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SMART CITIES CHALLENGES

SMART ENVIRONMENT FOR SUSTAINABLE RESOURCE MANAGEMENT

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FOR SUSTAINABLE RESOURCE MANAGEMENT

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THE EFFECTIVENESS OF PLANNING REGULATION TO CURB URBAN SPRAWL

THE CASE OF STRIANO (NA)

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ABSTRACT

Italy is facing an almost irreversible, extremely serious condition. A vital asset for humankind and the ecosystem, such as land, today suffers the negative effects of anthropogenic activities, first of all its uncontrolled and limitless consumption.
Such transformation of landscapes and environments, due to the misuse of land, not only affects the Italian country, but it spills over its borders: across Europe, urban sprawl is threatening agricultural productivity and biodiversity, increasing the risk of flooding, reducing water resources and contributing to global warming (ISPRA 2012).
The catastrophic impacts related to the spread of urban sprawl have made the identification of planning strategies capable of reducing the phenomenon essential. In Italy, many regions are trying to conform regulations and planning tools to control land use, and among them the Campania Region.
To date, only few studies have evaluated the effectiveness of these tools in curbing the phenomenon (Anthony 2004), to this end, the paper aims to assess the ability of Campania's Planning regulations and tools in checking urban sprawl.
The analysis was conducted in the town of Striano, within the complex urban conurbation of the Metropolitan Area of Naples, which can be considered an example of urban sprawl development pattern.
In particular, a hypothesis of Area Action Plan for Striano was developed on the basis of the measures imposed by Regional Law n. 16 of 2004 and the ones proposed by PTCP of Naples, then the potential outcomes achieved by the Plan were evaluated in terms of land use and density.
The case study results show a disconnection between the current legislation and the new planning tools which are pending approval, therefore, the paper suggests the need to update Campania's Planning legislation to the new guidelines, which are much more effective in terms of land protection.

KEYWORDS:
Urban sprawl, land consumption, soil sealing

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规划法规对遏制城市扩张的有效性

斯特里亚诺（STRIANO）案例

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摘要

意大利正面临着一个几乎不可逆转并且极为严重的状况。对于人类和生态系统至关重要的资产（如，土地），如今正遭受人类活动（首当其冲的是不受控制和无节制的消耗）的破坏。
这种因土地滥而用造成的地貌和环境的改变，不仅对意大利的国土产生影响，而且还跨越了国界：在整个欧洲，城市扩张正威胁着农业生产和生物多样性，同时增加洪灾的风险、减少水资源并导致全球变暖。
城市扩张的泛滥所带来的灾难性影响，已使人们意识到通过规划战略能够在根本上遏制这种状况。意大利的许多地区正在采用法规和规划工具来控制土地的使用，其中就包括坎帕尼亚大区（Campania Region）。
到目前为止，仅有少数几项研究对于这些工具遏制这种状况的有效性进行过评估，有鉴于此，本文旨在评估坎帕尼亚的规划法规和工具对城市扩张的遏制能力。
分析过程是针对斯特里亚诺（Striano）镇进行的，该镇位于那不勒斯大都会区的城市圈范围内，可将其视为城市扩张发展模式的一个样本。
尤其是，根据《地区法2004年第16号（Regional Law n. 16 of 2004）》的强制措施和那不勒斯PTCP提出的措施，制定出了“斯特里亚诺地区行动方案（Area Action Plan for Striano）”，然后根据土地利用和密度情况，对该方案能够实现的可能结果进行评估。
案例研究结果表明，当前立法和待审批的新规划工具之间存在脱节，因此，本文提出，需要将坎帕尼亚的规划立法更新至对土地保护更为有效的新的指导原则。

关键词

城市扩张；土地消耗；土壤板结

1 INTRODUCTION

Urban sprawl processes, born in the U.S. as a result of economic development after World War II, spread all over the world affecting urban and metropolitan areas, creating new ways of land use and damaging the environment and social relations.

Urban sprawl is now considered by the scientific community one of the most dangerous land transformation's processes involving Western cities: the uncontrolled use of land and the increasingly rapid expansion of cities, have weakened, if not eliminated, any kind of boundary between urban and natural space and, as Mumford stated in 1961, the shape of the metropolis is its shapelessness.

To stop urban sprawl, even European Commission decided to get involved, stating that after 2050 it won't be possible to build on free areas anymore (EU 2011).

In Italy, soil sealing related to urban sprawl is causing every day the transformation of over 100 ha of agricultural area in order to build housing, parking, commercial centers, quarries, etc.

Such change of landscapes and environments is threatening agricultural productivity and biodiversity, increasing the risk of flooding, reducing water resources and contributing to global warming (ISPRA 2012).

The Metropolitan Area of Naples can be considered a clear example of urban sprawl development pattern, for this reason the analysis has been conducted here.

The paper aims to verify if Campania's regulations and planning tools are able to curb urban sprawl and promote a sustainable use of land.

The concept of urban sprawl, its causes, its impacts as well as the planning policies adoptable to control the phenomenon are defined in the first part of the paper.

On the contrary, the definition of a hypothesis of Area Action Plan for the town of Striano is the core argument of the second part of the paper.

At the end, the study analyzes the impacts of the Area Action Plan in terms of land consumption and density and finds out that Campania's current planning regulations are not effective in curbing urban sprawl.

2 FROM CONCEPT OF SPRAWL TO THE POSSIBLE INTERVANTATION STRATEGIES TO STOP IT

The term urban sprawl was introduced in the U.S. in the beginning of '60, when the phenomenon was studied for the first time (Self 1961; Clawson 1962; Harvey and Clark 1965).

Over fifty years have gone by, the term has been used so widely that today it lacks of a precise meaning (Galster 2001).

Four types of urban sprawl definition can be found in scientific literature, each one of them focusing on a different feature: urban shape, land use, impacts and density (Chin 2002).

Regarding urban shape, sprawl is identified versus the ideal urban shape, such as the compact city: if the compact city is characterized by high density, by mixed used, by the presence of a central core and by the strong separation between city and countryside, it means that urban sprawl is the opposite.

When urban sprawl is defined by land use, it refers to the development of low-density residential areas with single-familiy houses and mixed use functions (Duany, Plater-Zyberk and Speck 2000).

An other type of definition of the phenomenon is that based on its effects on the environment: Ewing (1997) identifies some of the indicators of sprawl in the reduced accessibility and lack of available open spaces, which are both factors easy to measure.

Furthermore, you can define urban sprawl in term of density: several authors used density to define the phenomenon, but often without a clear measure of the parameter.

Recent studies tried to overcome the limits of preceding analysis by including within the definition of urban sprawl more than one feature:

(1) «Sprawl is a pattern of land use in an urbanized area that exhibits low levels of some combination of eight distinct dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed uses and proximity» (Galster et al. 2001);

(2) «Urban sprawl is synonymous with unplanned incremental urban development, characterized by a low density mix of land uses on the urban fringe» (EEA 2006);

(3) «Sprawl is defined here as a process of uncoordinated change, an approach that broadens the analytical perspective to incorporate the role of spatial planning in steering the activity in the urban hinterland» (Chorianopoulos, Pagonis, Koukoulas and Drymoniti 2009);

(4) «Urban sprawl is known worldwide as the uncontrolled expansion of low-density, single-use suburban development, that in Italy is mainly shaped by settlements scattered around the countryside» (La Greca, Barbarossa, Ignaccolo, Inturri and Martinico 2011).

From these recent definitions of the phenomenon, the absence of planning polices and coordination emerges as one main characteristic of urban sprawl development. Hence, it is necessary to sustain a correct planning strategy that is able to contain the random growth of the city.

The numerous literature that investigated urban sprawl pointed out several factors which can be considered responsible of its proliferation.

From early studies, researches agree to consider innovations in transportation technology the main cause of the phenomenon (Mumford 1961; Holden & Turner 1997; Antrop 2004): train railways first, automobiles later, favoured access to the city centre, making it easy to reach from the suburbs (Antrop 2004).

The growing attractiveness of suburbs compared to the urban core can be considered responsible of starting sprawl too (Friedman and Miller 1965; Mumford 1961): exodus towards suburbs is the first reaction to the dramatic decline of post-industrial cities.

Technological innovation in telecommunications largely reduced the supremacy of the city centre making it possible to widen several activities, contributing to urban sprawl (Ewing 1997).

Also planning policies adopted from several governments to increase competitiveness can be added to the list of urban sprawl causes: public investments for building highways and street systems represent a necessary condition to the automobile becoming the first mean of transportation.

At last, zoning regulation contributes to the spread of the phenomenon because it forces the separation of the different urban functions favouring the rise of residential suburbs, which are typical of urban sprawl environments.

In 2006, the European Environmental Agency (EEA) conducted the research *Urban sprawl in Europe; the ignored challenge* identifying a great number of variables responsible of the phenomenon, amongst which the aforesaid elements are mentioned together with others that can be considered more current, such as globalization, availability of agriculture land at convenient prices and weak application of planning rules.

The wide range of causes responsible of urban sprawl shows the complexity of the phenomenon that quickly evolves because of social, cultural and technological changes and, at the same time, it has dangerous consequences, discordant with the sustainable development of the city.

The effects of urban sprawl can be grouped in three categories: environmental, economic and social.

The increase of air pollution due to the use of automobiles is one of the environmental effects (Ewing 1997; Arbury 2005; EEA 2006), in fact, in low-density urban areas there is a reduced attitude to use public transport, absolute absence of pedestrian movement, and vice versa, a great use of the automobile; even

the strict separation between the different city's functions, typical of urban sprawl, leads to a higher distance between urban areas which makes the automobile the only possible means of transportation.

Air pollution related to car's emissions represents only one of the environmental effects due to urban sprawl, to these we should add land consumption, typical of the phenomenon.

Land consumption causes the loss of a non-renewable resource of primary importance, in fact, soil acts as a carbon sink, additionally, the little distance between urban activities and natural space causes noise and pollution, which are dangerous for animals and plants as well as for the integrity of the remaining natural areas. Land fragmentation produces negative impacts on the environment too, because it disconnects natural habitats so that wildlife species are split (IUNC 1980; Harris 1984; Kautz 1993).

Nonetheless environmental effects have to be considered as well as the economic and social ones, which are utmost relevant. The phenomenon of urban sprawl is absolutely unsustainable from an economic point of view because of the huge expenses that it demands of local governments for the deliverance of services and infrastructures. As a matter of fact, the costs of public investment for sewerage and water supply in sprawl urban areas tend to be greater than those ones you'd have in the case of a compact setting, that is to say that single-family houses request much more expenses that the multi-family ones: Burchell e Mukherji (2003) state that in the U.S. you could save more than 12 billion of dollars only by a more compact development, without limiting the user's request.

The infrastructure development represents an other relevant item of the administration's financial statement and its costs depend on the distribution and on the users density so that sprawl has direct negative consequences: in such a greatly wide territory, with low-density, the expenditure for road construction will be higher than the one you'd need for a more compact urban setting. A similar analysis can be considered for other public services such as schools and hospitals.

Besides the direct costs of urban sprawl we just mentioned, we have to take into account the indirect ones, deriving from the environmental effects we described above: the costs due to pollution, amongst which those deriving from health, agriculture and buildings damage.

Altogether with the economic effects, urban sprawl has also social impacts of similar relevance even if they are more complex to measure and to monitor.

A compact urban setting with pedestrian paths, mixed use functions and public meeting spaces, favours the interaction between inhabitants and a sense of belonging to the community in a way which is different from the suburbs of sprawl areas, where inhabitants have to move about for any kind of requirement, where the automobile is a necessary need and where the sense of place is weak, if not completely absent.

Urban segregation is one of the social effects which are typical of sprawl, not surprisingly, most of the residents of suburbs belongs to the same social class, with similar income and type of family.

If in the U.S. families with children and high income represent the typical inhabitant of the suburb, generally coming to escape the city's congestion and pollution, in Europe we can observe the opposite situation, meaning that suburbs generally are the place where lower classes and immigrants live. In both cases, urban segregation is harmful, because it creates a separation, which is impossible to overcome, between the different classes, that loose any form of dialogue and interaction. The consequences of urban sprawl we just analysed show why the phenomenon has to be curbed and checked.

In the U.S., where urban sprawl has been a matter of interest for the first time, its harmfulness was soon recognized and the initial tools to limit it were found.

From the beginning, researchers all agree to consider that urban planning is the most powerful way to stop urban sprawl: "my answer to sprawl is active planning" (Ewing 1997).

The early policies to reduce sprawl have been engaged in the U.S. from the beginning of '60 and are known with the term *growth management*. The goal of this programs is to control urban development introducing limits to quantity, timing and geographical distribution of new urban settlements.

The first program of growth management was adopted in Hawaii (Land Use Law 1961), where urban growth was putting agriculture at risk; since then, more than twelve American states adopted similar policies to reduce urban sprawl.

From the early '90 the idea of smart growth became popular with the aim of building compact, mixed used and pedestrian friendly districts, to preserve natural resources and open spaces, and assimilate instead of separating residential units by characteristics and price.

Pretty often the terms *growth management* and *smart growth* are confused or used alike: some sustain that smart growth is just a more appealing definition to identify policies of growth management. If we accurately analyse both concepts, you can find instead some important differences regarding the goals they want to reach: the aim of the programs of growth management is above all that of limiting the quota of urban development, on the contrary, strategies of smart growth focus more on the shape and type of settlements rather than on their volume.

This renewed interest for urban shape is tied to New Urbanism, a movement born at the beginnings of '80 and led by the architect Andres Duany, who paid much attention to urban design promoting the transformation of the basic principles of zoning, which was considered a wrong planning technique, also responsible of the increasing growth of urban sprawl.

Similar statements to those promoted by the New Urbanism movement inspired a new revolutionary tool for urban government, known as Transit Oriented Development (TOD), which transfers to public transport system a central role in the process of urban transformation. The term TOD refers to a high-density urban district built in such a way that any single house unit has a maximum distance of 10 minutes on foot from a public transport stop (Fig. 1). Favouring the use of alternative to the automobile is the main way to improve the quality of life and reduce environmental risks. So far, in the U.S. we have more than a hundred examples of TOD and it is advisable that in the upcoming years this number will keep growing.

Urban policies that we described have been introduced in last few years and, although there is plenty of scientific literature regarding urban sprawl, very few papers assessed the efficacy of such tools in limiting and control the phenomenon (Anthony 2004), in fact, their impacts on ground, economy and environment are not yet measurable. Among the available studies, the analysis by Anthony compares the variation of urban density in 49 American states between 1982 and 1997 and it points out that, although growth-managed states generally experienced a lesser density decline than states without growth management, regression analysis revealed that state growth management programs did not have a statistically significant effect in checking sprawl (Anthony 2004). The mismatch between measures adopted at state level and those implemented at local level is a possible explanation of the result, according to the author who states that if local support lacks, the implementation of any central policy ends up being of little efficacy.

Moreover, Anthony concludes his analysis suggesting a modification of actual zoning regulations to make anti-sprawl American urban policies more effective. These rules, in fact, impose a maximum density value which was fixed when American urban settlements were congested, crowded, with few available infrastructures; nowadays, things are different, so it is necessary to update the rules and define a minimum density value instead of a maximum density one, in order to guarantee compact urban development, inspired to principles of sustainability and land preservation.

Anthony's analysis results provide the opportunity to verify if, in Italy, planning policies are effecting in curbing urban sprawl, or if they are weak as well as the American ones.

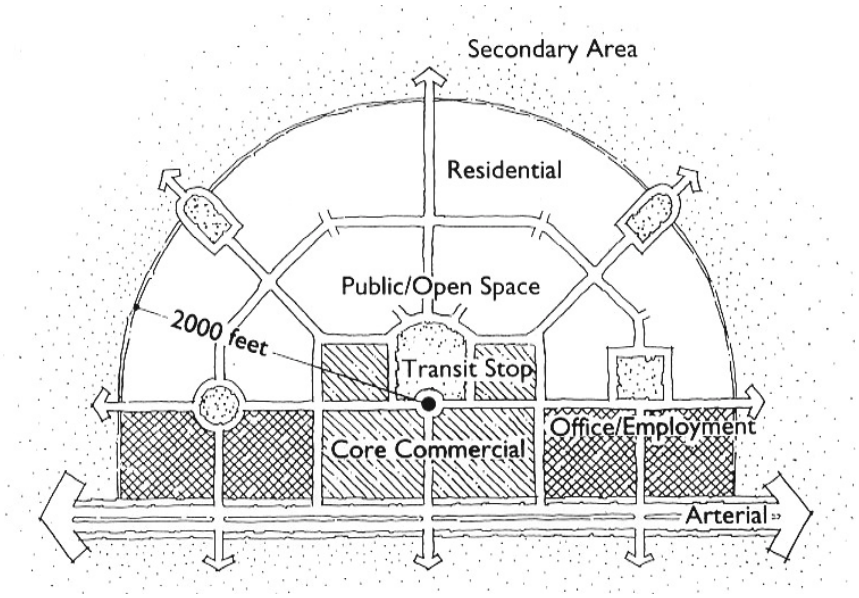

Fig. 1 TOD's model

3 STRIANO CASE STUDY

Inspired by Anthony's analysis, the paper aims to analyze the way planning regulations drive urban development in the Campania Region, now that urban sprawl represents one of the most dangerous phenomenon for the preservation of land.

Instead of comparing how urban density changed in a given period of time, the choice is to formulate a hypothesis of Area Action Plan so as to practically measure how much soil is necessary for the settlement of a given number of inhabitants in Campania, respecting the current legislation.

The town of Striano, which belongs to the Metropolitan Area of Naples, represents an interesting case study because it is identified by the proposal of Territorial Plan of Provincial Coordination (PTCP) of Naples as one of the few areas where increase in housing is allowed.

3.1 THE METROPOLITAN AREA OF NAPLES

In Italy, the metropolitan area notion was introduced with Law n. 142 of 1990 that, at art. 17, Section VI-*Aree Metropolitane*, states as follows: "We consider metropolitan areas those including the cities of Turin, Milan, Venice, Genoa, Bologna, Florence, Rome, Bari, Naples and other municipalities whose urban settlements maintain strict relations with them regarding economic activities, social life and culture, as well as territorial characteristics".

The institution of this new authority, the metropolitan city, which is similar to the Province but with greater powers, shows to which extent urban sprawl impacts Italian landscape: in fact, big isolated cities, as well as little towns, don't exist anymore, but territory is characterized by huge urban conurbations where relations between municipalities belonging to them, are so strong that they became part of a unique entity.

Law n. 142 gave Regions the task to draw the borders of single metropolitan areas within one year it became effective, but so far, in Campania, no official delimitation exists at all, but only several hypothesis.

One study regarding the trend of population on the Metropolitan Area of Naples (Mazzeo 2011) is interesting for our analysis. The paper identifies the boundaries of the Metropolitan Area of Naples based on «5 concentric bands, drifting far from the center», including a total of 142 municipalities belonging to the Province of Naples (92), Caserta (40) and Salerno (10). The analysis of the demographic variation between 1861 and 2009 allows to isolate two trends: the first regarding Naples, where population increases up to

1981 and then progressively decreases; and the second one regarding the other bands, from 2 to 4, in which population increases from 1981 to 2009, without any flection. «From data you can point out how decreasing of population in Naples was distributed in its surroundings and, in particular, in municipalities of band 2 and 3» (Mazzeo 2011).

Leaving Naples was generally due to the difficulty of reaching an acceptable level of quality of life in its center, and it favored the urbanization of surrounding areas and, as a consequence, the increasing consumption of land. The danger represented from excessive and uncontrolled consumption of land is nowadays, and more than ever, of great concern: several studies regard this topic (EEA 2011; Gerundo and Grimaldi 2011; FAI and WWF 2012; European Commission 2012; EEA 2012; ISPRA 2012) and focus attention on possible strategies to adopt to limit the phenomenon in the near future.

In the Campania Region, planning tools specifically redacted in order to contrast urban sprawl have been recently introduced. For example, one of the main goals of the Regional Territorial Plan (PRT), adopted in 2005, is to preserve and protect the natural environment by creating the Ecological Regional Network. Even the proposal of PTCP of Naples states and regulates the consumption of land focusing on the conservation of natural and rural spaces, promoting the improvement of density standards, because the densification of urbanized territory ensures a better use of land.

The town of Striano is within those territories that according to PTCP are to be densified and it is also chosen as a new node of the high-speed railway. For these reasons, Striano represents an interesting case study to apply those strategies we have already analyzed in order to limit urban sprawl and so evaluate the results in term of land consumption and density.

3.2 THE TOWN OF STRIANO

Striano lies in the Valley of Sarno located 38 km far from Naples.

Although it is not distant from the Vesuvio, it is not part of the eighteen municipalities belonging to the so called *red zone* (Fig. 2).

Its population amounts to 8.368 people (ISTAT 2011), distributed on 7.58 km^2.

The discovery of a IX sec. a.C. necropolis bears witness of an ancient village during the iron age. Several populations have followed in the territory: from the Opici, early inhabitants of the area, the Etruschi and Sanniti, up to the Romans. The entire population of Striano was forced to leave its land because of two natural catastrophes such as the earthquake of 62 d.C. and the Vesuvio's eruption of 79 d.C., and for these reasons the area surrounding the volcano stayed unpopulated until the beginnings of II sec. d.C., when the peasant community came back.

The agricultural vocation of Striano is still pretty dominant for its economy, even if from the beginning of '70 several industrial plants settled in the area.

Urban facilities are particularly scarce: two green areas, two sport centers with a soccer field and one school institution including one primary school and a secondary one, and a food market which was instituted in 1906 and a new market realized in Risorgimento Road.

Medical assistance is offered by an ambulatory located by the cemetery, in the eastern part of the city.

Striano's urban fabric looks complex and messy, so that it can be difficult to find an urban model that might represent its main structure. The plan's complexity disappears in buildings height: buildings, in fact, reach almost the same elevation; most of the buildings are under three floors and only few of them reach the fourth. Around the city center, characterized by the mix of ancient and new architecture together with few degraded buildings, there are some neighborhoods of more recent development, that were built without a precise urban project and so contribute to extend the disorder outside the city center.

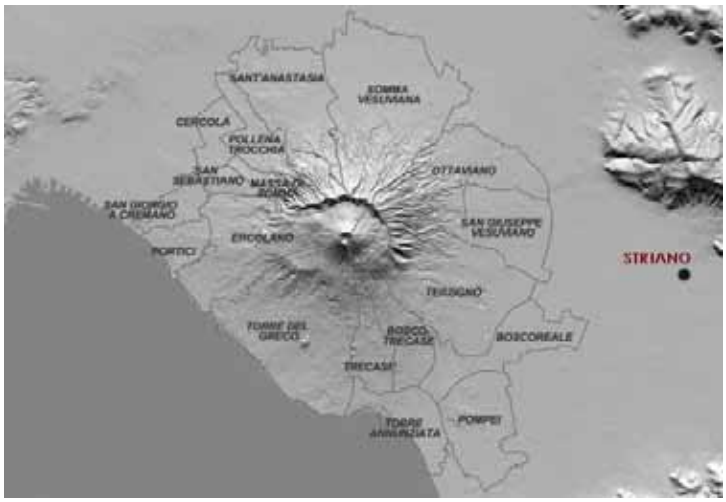

Fig. 2 the municipalities belonging to the *red-zone*

3.3 THE PROPOSAL OF PTCP OF NAPLES AND ITS MEASURES FOR STRIANO

The proposal of PTCP of Naples was made public in July 2006 with a Preliminary Document; in 2007, it was initially approved, but following the approval of PTR it was modified and integrated in conformity with PTR contents, and so newly approved in 2008.

After the administration election in 2009, the new provincial commission decided to extend the counselling phase before the final approval of PTCP, and for this reason, so far, PTCP remains a proposal.

One of the main goals of the Plan proposal is the preservation and the enhancement of the natural resources of the landscape, focusing attention on limiting land consumption.

The Plan isolates some area of *residential densification* to concentrate any intervention to increase housing supply, so that agricultural areas are preserved improving the use of building sites.

The area between Poggiomarino and Striano belongs to the *densification sites* where it is possible to make "interventions of requalification, densification and reinforcement of the existent settlements, towards the East, to move away from the high volcanic risk area" (Implementing Rules, PTCP of Naples).

According to the Table P.06.6. of PTCP, the area of Striano is classified in three different categories, relating to land use: historical area, urban area and agricultural area (Fig. 3).

The historical area lays in the central part of the town, confining with consolidated urban settlements that are surrounded by an area of urban integration.

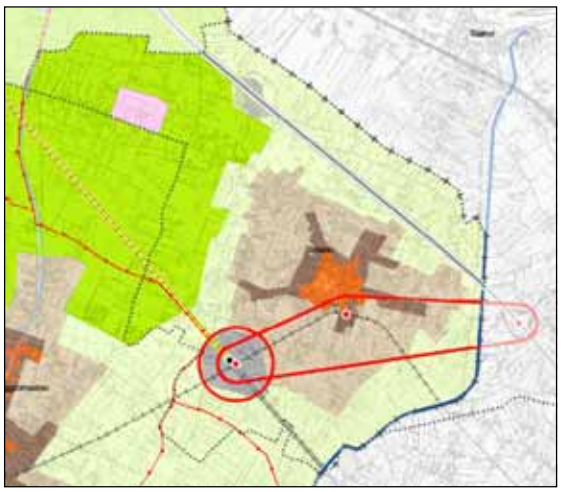

Fig. 3 Table P.06.6 of PTCP of Naples

Striano's rural areas are two, an ordinary agricultural area surrounding the area urban integration, and one of agronomic relevance in the East and Nord-Est part of the town, that the PTCP protects from future development. The first step to define the Area Action Plan is that of estimating the population housing needs, based on a ten year projection, using data from the National Institute of Statistics (ISTAT).

On this amount, a 15% of population rate has been added in order to supply the residential relocation needs, according to the forecasts of the execution rules of PTCP (art. 53)[1].

In the end, we have that the number of people to relocate in the project area corresponds to 3,908 inhabitants. Knowing the number of residents to relocate, it is possible to calculate the site area required, comprehensive of areas for building public facilities, called *Standards* (D.M. 1444/68) that include areas for schools, community facilities, green spaces and parking.

We chose to ensure an area for Standard destination of 20 m^2/person – greater than the minimum prescribed by the DM 1444/68 – as required by L.R. 14/82 for some types of municipalities[2]: the choice is justified by the expected significant increase in population that Striano will face in the future decade, in part due to the need for residential relocation of the communities of the close *red zone*.

The recently adopted L.R. 16/04 left in force the previous L.R. 14/82, which contains maximum residential density stipulations that restrict urban developments to 4 m^3/m^2; implementing such a measure, we obtain a site area of about 30 ha, corresponding to a population density of 127 persons for hectare (Tab. 1).

This result disagrees with the minimum population density value of 200 persons for hectare imposed by the proposal of PTCP for new residential developments[3].

Type of data	Threshold	Value	Measure unit
New population		3,908	
Residential Floor Area per person	35 m^2	136,780	m^2
Residential Building Volume (RBV) per person	105 m^3	410,340	m^3
Net Site Area (NSA)		170,975	m^2
Standard (DM 1444/68) per person	20 m^2	78,160	m^2
School	5 m^2	19,540	m^2
Community facilities	2.5 m^2	9,770	m^2
Green area	9.5 m^2	37,126	m^2
Parking	3 m^2	11,724	m^2
General Facilities per person	2.5 m^2	9,770	m^2
Residential Density (RBV / NSA)		2.40	m^3/m^2
Street Area	18%	46,603	m^2
Site Area		30.6	ha
Population Density		127	person/ha

Tab. 1 Area Action Plan for Striano

For this reason, a second hypothesis of Area Action Plan has to be formulated, respecting only PTCP's measures, in order to compare the two results. Calculating the site area for the second Area Action Plan based on a population density value of 200 persons for hectare means that 20 hectares of land are sufficient for the relocation of 3,908 people (Tab. 2).

1 PTCP of Naples, Article 53 (3): the allowable increase in residential development is that required to meet the existing needs of the resident population as well as a portion of what is required to meet the needs arising from the residential relocation, expressed in the strategy outlined by the PTCP. The aforementioned additional amount may not exceed 15% of the projected population for the decade of reference, determined in the manner set forth in Article 65. Interventions to increase residential development must be based on maximum savings in land consumption, providing new areas of residential urbanization only when the increase is not feasible through the reorganization of existent urban areas and the re-use of abandoned areas and buildings.

2 L.R. 14/82, Annex 1, Section 2 (1.4): the minimum allocation of areas for public facilities, established by art. 3 of the Ministerial Decree of 2 April 1968 n. 1444, of 18 m^2 per person, is increased to 20 m^2 per person in the Provincial capitals, in the municipalities with more than 50,000 inhabitants, and those with average rate of population increase in the last decade higher than 5%.

3 PTCP of Naples, Article 70: "General guidelines for the localization of new urban settlements".

Type of data	Threshold	Value	Measure unit
New population		3,908	
Population Density	200 person/ha		
Site Area		20	ha
Standard (DM 1444/68) per person	20 m^2	78,160	m^2
School	5 m^2	19,540	m^2
Community facilities	2.5 m^2	9,770	m^2
Green area	9.5 m^2	37,126	m^2
Parking	3 m^2	11,724	m^2
General Facilities per person	2.5 m^2	9,770	m^2
Street Area	18%	35,172	m^2
Net Site Area		72,298	m^2
Residential Building Volume per person	115 m^3	449,420	m^3
Residential Density		6.22	m^3/m^2

Tab. 2 Area Action Plan for Striano, second hypothesis

3.5 RESULTS

The hypothesis of Striano Area Action Plan based on the Campania Region's Law shows that for 3,908 inhabitants almost 30 ha of land are required, meaning a population density value of 127 persons per hectare. The second hypothesis of Action Plan, based only on PTCP prescriptions, indicates that 20 ha are enough for the relocation on 3,908 people, corresponding to a population density value of 200 persons per hectare. The Standard surface is the same in both hypotheses, because the number of people doesn't change, but in the second Plan this area is distributed on a smaller portion on land, thus confirming the greater settlement density of the new Plan. Hence, to make it easier to compare between the two hypotheses of Action Plans, the corresponding urban parameters have been summarized in the Table below.

	General data	Hypothesis 1	Hypothesis 2
Planning regulations and tools:			
L.R. 14/82		**Res. Density ≤ 4 m^3/m^2**	
PTCP Napoli			**Pop. Density ≥ 200 person/ha**
New population	3,908		
Residential Volume (m^3)		410,340	449,420
School Volume (m^3)	46,896		
Community facilities Volume (m^3)	23,448		
General Facilities Volume (m^3)	23,448		
Total Volume (m^3)		504,132	543,212
Site Area (m^2)		305,508	195,400
Street Area (m^2)		46,603	35,172
Standard (m^2)	78,160		
School (m^2)	19,540		
Community facilities (m^2)	9,770		
Green area (m^2)	37,126		
Parking (m^2)	11,724		
General Facilities (m^2)	9,770		
Population Density (person/ha)		127	200
Residential Density (m^3/m^2)		2.40	6.22

Tab. 3 Comparing the two hypothesis of Area Action Plan

4 CONCLUSIONS

The above analysis has attempted to evaluate the effectiveness of the Campania Region's planning regulation to stop urban sprawl by formulating a hypothesis of Area Action Plan for the town of Striano (NA) and measuring its impacts on land consumption and population density.

Basing the hypothesis of Striano Area Action Plan on the maximum residential density prescriptions imposed by the current Campania laws – LR 16/04 and LR 14/82 – implies allocating almost 30 ha of site area for 3,908 new inhabitants, instead, respecting the minimum population density limit required by the proposal of PTCP it is possible to save more than 10 ha of land, allocating 20 ha for the same population.

Therefore, the study as it was conducted indicates that the actual Campania Region's planning regulations are not efficient in limiting urban sprawl and end up being contradictory with the prescription contained in the proposal of PTCP to be approved. Thus, despite current Campania's planning Law 16/04 has been recently formulated, it needs to be updated because it maintained some preceding enacted laws (LR 14/82) created in a time when fast urban development was encouraged. On the contrary, new urban planning tools, such as the proposal of PTCP, contain all the necessary elements for a new approach to urban planning, based on the concepts of densification and sustainability.

More research is necessary to verify the possibility of extending the results of this analysis to the entire national territory, because the paper exclusively relates to Campania.

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IMAGE SOURCES

Fig. 1: Calthorpe P. (1993), The next American metropolis

Fig. 2: www.vesuvius.it

Fig. 3: PTCP of Naples

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