Why energy democracy can enhance landscape democracy in the energy transition: some reflections on the Italian case

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Abstract

The energy transition towards renewable energy sources is unavoidable in order to reduce gas emissions by 40-70% within 2050 (Paris, 2015). In the last two decades, we have witnessed frequent cases of opposition and blocks to the installation of renewable energy technologies by local communities, because of the landscape change associated to them. Local initiatives aiming at 100% self-sufficiency can be a challenging approach for a sustainable energy transition, safeguarding both the landscape democracy and the energy democracy. According to studies in sociology, the success of these bottom-up processes at community level depends on the socio-historical backgrounds and on the consequent capacity of acting in a cooperative perspective for the management of common goods. Special attention will be paid to Italian regional contexts. According to current literature, landscape architects are called to be facilitators for integrating knowledge and promoting reflection among different disciplines and backgrounds. This contribution want to address the role of research and practice in landscape architecture as facilitator, supporting communities in envisioning their own energy transition towards renewable energy.

Keywords

Energy transition, community, energy democracy, landscape democracy.

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State of the art

The energy transition towards renewable energy sources (RES) is unavoidable in order to reduce gas emissions by 40-70% within 2050 (United Nations, 2015). In order for an energy transition to be sustainable, the introduction of Renewable Energy Technologies (RET) in the landscape should not cause a depletion of the ecosystem services provided to communities (Coleby *et al*., 2012; Stremke, 2014; Kienast *et al*., 2017). Ecosystem services are defined as the benefits people obtain from ecosystems (Costanza, 1997). These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and diseases; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other non-material benefits (M.E.A., 2005, p. 3). For example, the installation of an offshore wind farm can affect the view on the horizon, reducing cultural ecosystem services or a hydropower installation, another example, can modify the water flows and consequently affect the ecological integrity and the regulating ecosystem services as fish's habitat. The notion of energy landscape comes from geography and landscape ecology:

> Energy landscape is a landscape whose image and herewith the functions (natural, productive, residential, recreational, cultural, etc. have been significantly affected by the energetic industry.
> (Frantál *et al*., 2014, p. 2)

Most of European countries as Italy, Spain and the Netherlands, operated the transition towards renewable energy in a top-down centralized approach, with strong policies and subsidies and large scale investments by National and private companies. At present, centralized renewable energy initiatives continue to face opposition by European communities, nature and culture managers and others due to concerns over trade-offs between the renewable energy supply and the ecosystem services. This happens because communities do not recognize RET as part of their landscape and related economy. Local communities frequently oppose the installation of RET because of the associated large-scale landscape change and the unavoidable trade-offs occurring in the supported ecosystem services in time and space. According to Bertsch *et al*.:

> landscape modification is the most important factor driving the (lack of) local acceptance for most technologies. (Bertsch *et al*., 2016, p. 473)

Paqualetti says that people believe that their landscape will not change in the future, and this is why they cannot accept renewable energy large-scale interventions (2000, 2011). Yet Selman affirms:

> Energy production has driven the emergence of distinctive landscapes throughout history, and traditional sites of wind and water power are often important parts of heritage. (Selman, 2010, p. 163)

Some energy landscapes from the past are nowadays considered cultural landscapes, for example the wind mills landscapes Kinderdijk near Rotterdam, The Netherlands, or the famous waterfalls in Tivoli, Italy, both were producing mechanical energy respectively for pumping-up water and for manufacturing and later on renewable energy production (fig. 2). Those assumptions demonstrate that the relationship between renewable energy (RE) and landscape also needs to be analyzed and studied as a landscape change phenomenon (Antrop, 1997).

Italy is not immune to this socio-cultural phenomenon, indeed Italian communities, national and local associations and citizen groups created oppositions and blocks to large-scale interventions. Among the others, *Viadalvento* is a citizen led information group that fights against the invasion of windmills showing aiming at RE generation through different and integrated RET at smaller scales (Viadalvento, 2019). In Italy regions produced guidelines to introduce the RET in the landscape in order to regulate the landscape change and define the areas suitable for RET installation. Some regions as Apulia (2004) proposed design principles to introduce them into the landscape. In several cases, as for Apulia, Calabria and Molise, regional governments emit-

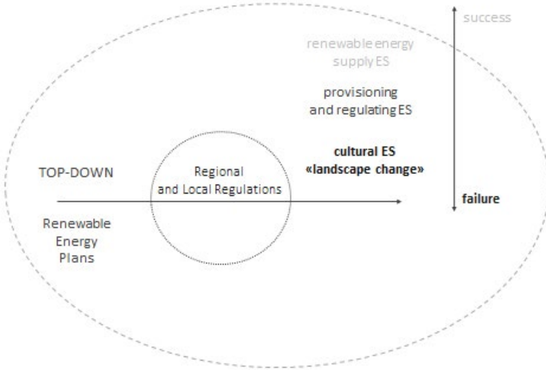

Fig. 2 – The flowchart shows how large top-down initiatives can lack authorization at regional and local level, making the energy transition failing. In particular, this is due to the impact on cultural ES, than on regulating and provisioning.

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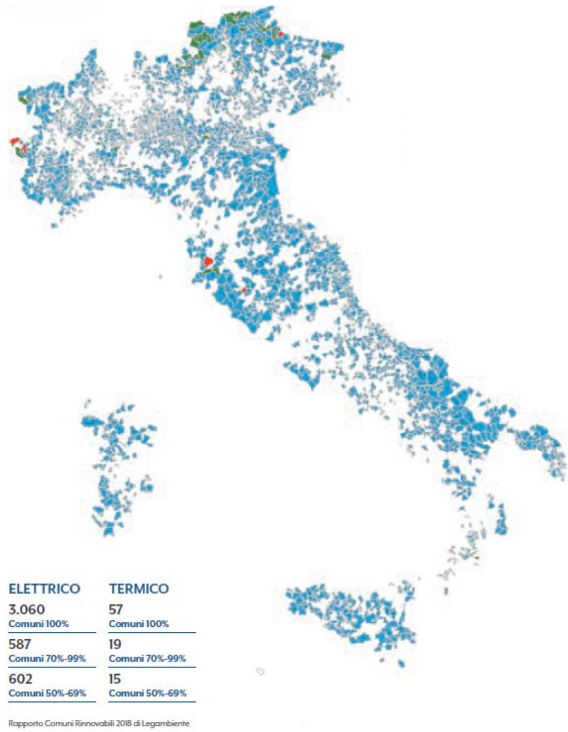
Fig. 1 – The structures of one of the first Italian hydropower plants in Tivoli, quickly become a new sacred landmark within the context of the old Roman ruins of the Hercules Sanctuary. The tower was realized to host the conducts that bring water to the *Acquoria* power plant of Tivoli.

ted procedure for large-scale wind farms authorization that blocked or delayed the realization of RE targets. The authorization was based on criteria as the type of RET, the spatial footprints and the safeguard of environmental aspects, the landscape and the cultural heritage. In many cases, as for Calabria, the Constitutional Court recognized these authorization procedures too restrictive and not Constitutional because limiting the capacity of Italy in reaching the purposes as in European directives (Ammannati, 2011). In other cases as in Apulia, the regional government recognized as legal some environmental compensation. Those restrictions limited the access to a free market of RES from investors (fig. 1). We can affirm that regulating the introduction and integration in the landscapes of large plants, especially with regard to wind development lacked success: first communities if not involved in the process would not accept them, second the risk is that Regions would reject such large-scale development projects, blocking the transition process (Ammannati, 2011). This is not a solely Italian case, but is reported by several authors within different European Union countries. According to Dinica and Arentsen, in the Netherlands the Dutch Energy Policy has been based on green labels or green certificates and subsidies to investors on RET since the 1990's and local communities and local governments had strong legal instruments to block the erection of top-down new green electricity facilities (2003). In the last decade, a huge amount of literature has been produced in studying the 'social attitude' of communities towards the renewable energy development and the landscape change that this provokes. In most of cases, studies focus on what communities think with regard to renewable energy development in their landscapes (Picchi *et al.*, 2019). In several cases, literature has demonstrated that if the development is based on bottom-up citizen-led initiatives or on an early involvement of community in the decision process, the acceptance will increase with favor to the energy transition (Bolinger, 2001; Breukers & Wolsink, 2007; Walker, 2008; Agterbosch *et al.*, 2009) as for example Schreuer and Weismeier-Sammer report for Danish, Dutch, German and Austrian cases (2010) or as in Drechsler *et al.* (2012). In 2015, the European Strategy and Policy Analysis System (ESPAS) remarked the relevance of promoting the access by local groups to decentralized means of renewable energy production by encouraging the emergence of cooperative structures for the production of renewable energy (2Restoring trust in democracy, p. 64). This decentralization through bottom-up approaches in energy transition has also been defined in literature as an energy democracy approach. According to Kunze and Becker:



> Energy democracy demands de-centralization and independence from corporations, distribution grid use rights and control over municipal energy suppliers, moderated forms of reconciliation of interests, and union co-participation.
> (Kunze, Becker, 2014, p. 8)

An energy democracy, avoiding blocks and oppositions at regional and local level can advance a sustainable energy transition. It is not a coincidence if the last Italian Legambiente Report *Comuni Rinnovabili* (2018) outlines that Italy reached the 34,4% share of renewable in electricity consumption in the last few years, and the 17,7% in general consumption especially due to local private initiatives and to local communities and municipalities that pushed on renewable energy development. At present 3060 municipalities are independent in electricity consumption, 58 municipalities are independent for heat consumption and 37 are 100% self-sufficient in heat and electricity consumption (fig. 3). According to these data, we can breakthrough that the success of an energy transition is strongly linked to energy democratic approaches, promoting citizen-led initiatives and the energy self-sufficiency of local communities.

So were local initiatives regulated or at least addressed in the last two decades in Italy?

Osti affirms that forms of energy democracy in Italy are still in an early stage, since the national agencies as Enel and ENI retain the majority of the energy plants and markets (2017). As in several other EU countries as the Netherlands, the Italian Energy Policy has been based on green labels or green certificates and subsidies to investors on RET since the beginning of 2000's. At National level, Italy implemented the directive 2020 and the 2011/77/EC in the DL 28/11 on the development of production and use of RES. The DL 387/03, that implements the 2001/77/EC, introduces National Guidelines on the authorization procedures of RE plants, that have been published in 2010, DL 10 September 2010, yet much more previously, in 2001, regions started creating their own Regional Energy-Environmental Plans (PEARS) and guide-lines. PEARS were approved between 2001 and 2007, before the 2009/28/EC EUROPE 2020 and the national guidelines. The Italian regional plans main objectives were the carbon emission reduction and the transition towards RES through top-down initiatives, but

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Fig. 3 – The map shows the distribution of the 100% renewable municipalities in Italy (Legambiente, 2018 p. 26).

Comuni 100% rinnovabili
Comuni 100% termici
Comuni 100% elettrici

as secondary objectives these addressed the enhancement of bottom-up initiatives aimed at communities self-sufficiency through a mixed use of local RES. Vallo affirms that these plans considered the peculiarities of specific territories, presented as challenging for local development; e.g. Campania region focused on the relevance of agro-energy local markets and this is highlighting for the objectives of this contribution (2012). Zanchini *et al*. remarks that "the future of renewable energy is through the auto-production" (2015, p. 32).
At this point, the question is what are the conditions for a local community to be successful in energy democracy? In sociology, Scotti and Minervini affirm that the success of these bottom-up processes depends on the community socio-historical backgrounds and in the consequent capacity of acting in a cooperative perspective for the management of common goods (2017). For example, a recent study from the above-mentioned authors showed a local initiative in the Municipality of Sasso Castaldo in the region of Basilicata, characterized by an agro-forestry economy. The plan involved public and private actors to design and implement the program, aiming at mediating heterogeneous interests. The final aim was to combine different type of RET to reach a self-sufficiency. The authors concluded that the experience can be intended as:

> a complex of socio-political negotiations that take place in several (but interconnected) levels of governance as well as practices, involving actors and socio-technical arrangements in an heterogeneous network that enact different agencies/competencies. (Scotti and Minervini, 2017, p. 12)

In this small community, the authors revealed how the background of a common forests management has been relevant for the success of such initiative. The example of Sasso Castaldo make us reflect in terms of applicability of a bottom-up energy transition: among the conditions that enabled the good practices previously mentioned, the social cohesion was the most relevant (Boon and Dieperink, 2014). Holmes *et al*. affirm that landscape architects are called to be facilitators for knowledge integration and reflections among different disciplines and backgrounds and could probably support communities in complex processes as the energy transition (2018), indeed according to Nassauer and Opdam landscape design can integrate the knowledge among disciplines, practitioners and stakeholders (2008).
Concluding this introduction, the research question that this contribution wants to address is if local initiatives in the energy transition can safeguard the objectives in landscape quality as in the European Landscape Convention and the landscape democracy, exploring the potential role of landscape archi-

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Fig. 4 – The stunning landscape in Val Badia/Abtei (South Tyrol, Italy), the municipality reached the 100% self-sufficiency avoiding large scale interventions impacting the landscape and tourism, which is the main source of income during the whole year (photo: Paolo Picchi, 2017).

tects as facilitators when communities suffer of a lack of cohesion due to historical reasons and cultural backgrounds. The following section will briefly explore the potential synergy between energy democracy and landscape democracy, while the concluding section will reflect on the Italian regional context and the possible future challenges.

Energy democracy and landscape democracy

The Cost Action focused on the relationship between Renewable Energy and Landscape Quality (RELY) is recently concluded. This adopted the following landscape quality definition:

> the perception of the holistic environmental, cultural, sensory and psychological characteristics of a landscape, with respect to their benefits or significance to people. (Roth *et al.*, 2018, p. 102)

In order to safeguard the ecosystem services provided by the landscape, and pursue in landscape quality objectives the landscape change provoked by RET needs to be strategically planned and designed through the involvement of communities (Stremke and Picchi, 2017). In the last decade, we witnessed an increasing consciousness in environmental planners and landscape architects on their role in assisting regions and local communities in the energy transition management and pursuing a landscape quality (Minichino, 2014). A research from De Waal and Stremke showed that in three relevant cases of communities reaching the 100% self-sufficiency, Güssing (Austria), Jühnde (Germany) and Samsø (Denmark), landscape architects were not as involved as they, theoretically, could have been (2014). The authors affirm:

> Some of the activities that landscape architects, according to the literature, could have conducted in the transition process were realized by other experts and, in the case of Samsø, also by non-experts. (p. 4410)

The paper explains that an early application of landscape planning and design principles could have better supported the renewable energy system and the mitigation of landscape impacts. Yet in these local initiatives blocks and opposition to the installation of RET did not occur, because it was the community itself to start and lead the process, according to their future aspirations for a sustainable development. People were agree on the landscape modifications that would have occurred in their landscape because the scale of such interventions were not as large as in the case of top-down interventions as wind farms for example.

The cases reported by de Waal and Stremke are very similar to the 37 Italian cases reported in Legambiente reports 2017 and 2018. Among the others some municipalities in South Tyrol as Brunico/Bru-

neck and Badia/Abtei reached the 100% sufficiency for RE and heat generation through the integration of different RES and systems (fig. 4). Undoubtedly RET require space, but the advantage of local initiatives is the exploitation of multiple and integrated RES through small plants that can be more easily integrated in the landscape (Stremke, 2014; Legambiente, 2018).

At the regional scale, the Province of Siena has been the first Carbon Free Province in Europe since 2013 through the involvement of 36 municipalities in shared objectives and practices: an integration of RES in the renewable energy generation (even though 90% of electricity generation is from geothermal), a reduction in carbon emissions and an increase in carbon sequestration thanks to effective forests management. Forests cover almost the 50% of the province surface. Further the 36 municipalities advanced the climatic standards and the electricity self-sufficiency of public buildings and promoted incentives to private plants to safe the remaining 10% of renewable energy generation (Province of Siena, 2013) (fig. 5).

So the first reason why an energy democracy safeguards landscape quality is the adoption of diverse and integrated RES and RET at small scale, which better afford the integration in the small scale European landscapes. If e.g. we look in detail at the

Municipality of Brunico/Bruneck, this reached the 100% by integrating six different technologies: RE generation by means of 5,7 MW from PV panels; 5,8 MW from mini hydropower plants; 1,5 MW from one biogas plant; 1 MW from one biomass plant; heat generation by means of a 31 MWt from biomass and 1,5 MW from biogas through a 132 km grid, plus 840 m^2 of solar thermal panels. Further public buildings host 567 kW form PV panels. New or restored buildings should mandatory cover autonomously the 25% of RE plus heat demand and not less than 50% for heat water (Legambiente, 2017). These data show how concretely it is possible to get the 100% self-sufficiency at local level by integrating different sources and technologies with a low landscape impact. We can evidently state that the landscape in Brunico/Bruneck has not been afflicted by RET and not critical trade-offs with ecosystem services occurred. The same can be affirmed for the carbon neutrality of the entire Province of Siena.

So how an energy democratic approach can enhance landscape democracy? The European Landscape Convention has introduced the term "a true landscape democracy" (Explanatory Report, paragraph 64; Arler and Mellqvist, 2015). The Landscape democracy concept is twofold; it includes both the community rights to the ecological and cultural values and the rights to the economical values within their landscape. When communities start an energy democratic approach, they want to pursue the economical values within the energy transition and they need to design their own plan, or strategy, based on the RE consumption and targeted RE generation, the use of smart grids, the adoption of RE

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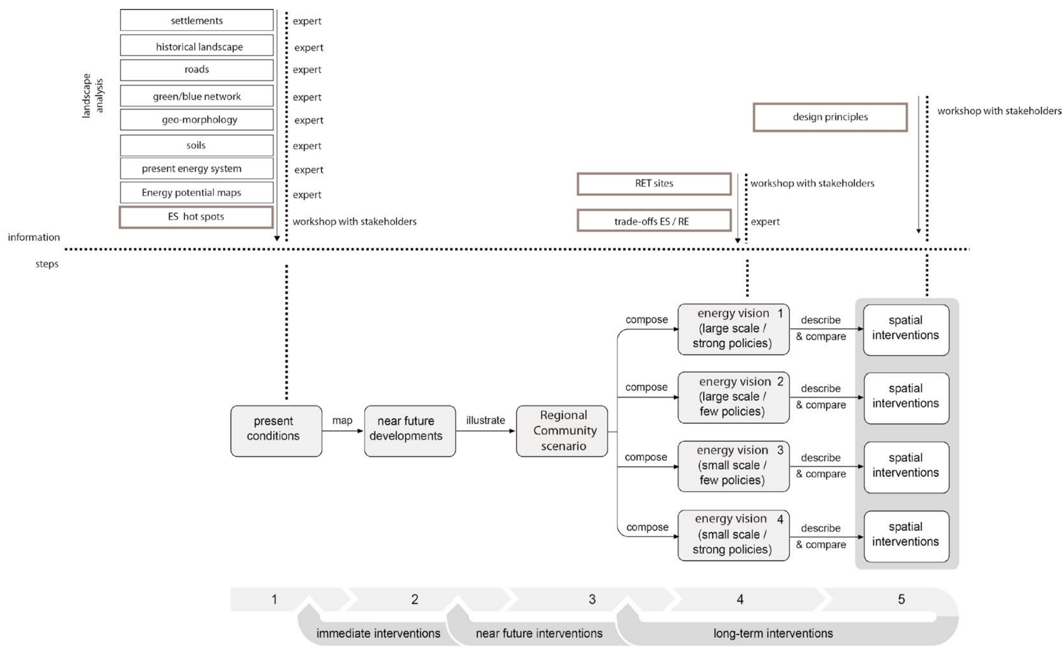
Fig. 5 – The worldwide famous landscape around Siena (Tuscany), is carbon free since 2013 (photo: Paolo Picchi, 2016).

plants co-ownership and public-private partnership and so on. Yet the energy strategy should safeguard the ecological and cultural values too, with the aim to not afflict the other ecosystem services supported by the landscape. Here it is the challenge to plan and design a sustainable energy landscape involving spatial disciplines as landscape architecture in a transdisciplinary process, where landscape architecture is called to have a leading role, a facilitator role, as in the most complex society's grand challenges of the XXI century (Holmes *et al*., 2012).
Landscape architects are becoming aware of their future role in energy transition. In Italy good design practices are emerging (Marchigiani, 2010), among the others the geothermal park designed by Daniela Moderini in Sasso Pisano (Turris Babel, 2015) but there is one branch of research in landscape architecture who started researching on how landscape architects could advance both procedural and substantive knowledge for a sustainable energy transition (Stremke and van den Dobbelsteen, 2012; de Waal and Stremke, 2014). By a landscape architecture perspective, Sven Stremke defined the concept of energy landscape as one of the many layers of the landscapes (Stremke and van den Dobbelsteen, 2012). This means that if we read the landscape in a multi-layer analysis plus synthesis, a design approach in planning can be applied to envision the future of sustainable energy landscapes at local-regional scales (Mc Harg, 1969; Ferrara and Campioni, 2012; Steiner, 2012).
Stremke *et al*. formulated a method for planning and design sustainable energy landscapes (the Five-step Approach), based on the application of long term visions for planning and design sustainable energy landscapes (II, 2012). This is a design approach in landscape planning, or regional design. A design approach in planning is based on landscape design principles useful for spatial planning (Sijmons *et al*., 2014). These should be up-scaled at regional level to facilitate any form of transition in a bottom-up perspective. In relation to the energy transition, Stremke affirms:

> a regional approach to energy transition also has the potential to bridge the gap between (inter) national targets and local initiatives. At the regional scale, long-term strategies and short-term actions can be integrated effectively to transform today's fossil fuel depending physical environment into sustainable energy landscapes.
> (Stremke, 2010, p. 108)

The contribution of a design approach to the energy transition should be seen in a regional context where regional plans promote local initiatives that should involve public and private actors, yet still in a regional or even trans-regional context since the flows of ecosystem services supply and the present



complex of markets and marketable goods flows can be regional or even trans-regional (Stremke and Picchi, 2017).

In the Five-step Approach, the first step focuses on the analysis of present landscape conditions and historic developments according to a multi-layer analysis and synthesis approach. The analysis includes the present energy system, the energy potential, and a participatory mapping of ES. A trans-disciplinary team consisting of local stakeholders, planners, landscape architects and energy experts, should conduct these activities. The output are a set of maps describing the whole landscape by several layers, included the energy ones. The second step focuses on how the region will change in the near future (Stremke *et al.*, 2012, I) according to the analysis of current trends and policies, planned developments and interviews with key decision makers. The outputs are a near-future base map, which illustrates how the near future developments could change the landscape. The third step illustrates possible far-future developments, which means to understand what possible long-term development, are existing in the region, according to existing scenario studies. The scenarios storylines can be illustrated through a scenario base-maps. The analysis of existing context scenarios and the mapping of possible future developments can be conducted by experts through the support of involved key actors and stakeholders, especially if the resolution of the existing context scenario study is not well defined. The objective of the fourth step is to define a set of energy scenarios or visions, each one should reveal to turn a possible future into a desired future, each scenario represent a possible pathway to reach a sustainable energy landscape considering the trade-off with ecosystem services.

> It is important to stress that the goal of this 'exercise' is not to render the ideal future but to reveal different pathways of reaching a desired future. In order to identify a wide range of possible interventions, while maintaining a sense of realism, we suggest conducting this normative step in a trans-disciplinary manner. (Stremke, Picchi, 2017, p. 374)

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Fig. 6 – The Five-step approach in the application in the DEESD (Sustainable Energy and Ecosystem Services) project (image: Stremke and Picchi, 2017, p. 373).

The steps three and four are the ones able to accompany the community in the transition process making use of recovered or new landscape narratives. Nadai and Prados affirm:

> Looking at the energy transition through the lens of landscape might contribute in deepening the analysis of how renewable energy technologies might, through their development, recompose entities and relations. (Nadai, Prados, 2015, p. 28)

Some communities found in the energy transition and self-sufficiency new networks and new identity, this is the aforementioned case of Samsø, where an Energy Academy was established (Hermansen *et al*., 2007). Here landscape architect can contribute in inventing new narratives within the energy transition, applying poetic and inventive approaches in envisioning the future sustainable energy landscapes (Lassus, 1998).

The Five-step Approach has been successfully applied in some case studies, among the others a research project in the island of Schouwen-Duiveland, Province of Zeeland, The Netherlands. In this project the output was the storytelling of future scenarios for the self-sufficiency of the island community, a trade-off analysis between different types of RET and the ecosystem services and landscape design principles (Stremke and Picchi, 2017) (figg. 6-7).

Discussions and conclusions

In the previous section, we addressed why an energy democracy approach can safeguard landscape democracy mainly for two reasons:

1. The use of multiple and integrated renewable energy sources and renewable energy technologies at small scales enables a better integration in the landscape
2. The process can be led in a trans-disciplinary approach where landscape architecture has a potential leading role in envisioning sustainable energy landscapes

Long term planning and design approaches in landscape architecture can be tools to facilitate local initiatives, supporting communities in finding cohesion and common objectives, synergies and envisioning future scenarios. At present, in Italy local initiatives are an exclusive option of regional plans and strategies, and based on the willingness of local municipalities to perform local plans. Local initiatives are not mandatory, and even the last energy action plan (Strategia Energetica Nazionale, 2017) does not address these as strategic actions to advance the energy transition at regional and local scale. At present local initiatives depend on the will of private actors, citizen groups or local politicians and administrators in performing such bottom-up strategies, and according to literature this

has much to do with the socio-technical historical backgrounds of communities and a sense of cooperation between public and private actors (Scotti and Minervini, 2017). It is for socio-cultural background for example that while in the Netherlands local initiatives are spread in the whole country, in Italy these are mostly localized in the Alps and other northern regions while are almost absent in the southern regions, where the socio-technical historical backgrounds are different (Osti, 2017). Here the question of the applicability in different socio-technical contexts with different backgrounds emerges, as widely discussed in Sociology. In case of communities in Southern Italy as Sasso Castaldo, long term planning and design approaches as the Five-step Approach, can be a useful tool to facilitate the process and consequently safeguard first the energy democracy, and the landscape democracy as a result.

The reader may have noticed that in this contribution we focused on small communities initiatives, because this phenomenon is typical of small rural or mountain communities, where the RE generation can be derived by other local supplies as primary and secondary biomass production and management. An emerging question is how big communities or metropolitan areas can approach the energy transition in the same way. According to Finn Arler[1] those local initiatives are not always possible, and the difference in spatial and social context is the first discriminating factor. But if we think that local initiatives can be the answer to the crisis of small communities afflicted by large top-down renewa-

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Fig. 7 – An image from a workshop in the DEESD project, held in Zierikzee, Province of Zeeland, The Netherlands in November 2014. Stakeholders express preferences for the future renewable energy landscape (photo: Paolo Picchi, 2014).

ble energy initiatives, than we can still be satisfied. Densely populated metropolitan area, with few space available and conspicuous energy targets for the future also need to approach the energy transition. These should be reached reducing the use of distant large plants as offshores wind farms in the North Sea or photovoltaic fields in the Sahara desert as in Desertec Foundation scenarios (2019). Recently the research group High Density Energy Landscape, set at the Amsterdam Academy of Architecture started a research project commissioned by the Municipality of Amsterdam to explore the spatial dimension of the energy transition in the Metropolitan Region of Amsterdam. In this case, the energy transition can pass through decentralization; each metropolitan district should have its own transition, which starts by condominium and neighborhood level self-sufficiency. This research through design process will address some new substantive knowledge for the future to understand if it is possible to address self-sufficiency and bottom-up approaches even in densely populated areas.

We started this article reporting how a top-down led energy transition can cause blocks and opposition among local communities that don't accept landscape change, yet literature shows us that an early involvement or even better citizen-led bottom-up initiatives can transform oppositions into acceptance. The concept of energy democracy demands for decentralization of the energy transition and local initiatives. Some cases in Europe show how an energy democracy approach can safeguard landscape quality and landscape democracy

In Italy bottom-up approaches are still at an early stage, as most of European countries, Italy approached the energy transition in a top-down manner, through subsidies to large scale plants and the involvement of national agencies. Regional governments designed regulations and guidelines to introduce the renewable energy technologies in the landscape, but instead of safeguarding a landscape quality, these frequently caused blocks to top-down initiatives slowing down the transition. At regional level, renewable energy had as secondary objectives the promotion of local initiatives. In the last few years, the reports from Legambiente showed how local initiatives are pushing now the energy transition in Italy. These safeguard the landscape quality as in the case of some municipalities in South Tyrol, showing a synergy between energy democracy and landscape democracy. Further research and practice in landscape architecture should facilitate and support communities in finding cohesion and common objectives, synergies and envisioning sustainable energy landscapes of the future. Further, those long term planning approaches as the Five-step Approach can support even those communities that would lack cohesion due to socio-cultural backgrounds, facilitating the sharing of values in ecosystem service supply and the whole process. In this way, future research in landscape architecture should advance in research for design and research through design in the energy transition process, conscious that the local scale and initiatives are the key scale and approach for the sustainability of the energy transition.

Note

[1] This reflection emerged as an answer by Finn Arler to the author during the work conducted together at the Cost Action TU RELY training School in Iceland in May 2017.

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Wind turbines
(photo: Andrea Scippa).

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