.

Energy Communities in Italy

The implementation of the European directive RED 2 was acquired in Italy in the Milleproroghe decree. In Italy the first experiences of Renewable Energy Communities are recorded around the 2000s, mainly in the North. Only in recent years, however, has it increased its attention and has made users aware of the principles of self-consumption and environmental sustainability. In turn, the Renewable Energy Communities are mentioned for the first time by the Italian Energy Strategy in 2017 and, subsequently, by the National Energy and Climate Plan in 2018. Then in 2018, the Piedmont Region approved a law on Energy Communities, which is It being mainly a declaration of intent, even if it was politically relevant, being the first legislative initiative explicitly dedicated to the Energy Community sector. In detail, article 42 bis allows for the establishment, on an experimental basis, of collective self-consumption, which can be activated by families and other subjects who are in the same building or condominium. Compared to RED II, the Milleproroghe decree provides for and establishes a system of continuous monitoring and growth of self-consumption configurations, detectable from the monitoring activity, and from the evolution of the overall requirement of the various components. For these purposes, the regulatory authority for energy, networks, and the environment (ARERA) can make use of the companies of the Energy Services Manager (GSE) Spa group. Furthermore, it identifies ways to encourage the direct participation of municipalities and public administrations in the community's renewable energy. The decree provides that the incentive rate is paid for a maximum period of use and is modulated between the different configurations eligible for incentives to guarantee the profitability of the investments. Furthermore, the mechanism is implemented considering the overall balance of bill charges and the need not increase trend costs with respect to those of the mechanisms in force. Finally, a single adjustment is envisaged, consisting of the refund including the share of shared energy, and the incentive tariff. Renewable energy communities within positive energy districts constitute an innovative model for which energy needs are met locally, autonomously and in a shared way. Starting from 2020, the legislation has been defined in a more accurate way making possible the formal establishment of the Renewable Energy Communities in our country but there are still gaps in the implementation in the planning processes such as experimental analyzes in relation to the physical and functional organization of urban systems. Finally, the CER allows us to make a cultural leap where everyone shares something to make it available to others, users and their behavior are a key element. The social benefit becomes the engine — in motion — of the community which, through the energy vector, produces and realizes the common good.

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