Assessing risk and opportunities in a high-renewables scenario: local planning and new energy landscapes

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Abstract

With the significant exception of hydroelectric power plants and traditional biomass burning, renewable energy (RE) have so far represented a limited share of global primary energy. However, renewable power generation technologies, with specific reference to wind and solar plants, have consistently followed a steep price-experience learning curve: new solar photovoltaic power plants cost today 80 per cent less than those built ten years ago and since 2013 the world is annually adding more capacity for renewable power than coal, natural gas, and oil combined. The impressive and largely unforeseen reduction of total RE generation costs, together with emerging options for energy storage, is empowering new distributed power generation models and some analysts suggest that electricity produced from large-scale solar plants will be soon cheaper than power produced from any conventional technology, in many European countries.

The perspective of a power generation system strongly based on renewable sources represents a thrilling opportunity for climate change mitigation, but also raise concerns about potential risks. In this context, a first analysis of the Italian scenario is proposed, and the relevance of a possible transition to a power generation system based on renewables in terms of soil consumption and potential competition with agriculture is discussed.

Renewable power plants have generally low environmental impacts, particularly in terms of pollutants emissions, but due to the need of harvesting diluted forms of energy (solar radiation and wind) have a different spatial scale with respect to traditional thermal power plants. The adoption of a distributed power generation model based on renewable sources can produce positive social, environmental and economic effects, but implies relevant transformations at landscape level and hence needs to be properly managed. Local authorities and communities should be aware of the transition scale and importance, being involved and empowered in designing future energy landscapes.

Fostering the adoption of renewable energy, the Italian legislation has introduced the concept of 'not suitable areas' for RE plants, but the approach adopted so far in the authorization process appears insufficient for achieving high quality results at local scale. In this perspective, pro-active planning tools should be adopted to orient the deployment of renewable power plants at district level, filling the gap between building efficiency policies and large-scale energy plans, toward the definition of collectively shared renewable energy landscapes.

Introduction: tracking an unexpected paradigm shift

The global energy scenario is crossing an extremely complex transitional phase: technological, geopolitical, and economic factors are putting pressure on a model – involving power generation, distribution, and energy consumption – that has been structurally stable for decades.

A comprehensive analysis of the global energy system, including the vast debate of Climate Change mitigation heading toward the Conference of Paris 2015 (Colombo, 2014), represents a gruelling task and goes far beyond the means and the aim of this paper. In order to briefly address the sudden evolution of renewable power generation, a phenomenon that has relevant consequences at landscape level and needs to be carefully addressed by urban planners, we have analysed two series of the most renowned reports on the matter at global scale, produced by the International Energy Agency (IEA) and by the Intergovernmental Panel on Climate Change (IPCC).

Until very recently, renewable energy technologies have been considered theoretically promising, but not adequate to represent a substantial contribution to global energy systems. With few exceptions, both technical and economic analysts have been caught off guard by the unexpected reduction of renewable power generation costs, and looking backward at predictions and scenarios proposed few years ago it is possible to appreciate both of the speed of the on-going transition and the dire difficulty of making today even short-term assumptions in the energy field.

The International Energy Agency has published since 2006 the bi-annual report *Energy Technology Perspectives* (IEA, 2006, 2008, 2010, 2012 and 2014), based on a model developed to study global energy efficiency and CO_2 emission reduction potentials, including the role of renewable power generation in tackling climate change. This approach makes the series easily comparable with the IPCC reports on climate change mitigation prepared by the Working Group III (IPCC 2001,

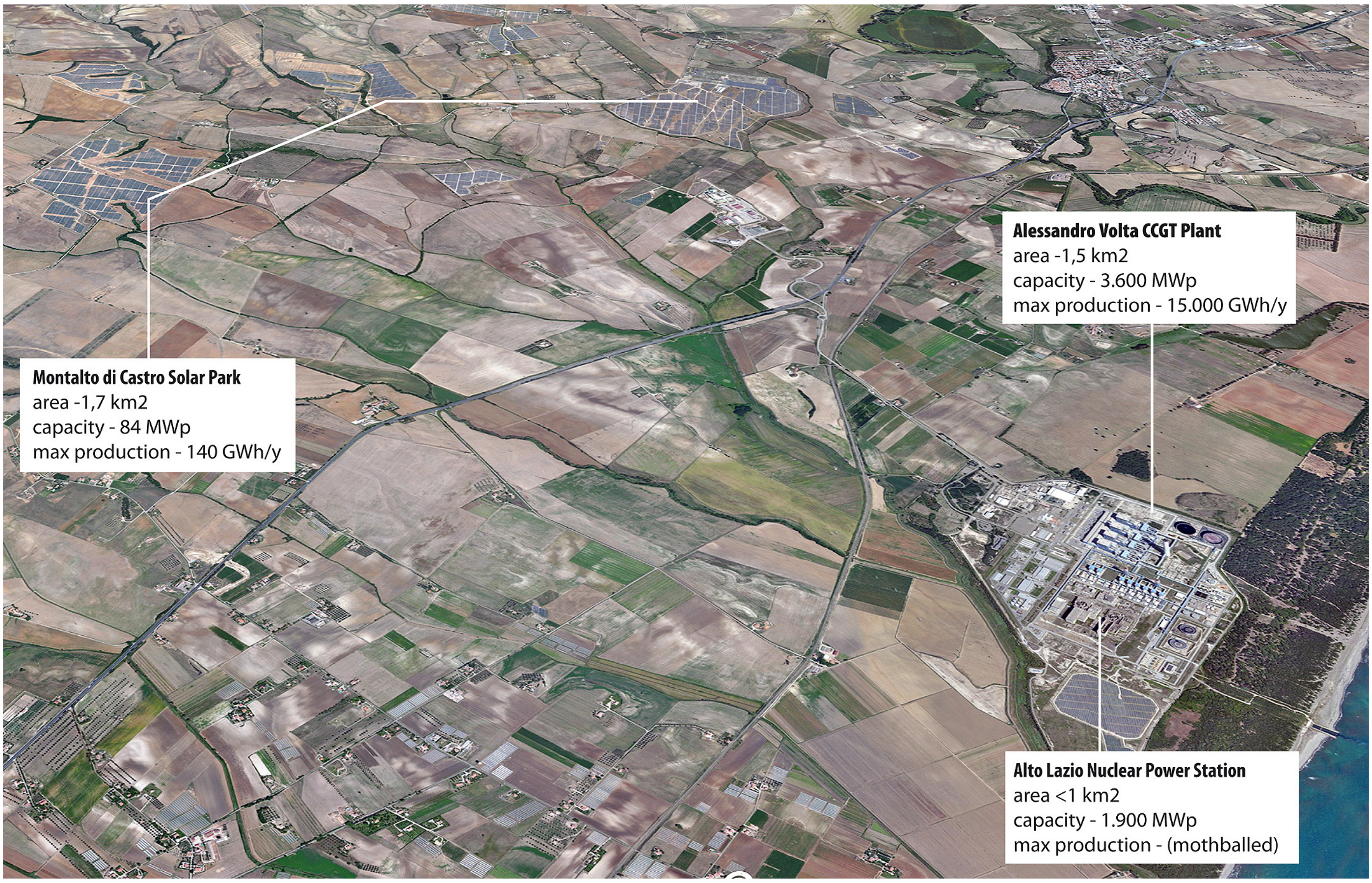


Figure 1 – Power generation technologies and land use. Comparing different magnitude scales in the emblematic context of Montalto di Castro (Italy).

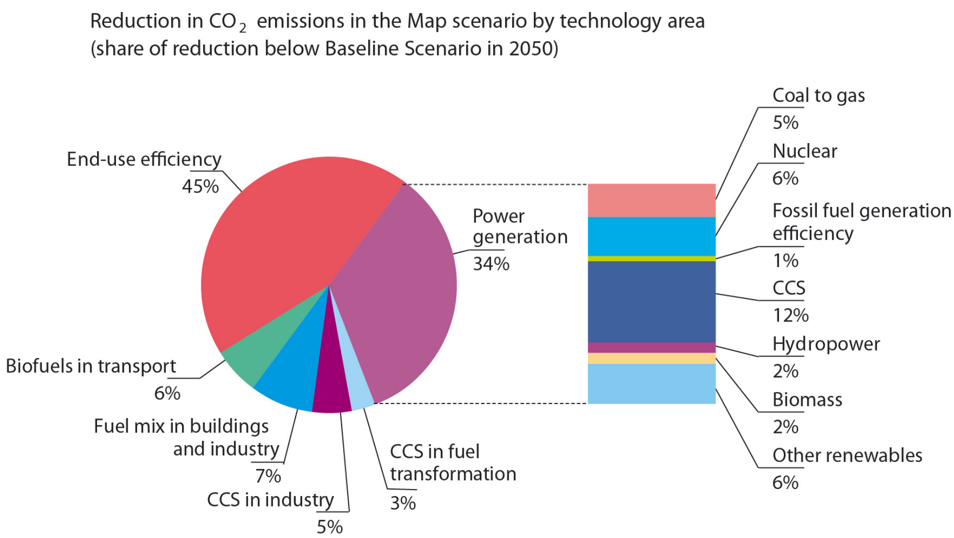


Figure 2 – Potential contribution of technologies in reducing CO_2 emissions by 2050 in the IEA 2006 Energy Technology Perspectives (IEA, 2006).

2007 and 2014), considered here as suitable benchmark[1].

In 1990, renewable energies were barely mentioned by the IPCC among the technical options for tackling climate

1. Indeed, earlier IPCC studies (IPCC, 1990 and 1995) appear today as sights from another world: it was in 1990 when the third energy crisis, after the 1973 and 1979-80 crises, caused by the Iraqi invasion of Kuwait, was quickly resolved by the US led intervention, hence confirming an apparently undisputable energetic status-quo. Not surprisingly, the main strategies proposed at that time for reducing greenhouse gas emissions were efficiency improvements, fuel substitution, gas removal or fixation, and behavioural change (e.g. increased work in homes through information technology, modal shift in transport, etc.).

change. More interestingly, the attitude toward renewable energy still wasn't changed 15 years later.

In the 2006 issue of Energy Technology Perspectives, the EIA still considered renewable power capable of a mere 10% contribution, including hydropower and biomass, in reducing emissions by 2050, against the baseline scenario.

The hopes for emission reductions were still mainly put in end-use efficiency (45%) and in the application of Carbon Capture and Storage technologies (CCS, 20%), with nuclear power accounting for a limited 6% value. In this context photovoltaic power generation (PV) was pitilessly judged: unless a technological break-through it was not expected to become ready for mass deployment before 2030, and the investments required considered in the order of USD 100 billion: much larger than for any other renewable technology (IEA, 2006).

facts at continuously adjusting its forecasts, increasing the highest expected contribution of PV to the global electricity by 2050 from 7% (IEA, 2010), to 12% (IEA, 2012) and finally to 16% (IEA, 2014).

The rise of high-renewables scenarios

When considering the potential of a technology in reducing carbon emissions, deployment rate is an essential parameter. Many models used to build mid-term predictions, including IEAs, have considered linear growth rates for RE technologies, while wind and PV have grown exponentially: during 2014, cumulative PV capacity reached 177 GWp, sufficient to supply 1% of global electricity demands (IEA_2, 2014).

In a context where the world is annually adding more capacity of solar and wind than coal, natural gas and oil combined, several studies has gone far beyond IEA and IPCC positions, advising a drastic reconsideration of the role of solar power in future energy systems.

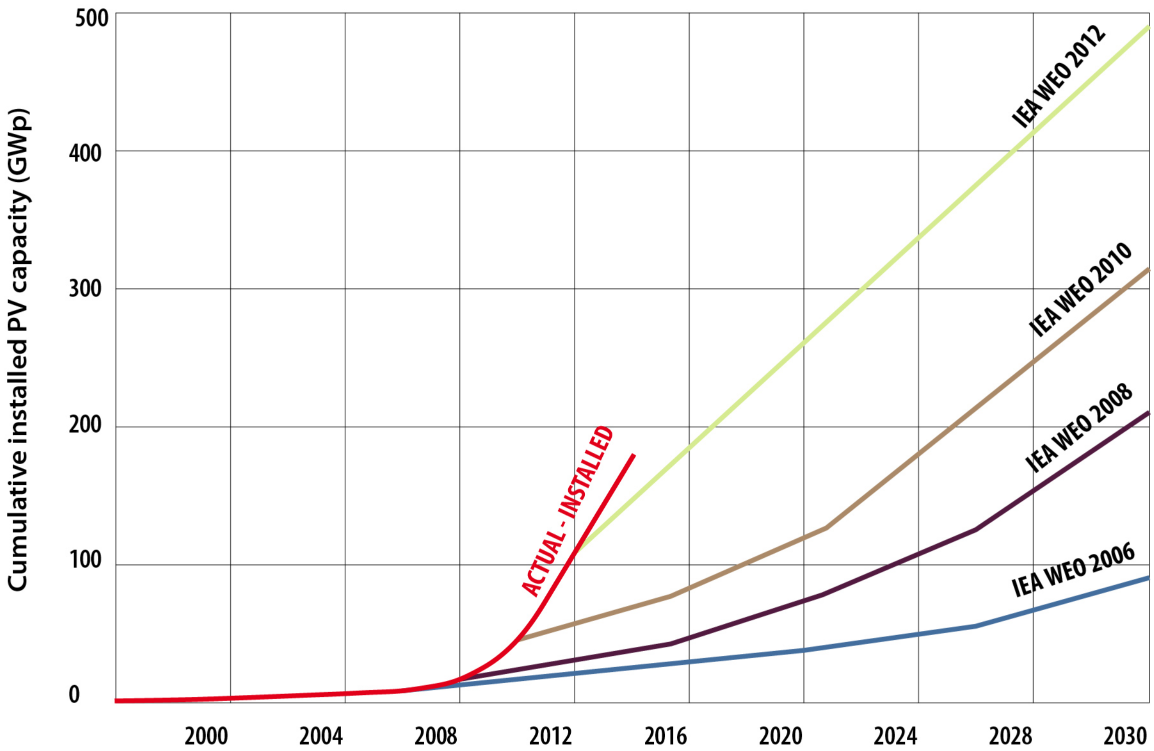


Figure 3 – Actual growth of installed PV capacity confronted with IEA World Energy Outlook scenarios.

IEA and the IPCC have analysed in depth solar PV and wind power – the two technologies of our greater concern due to their potential impact at landscape scale – in specific studies (IPCC, 2011 and IEA, 2014). However, only in 2014 the IPCC Work Group III recognized that, in the seven years after the previous assessment report, renewable energy had become a fast growing category in energy supply, with many RE technologies having advanced substantially and achieved technical and economic maturity (IPCC, 2014 – TS3.2.2).

In 2014 IEA has similarly shown a new attitude toward renewable power generation, in contrast to the former very cautious position: the Agency has actually been forced by the

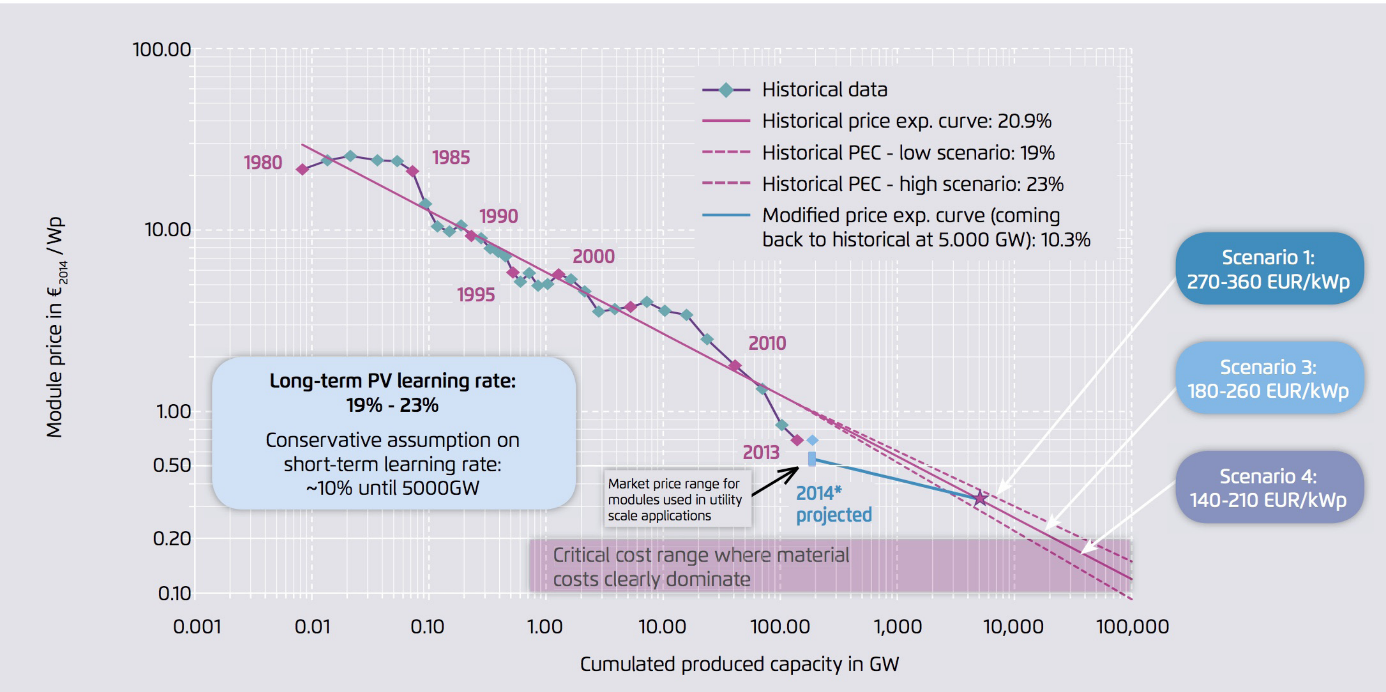
This is the case of the AGORA report published by the Fraunhofer Institute for Solar Energy Systems (Fraunhofer ISE, 2015) that have analysed current and future cost of PV for large-scale power generation, urging a fundamental review of cost-optimal power system pathways[2].

2. Fraunhofer expects LCOE (Levelised Cost Of Energy: the price at which electricity must be generated from a specific source to break even) to decline to 2-4 $€_{cent}$ per KWh (compared to IEA's 4-16 $US\$_{cent}$) and worldwide installed PV capacity to reach as much as 30.700 GW_p

The analysis takes into account all costs related to large-scale PV generation, and indicates that power produced from large-scale solar photovoltaic plants could be soon become cheaper than power produced from any conventional technology in large parts of Europe.
In the context of the present study, it is important to underline that a large scale deployment of PV does not necessarily imply the adoption of ground-mounted power plants, which can determine "large scale" impacts on the landscape.

cal and regional scale, or over long ranges.[4]
As already mentioned, it is almost impossible today take robust assumptions about the mid-term evolution of the global energy system: meanwhile, from a planner's perspective, it is important to consider renewable power generation as a single 'technology package', together with transmission and energy storage technologies. Indeed, the relative efficiency of these factors can affect economic and environmental equilibrium, hence producing different solutions on the ground,

Future module prices in different scenarios based on the historical "learning rate" Figure E2



Fraunhofer ISE, own illustration

Figure 4 – In logarithmic scale: historical learning rates in PV module prices and future price scenarios (Fraunhofer ISE, 2015).

Regional and even local conditions definitely do matter in determining the economic convenience of RE: in many contexts competitiveness has already been reached[3]. According to IRENA, in 2014 new European onshore or mainland wind projects have provided energy at a lower cost than conventional systems (IRENA, 2015). As a consequence, the theme of regional and local convenience of RE sources has become extremely relevant for planners, although it is not clear if intermittent RE sources will be predominantly integrated at lo-

and therefore different cities and different landscapes.

Assessing risks for land use and landscape of renewable energy technologies in Italy

After a short period of European supremacy, large industrial states like China or US are rapidly surpassing European nations in terms of absolute installed RE power. For general comparison, in 2013 only China has installed 51 GW of RE,

(compared to IEA's 4.600 GW_p) by 2050.

3. In January 2015, the tender for the second phase of Mohammed bin Rashid Solar Park in Dubai was awarded to the lowest bidder for a value close to 5 $\$_{cents}$ per KWh for a 25-year fixed contract: the lowest solar price ever achieved worldwide, already competitive even in an oil producing country like UAE. According to IEA 2014 projections, the proposed price should have been reached only in 2050.

4. An international study group (Breyer C., et al., 2014) have recently proposed the economic convenience of a 100% renewable generation mix in the whole North-Eastern Asian region, from the Gobi desert to Japan, achieved connecting wind, hydro and PV solar plants in a high voltage direct current transmission (HVDC) supergrid, deployed at continental scale with the support of a power-to-gas storage system.

which roughly corresponds to the total Italian renewable power capacity. In some sectors, however, European nations are still in the frontline, being the firsts experiencing intermittent renewable power as an essential part of their electricity supply: during 2014, Italy has actually been in the first place worldwide for PV generation, with a share close to 8%, followed by Greece and Germany (IEA, 2014).

Taking into account the electric, thermal, and transportation sectors, in 2013 Italy has consumed 20,7 Mtep of renewable energy, corresponding to 16,7% of total primary energy demand (124 Mtep): a value already close to the target assigned to Italy by the 2009/28/CE Directive for 2020 (17%) and in line with the National Energetic Strategy – SEN, that foresees a 19-20% renewable share for 2020 (GSE, 2015).

In the electric sector 600.000 renewable power plants are operational in Italy, for an installed capacity of 50 GWp, which have produced 112 TWh of electric power (9,6 Mtep) in 2013. The main renewable source has been hydroelectric energy (44% of renewable electricity), followed by solar (21%), bioenergy (16%), wind (14%) and geothermal energy (6%).

Considering renewable technologies risk in terms of land use and landscape, it can be observed that hydroelectric and geothermal installed capacity is basically unchanged since decades, and residual potentials can be considered negligible[5].

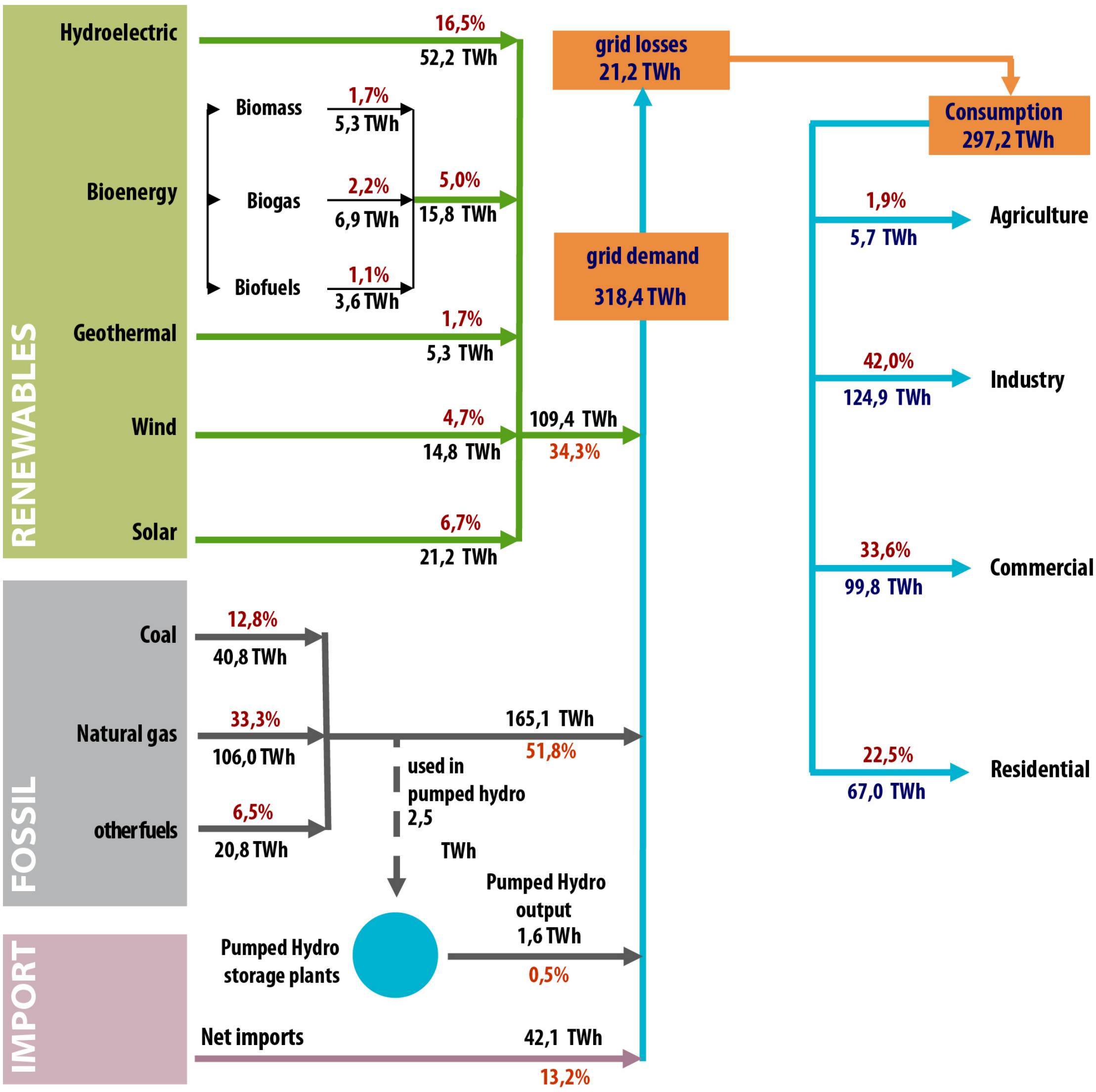


Figure 5 – Contribution of RE sources in Italian electric power generation, year 2013. Data GSE (2015).

Conversely, biomass production represents the first renewable source in terms of share of Italian primary energy[6], and

5. Geothermal plants are presently concentrated in the provinces of Pisa (53,7%), Siena (24,3%) and Grosseto (22%), and although some minor plants have been recently installed, a relevant deployment of this technology is unlikely. Many mini and micro-hydro projects have been introduced in the last years, and the environmental assessment of new projects can represent a relevant theme at local level. However, all the Italian mini-hydro power plants have a combined capacity of 3 GW, and cannot represent a viable solution for the structural needs of the Italian energy system, nor a significant overall potential threat in terms of land use.

6. In 2013, biomass provided 7,5 Mtep in the thermal sector, 1,25 Mtep (biofuels) in the transport sector and 1,5 Mtep in the electric sector (GSE, 2015).

potentially involves a great part of national ecosystems.
In the context of the present study it is worth noting that an exhaustive analysis of the risks of a substantially higher use of biomass in the national energy mix should consider a challenging number of factors, including forestry and agricultural policies, as well as air pollution regulations at European and national level. Moreover, these implications put biomass production for energy uses partially beyond the range of effectiveness of urban planning instruments. Linkages between biomass, energy and land use represent a peculiar subject that needs to be analysed with the support of specific studies that cannot be exhaustively treated here.
As a general remark it can be said that agricultural waste and by-products will indubitably play an important role in sustainably integrating the Italian energy system, while feedstock production dedicated solely at producing electric power or fuels should never be considered a viable option. Conversion of sunlight into power through photosynthesis is 100 times less efficient in comparison with PV plants (World Resources Institute, 2015), therefore the use of bio-energy must always be conceived in terms of co-production of goods and in synergy with ecosystem services empowerment. In this perspective, forestry and co-generation power plants, as well as biogas plants combined with agriculture and livestock, can constitute integrated value chains, capable of positively contributing at environmental and landscape level, and pondered as such, with all the complexities indicated above, within local planning instruments.
Considering wind, Italy does not have a potential comparable with European states like Germany, Nederland, and Great Britain. Installed wind capacity is above 8.5 GW, which is surely significant, but already represents more than half of total inland potential for large generators, which has been consistently esteemed at 12-13 GW (RSE, 2012)[7].
The complex relationship between large wind power plants and landscape, including environmental issues and social acceptability, has been acutely debated during the last ten years (Puttilli, 2014), and the main assessment references have been well summarized in the already cited RSE monographic study on wind power (RSE, 2012). In the context of this brief review it is sufficient to underline that maximum wind power generation for Italy is inherently limited, and although significant in the national electric mix, wind power cannot be radically increased. Wind plants presently operating in Italy are 6.400, with an average power of 1,3 MW each; their number can be increased up to 10.000, but not much further. Therefore, the maximum theoretical impact of wind power in terms of land use, considering a soil footprint[8] of 3 hectares for each generator, corresponds to a total of 300 km^2, which roughly corresponds to 0,1% of the Italian total area (300.000 km^2 circa).
Small wind plants are not deemed capable of significantly contributing to renewable power generation due to reduced efficiency, which is substantially dependent to the physical dimension of the generator, and higher costs. However, the reduced impact on environment and landscape, with respect to larger plants, can make micro-wind plants attractive and worth of consideration for local planning in specific contexts.
All renewable technologies analysed above are inherently resource-constrained[9]: biomass is limited by competition with food production in agricultural land, high-temperature geothermal, hydro, and wind energy by local availability of potentials.
Therefore, all this technologies can be further developed and deployed in the Italian context, but cannot represent a game-changing option for our energy system and for the Italian landscape.
This is not the case for solar energy. As summarized above, solar power presently represents 8% of Italian electric power production (21,5 TWh/year, corresponding to 2 Mtep) and only 1,6% of primary energy demand. However, solar power is not resource constrained and other factors have to be considered, in order to quantify the potential impact of a large-scale deployment of this technology.
The integration of high shares of not-programmable RE in the electricity system is challenging, although the Italian grid appears already able to manage larger shares of intermittent power without structural problems. The considerable storage capacity represented by Italian pumped-hydro reserves, able to provide 8 GW of power and 8 TWh of storage[10], is basically underutilized and the national transmission system operator has recently been capable of flawlessly managing a solar eclipse[11], demonstrating the Italian grid resilience to PV-induced unbalances. In the longer term, the promising trends in the development of energy management and

7.This figure also corresponds to the target defined by the PAN (National Action Plan for renewable energy), which is of 12,68 GW wind capacity in Italy by 2020, with a production of 20 TWh/year.

8. The indicative, precautionary value of 3 ha of non exclusive land use is suggested assuming the diameter of a 4MW generator (120m), which corresponds to the maximum diameter presently adopted for inland plants, taking into account the minimal distances between generators within a wind farm.

9. Due to their negligible relevance at landscape level heat pumps are not mentioned here. Heat pumps remarkably contribute (2,5Mtep in 2013) to the thermal energy sector needs, taking advantage of the unlimited thermal potential of soil, water and air.

10. The feasibility of further 3 GW – 9 TWh of pumped-hydro storage has been investigated (RSE, 2012).

11. According to Terna (Italian transmission system operator) the recent solar eclipse event occurred on March, 3rd 2015, has strayed only ±25 millihertz, which is about the half of normal variability in Europe's grid frequency.

storage solutions, from short period regulation to long-term storage, including power-to-gas conversion, do not permit foreseeing an *a priori* absolute limit to the deployment of solar power plants.

In conclusion, although the Italian PV market is presently stabilized at very low levels (the market is presently esteemed at 1 GWp of installed PV power per year, circa), is important for local planners to pay special attention to solar technology, because due to rapidly declining costs, in combination with the lack of evident physical or technological constraints, it can become the main element of transformation of the Italian energy system, in a relatively short period of time. The remaining part of the article is therefore focused on PV technology, while other renewable sources are consciously kept in the background, due to their site-specific relevance and their overall limited role in the transformation of the national context.

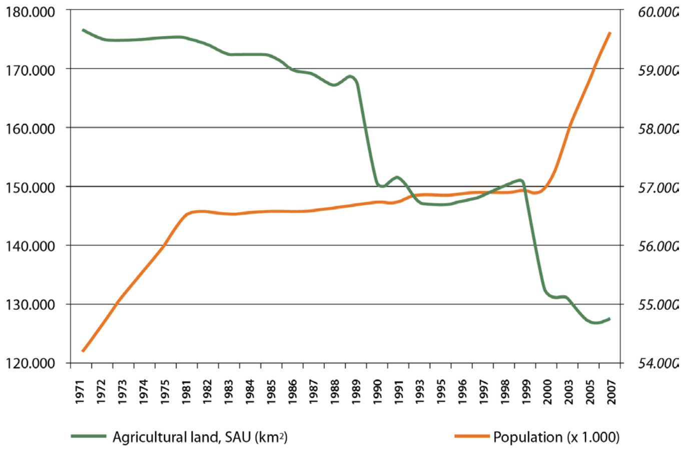
Land use and landscape risk of photovoltaic: a comparison with agriculture and soil consumption dynamics

In order to quantify the potential impact of a large-scale deployment of solar photovoltaic plants in Italy the complete substitution of imported (42 TWh/y) and fossil fuel generated electricity (165 TWh/y) can be hypothesized. It is worth noting that this is not proposed here as an operational scenario, but a figure of 200 TWh/y of added PV electricity will be cautiously supposed in order to explore the maximum potential impact[12].

We propose as relevant background for the assessment two main dynamics of Italian land use: the loss of agricultural land and soil consumption (soil sealing).

In 1970 total agricultural land (Superficie Agricola Utile, SAU) was km² 180.000 circa, corresponding to 60% of total Italian national area. In the '90s, due to abandonment of less productive areas and soil consumption, used agricultural land was reduced to km² 150.000 circa (50%), and became km² 130.000 (43%) in 2010 (ISTAT, 2012).

This land use change is potentially reversible, but its scale is impressive, especially if compared with population trends, and implies not only negative consequences in terms of food production capacity, but also affects landscape and ecological factors, mostly in a negative fashion. Loss of organic soil content and landscape simplification are only partially balanced by the reduced anthropogenic pressure (use of fertilizers, etc.), and the slow reverse path toward stable natural ecosystems of abandoned arable land is not linear, nor certain.



Picture 6 – Agricultural soil (SAU) loss and population trends in Italy, 1970-2007 (INEA graphics on ISTAT, 2012).

Agricultural soil loss is partially overlapped with irreversible soil sealing determined by urban dynamics. Before 1960 urbanized soil was 8.700 km², involving 2,9% of total Italian area. In 1989 16.220 km² had been occupied (5,4%), and 21.890 km², corresponding to 7,3% of the total national area, resulted irreversibly consumed in 2012 (ISPRA, 2014).

Residential, commercial and industrial buildings represent 30% of total soil consumption (6.567 km²), railways and paved roads 6.129 km² (28%), other roads 4.159 km² (19%), while service areas, parking, quarries, and landfills correspond to 14% of soil consumption (3.065 km², the remaining 9% being classified as other consumed area).

If the ecological effects of agricultural land abandonment are partially reversible, and not only negative, soil sealing produced by urbanization is almost completely irreversible, and in general represents a severe ecological loss. At the same time, urbanization should be considered the greatest energetic, economic, and social investment made so far by the Italian people, and considered as the most relevant background when assessing the new energy perspectives.

For a first comparison between the different magnitude orders implied, it's worth noting that all operational ground mounted PV plants in Italy, representing 41% of existing capacity, corresponding to 7,3 GWp, interest a gross area of 138,4 km² (GSE, 2013) which corresponds to the 0,05% circa of total national area.

In order to provide, as proposed above, enough PV capacity to completely substitute imports and fossil fuels used today in power generation, assuming a mean production of 1.300 kWh for installed kWp, a total 160 GWp capacity would be necessary.

12. The most extreme scenario, i.e. the complete substitution of primary energy production, would imply a three fold-increase of proposed values, but also a radical technological transformation that is deemed too theoretical for being considered here.

Considering an intermediate density value between on ground and on roof plants (GSE, 2013) a footprint value of 15 m^2/kWp could be assumed, therefore implying a total needed surface of 2.400 km2, which corresponds to the 0,8% of the Italian territory.

This maximum value represent less than 1/9 of already sealed soil, which makes evident the opportunity, and the need of appropriate tools for managing the "landing" of solar energy generation capacity in relationship with the built environment and with local energy demand.

aluminium, copper and steel. However, in the Italian context, the landscape should be considered as the real key element in the evaluation of renewable energy plants.

If the maximum total deployment of wind and PV plants does not represent in absolute terms a dangerous contribution to soil sealing, a badly allocated renewable energy capacity can indeed represent a lost opportunity for the Italian landscape.

Energy and food production have always been connected, and have played a fundamental role in generating the Italian

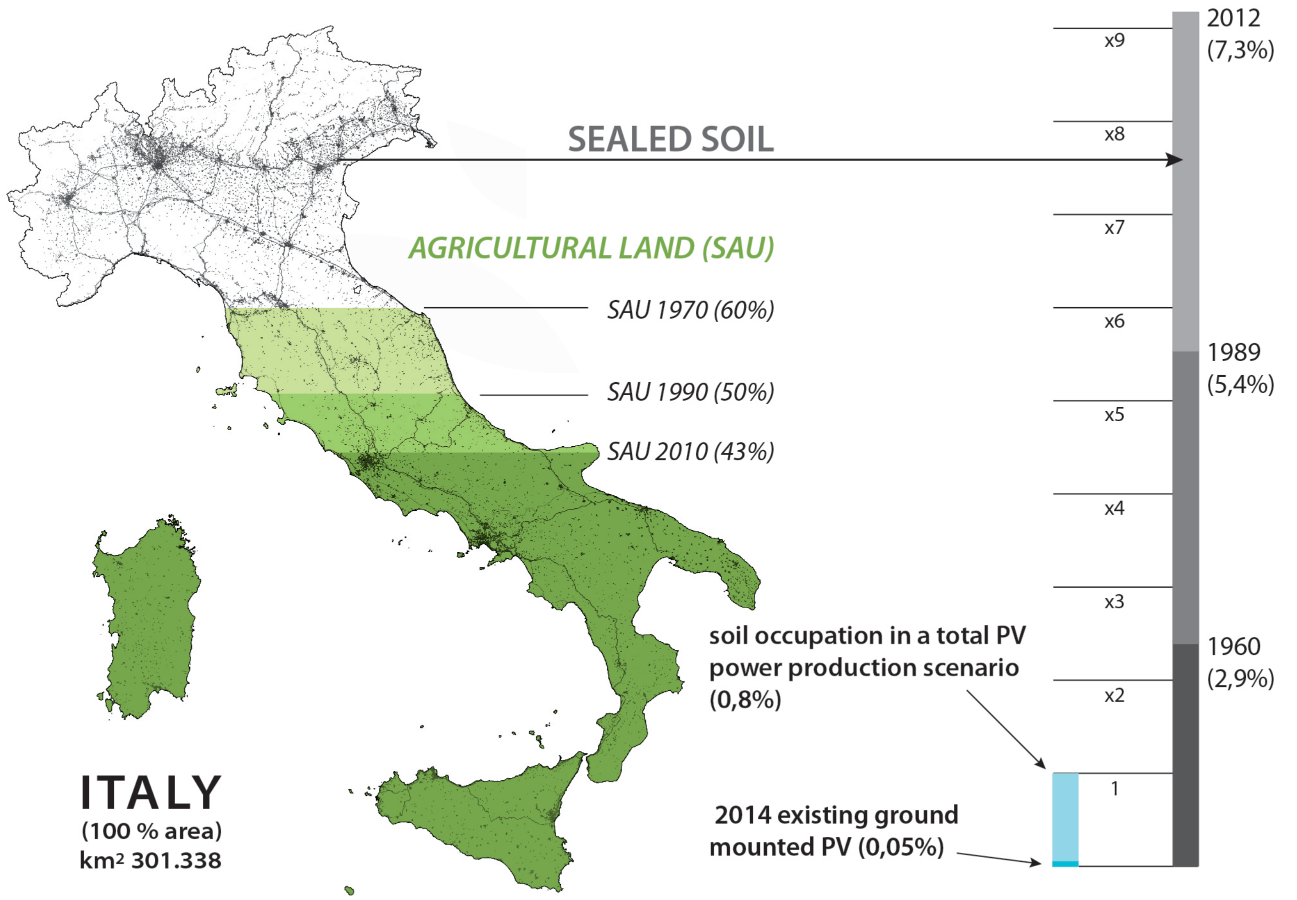


Figure 7 – Actual soil occupation determined by PV power plants, in comparison with agricultural land loss, and soil consumption dynamics. The maximum impact of PV plants (up to a complete substitution of imports and fossil fuel generated power) is compared with irreversibly sealed soil.

Opportunities from a decentralized power production model: a pro-active approach for local renewable energy plans

Integrated life-cycle assessment of electricity-supply scenarios seems to confirm global environmental benefit of low-carbon technologies (Hertwich et al., 2014). At global scale wind and PV power, besides obvious advantages in terms of emissions, show lower soil consumption with respect to coal, or even to large hydro power plants, their main impact being linked to the production and use of cement (foundations),

landscape (Sereni, 1961), through the incessant activity of local communities.

Renewable power plants, including biomass, micro wind and solar, can represent an important opportunity for re-binding local communities and landscape, but placement options, quality and dimensioning should be responsibly planned and managed.

An example of how extremely large-scale PV plants can literally flood a landscape in a very short period of time is depicted above. The Topaz Solar Farm in Central California, one of the largest in the U.S., is a 550 MW power station that

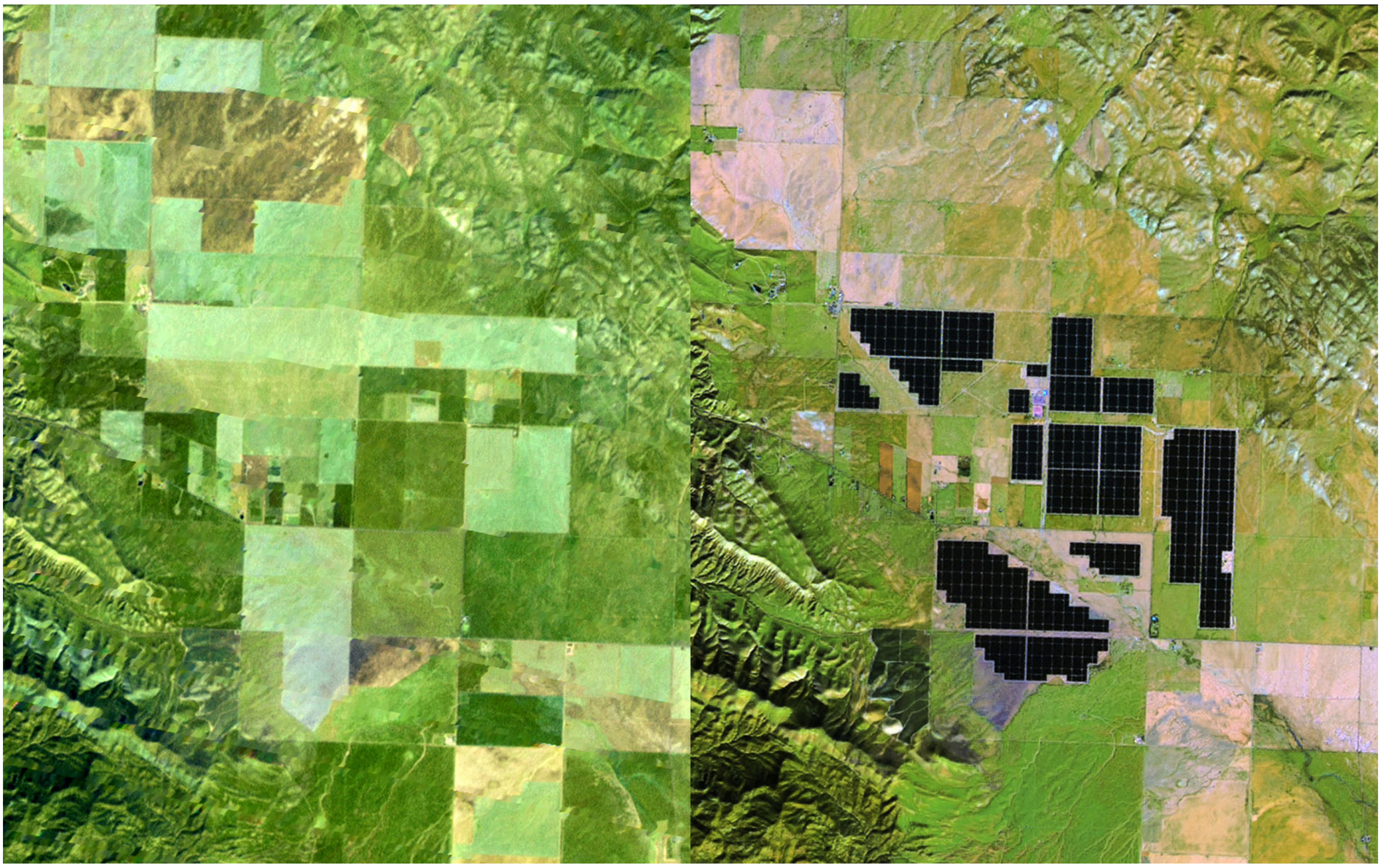


Figure 8 – Abrupt landscape transformation induced by large scale PV plants. The Topaz solar Farm in Central California: Landsat images 2011 - 2014. Source: U.S. Geological Survey (USGS) Landsat Mission Gallery "Topaz Solar Farm, California," U.S. Department of the Interior / USGS and NASA.

consists of 9 million solar panels; construction began in 2012 and was completed in late 2014. Similarly, not much more than 2 years have been necessary for the deployment of the Montalto di Castro photovoltaic power station[13].

Although very large ground mounted PV installations permit economies of scale that would represent an advantage for base-load generation, this approach cannot represent a viable, or a smart solution in the Italian scenario. As depicted above, all PV capacity could, and should, be mostly allocated in proximity with energy demand and integrated within already urbanized areas, including public urban spaces (Foglia & Valente, 2014), reactivating the co-evolutionary link between energy production and landscape that has been broken by the advent of imported fossil fuels.

In present market conditions the realization of large plants for base-load energy generation is absolutely not convenient, and, by the end of the Italian "Conto Energia" feed-in tariff, PV plants are realized only where self-consumption of energy is possible. Residential installations are incentivized with tax reductions and industrial SEU (Sistemi Efficienti di Utenza) contracts can be reasonably adopted only where an almost total local consumption of produced energy is possible.

As a consequence, a large-scale proliferation of solar plants is at the moment unlikely and new plants do "spontaneously" correspond with demand and built environment on the basis of present market conditions and fiscal policies. However, the speed and the extent of on-going global dynamics in renewable power generation should not be undervalued and it is important to provide adequate instruments to coordinate individual RE initiatives in a coherent design at district level.

The national energy strategy (SEN) and regional energy plans often provide valuable background information to understand and orient the development of renewable energy at sub-regional level. Yet, general energy planning documents fail to present spatial references, and the different scale makes them unsuitable for designing the local deployment of renewables.

The Italian guidelines for the authorization of renewable energy plants, defined by the Ministry Decree 10 September 2010[14], have clarified that only Regions and Autonomous

13. Completed in December 2010, the 84 MW Montalto di Castro Solar Park is the larger Italian plant, and one of the largest in Europe.

14. Renewable energies have received a complete discipline only in 2003 by the legislative decree no. 387 (which has long remained lack-

Provinces can forbid or limit the installation of RE plants[15] within planning documents, and have introduced the concept of "unsuitable areas": a preventive indication of critical areas, where a positive result of authorization procedures must be considered highly unlikely.

Local administrations have tried in some cases to take advantage of the concept of unsuitable area to quickly "protect" their territory from the sudden advent of RE, which have been perceived with contrasting opinions during the years of faster growth, determined by national incentives. But the accelerating aim of the law has been clarified (i.e. critical conditions are pre-emptively mapped in order to prevent meaningless administrative burden and unsuccessful proposals) and restrictive misinterpretations of the norm have been judicially rejected.

Conversely, the role of local authorities in authorization processes should be exploited *in a pro-active fashion*, producing convincing *energy plans at district level* (which does not necessarily corresponds with single municipalities).

Local demand, carbon emission profiles, available resources and potentials should be analysed, and opportunities for the creation of industrial ecologies (e.g. the valorisation of waste thermal energy produced by industrial activities, the use of energetically valuable by-products, etc.) should be highlighted and encouraged.

For both citizens and entrepreneurs, the uncertainty of authorization procedures actually represents a relevant cost and a deterrent for the deployment of renewable energy: in this perspective the prefiguration of virtuous, "desired" scenarios (including spatial allocation of PV, repertoires of high-quality solutions, etc.), openly supported by local administrations, can represent a valuable contribution to action.

Decentralized power production models can be significantly supported and oriented through a simplification and linearization of procedures, making room for entrepreneurship through management and control.

In this perspective local energy plans should became the common space of convergence for the pro-sumer citizen, the self-producing enterprise and the public authority, an opportunity for reactivating the broken production of landscape by a energy-responsible community.

ing of the essential integrative element of the guidelines, arrived only in 2010, when the Ministry Decree 10 September 2010 was adopted) then replaced by the legislative decree n. 28/2011, by which Italy has transposed the directive 2009/28/EC.

15. Limitations can be introduced only within the limits and with the modalities defined in Article 17 on the Decree. Furthermore, the Annex 3 defines criteria for the definition of unsuitable areas.

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