GEO-ICT SERVICES IN SPATIAL PLANNING: DEFINING A CONTEXTUAL FRAMEWORK FOR OPERATIONALISING PUBLIC LAND POLICY

Pietro Elisei[1], Wendy-Laura C n [1], Radu-Matei Cocheci[2]

[1] Smart Cities Concepts and Project Management, Urbasofia, Bucharest, Romania, wendy.cinta@urbasofia.eu
[2]Department of Urban Planning and Territorial Development "Ion Mincu" University of Architecture and Urban Planning Bucharest, matei.cocheci@gmail.com

Fragmented, inefficient institutional arrangements, layered on top of the weak reliability of statistical information across both the developed and developing world, and the subsequent low degree of awareness concerning the management of public property / public land rule out the effectiveness of traditional planning instruments.

To what extent may a Planning System incorporate geoICT (geographic Information Communication Technology) services to the mutual benefit of the planning profession, communities and policy-makers in their attempt to optimize the development processes? An open and responsive government seems more likely to encourage an aggregated view of new planning models rather than obstructing them, subsequently propelling effective public service delivery.

The contemporary ICT era triggers the need for masterplanning as a dynamic collaborative process / output, allowing on the integration of end-user requirements through means of a crowdsourced inflow of data, having thus modelled the pre-existing regulatory planning framework.

Through this paper, we aim to define a possible framework for connecting ICT models with normative and strategic planning processes at local level, starting from a comparison between different EU planning systems and how geo-data can be used in both facilitating the implementation of planning regulations and building local governance capacity.

Addressing the challenges and inconsistencies of spatial planning norms in relation to the real-time developments / evolutionary trends, by mapping the gaps between different planning levels, may pave the way for geoICT services as innovative binder between the co-dependencies generated at various planning scales.

Keywords: Planning Systems, Digital Spatial Plans, City-Services

1. Introduction

Until recently, the problem of geographic analysis for public administrations was the lack of spatial data availability. The more recent over-abundance coming from various sources, such as volunteered GI activities (e.g. Wikimapia, OpenStreetMap OSM), public initiatives (e.g. Spatial Data Infrastructures SDI, Geo-portals) and private projects (e.g. Google Earth, Microsoft Virtual Earth, NASA World Wind and other 3D models), has not yet been aptly put in use, enacting planning policies in (public) land use management for a wider range of urban governance models. Weighting the costs and benefits of these policies requires both data accessibility as well as data storage capabilities to be provided by the use of geoICT.

Maps in spatial planning are often reduced to their role in evaluating the normative content of spatial plans – unlike ordinary maps, governments issue spatial plans not to describe the existing situation, but to illustrate different regulations often associated with geospatial objects (MetaLex, 2009).

Established as a policy infrastructure for sharing geospatial information in Europe in order to support Community policies (EC, 2007), the INSPIRE (Infrastructure for Spatial Information in the European Community) directive, as well as other Spatial Data Infrastructure (SDI) programmes depend on standards such as the ones provided by the Open Geospatial Consortium (OGC). As the large volumes of information collected by various public authorities become *a gold mine* for Europe's public administrations (EC, 2011), the further development of geoICT services are considered to be a factor enabling better public policy and scientific decision making, while also producing significant benefits to society as a whole (Stoter et al, 2011).

However, around the world there are significant differences in the way SDI is explained. On the one hand, in the USA the focus is on re-engineering projects, duplicate data reduction, data sharing promotion or standards and metadata revision, while in Africa SDI is used just as a decision-support tool in enhancing sustainable development, social and economic transformation or environmental conservation (Navarra, 2010). As national SDI initiatives also include the existence of a national government policy for SDI (e.g.: in Romania, the efforts of the National Cadastre and Real Estate Publicity Agency – ANCPI), with different institutional arrangements in acquiring and providing spatial information (Crompvoets et al, 2006), it is often difficult to evaluate these initiatives through the use of measurable variables.

Consequently, the aim of this article is to identify to what extent may a Planning System incorporate geoICT services to the mutual benefit of the planning profession, communities and policy-makers in their search for optimized development processes. Besides explaining the state-of-the-art in using geoICT services in spatial planning, the article presents initiatives from the Netherlands, Italy and Romania in an attempt to identify common paths that can be taken in the creation of a contextual, geoICT driven framework in operationalising public land policy.

2. Background

GeoICT is the end result of the combination between geographic (or spatial, geologic, geodetic, geometric, etc.) information and Information and Communication Technology (ICT), increasing the availability and accessibility of government's services by improving general planning, coordination and cooperation (Akingbade et al, 2009). As highlighted by Navarra (2010), geoICT can be perceived from three perspectives: urban and regional economics, 'techno/legal/managerial' perspective and GIS sciences perspective.

Table 1. Perspectives in defining geoICT services

Urban and Regional Economics' perspective	**'Techno/Legal/Managerial'** perspective	**GIS Sciences**' perspective
- **public good**, used to discipline the spatial structure of the urban economics, 'optimizing' the spatial distribution of natural, economic and social activities.	- **standardisable**, formal and quantitative way, not necessarily mediating spatial knowledge, in its attempt of making space controllable and measurable.	- contingent, informal, qualitative and prone to manipulation by humans, displaying diverse values and interests.

The first perspective analyses the provision of geoICT by achieving maximum possible output from a given set of inputs (Worthington and Dollery, 2000), as spatial and economic data define financial and strategy decisions in state governance. This concentrates upon the spatial management of cities as an administrative unit for state governance, covering for regional and urban spatial policies (transportation infrastructure, bio-diversity, local taxation), managing urban change / regeneration (rising / declining areas) and steering land use policy to act as blueprint for population behavior and development.

The succesful applicability of geoICT services in public sector governance requires the existence of comprehensive evaluation methods (DeLone and Mclean, 1992), taking into account not only the overall benefits, but also the societal and economic impacts, the latter including operational efficiency and effectiveness, as well as program efectiveness (Clapp et al, 1989).

The supply of general information is critically different from the support of real planning processes, as encountered in a survey by Campagna and Deplano (2006) on GI provision within public administration in Italian websites presenting mixed impacts on the effectiveness of geoICT to support spatial planning and decision making processes. The various forms (tourism, location of government services, online planning) were not consistently addressed, failing to provide substance to the actual planning domain.

Another example in supporting this theory is reflected in the analysis deployed by Karikari et. al. (2005) concerning the application of GIS for land administration in Ghana, finding that nearly all cadastral and land registration systems focused on record management rather than information exploitation. No GIS was used for analytical purposes by the Lands Commission Secretariat in Accra - the leading agency on land administration - but only for static map displays, leading, in turn, to limited research attention in terms of the societal benefit of resorting to dedicated geoICT services.

In the case of the Netherlands, Koomen and Groen (2004) studied the current and expected development on supply (agriculture) and demand (urbanization) side and then discussed government intervention. To this instance, STEPP - a GIS-based Strategic Tool for integrating Environmental aspects in Planning Procedures - was found to stimulate the exchange of relevant information among various stakeholders including decision-makers, providing means of navigation to explore planning scenario alternatives, thus aiding the less-equipped actors to be able to perceive land use change for achieving a more participatory process of governance and decision-making. As we will see further, an added value of such service provision will be addressed by the Legal Atlas (MetaLex standard) incorporating the legislative part of land use management.

The operational level of service delivery based on inputs (such as geo-data, geo-information and monetary resources) is directly linked to the effectiveness of the programmes using geoICT to provide such services, resulting, in turn, into a quicker decision-making process. Another aspect is the value of geo-information and how this is actually used as input for the delivery of public services. Eventually, geoICT can contribute to the making of smaller cities more fertile grounds, by providing agglomeration benefits to firms, government services and otherwise unavailable social activities in such contexts (Navarra 2010).

According to Acharya (2009), the wise use of geoICT could be the prime instrument to support the overall objective of the envisaged Land Administration System (LAS) of the nation, admitting that adopting geoICT in land administration is a problem and a solution in itself, especially acknowledging the huge investments to be allocated for mind-set revolution.

From a Spatial Data management point of view, geoICT includes: data acquisition, data assimilation, data analysis, information extraction, decisions support and data/ information dissemination. Out of

these prospects, our current focus relies on decision-support, whilst the main issue to be addressed is the integration of various information extraction processes in the scope of providing relevant and reliable interoperable public services.

Land Administration - as defined by the UN - is the process of determining, recording and disseminating information on ownership, value and use of land when implementing land management policies, focusing on the accurate boundary survey of the land parcel and the registration of rights over that parcel, whilst Land (Use) Management perceived the land as a resource from both the environmental, as well as the economical perspective. Land Reforms come to alter the pattern of land tenure and land use in specific areas.

Identifying users with information requirements into the integration of survey records information addresses an operational model of a dedicated public-enabled land administration portal (Lee 1995). Such a tool has been defined by the International Federation of Surveyors (FIG) in the form of a database containing spatial referenced land-related data for a defined area, also covering for procedures and techniques for the semantic collection, updating, processing and distribution of data (FIG, 1995) - the Land Information Systems (LIS). Within such framework, specific software development languages and methodologies have to be addressed in order to provide for geoICT related services. The Unified Modeling Language (UML) has been rapidly perceived as a de facto standard software design language, based on its capabilities of visualising the modeling language into specifying, constructing and documenting the artefacts of a software system (Rumbaugh et al, 1999).

Also, from this perspective, geoICT services for e-land administration fundament government infrastructure, in their primary scope of recording legally recognized interests of land (ownership and use) including the technical, legal and managerial issues concerning the legal situation of defined units of land. In turn, these provisions reflect upon the real estate market, and further, handling the quantitative analysis of historical states, the continuous monitoring of comparable metrics and indices in time series can scope for the optimization of future landscape development.

Safeguarding the reliability, availability, access and use of spatial information can quantify for the societal objectives of geoICT services, developing new social and organizational capacity, whilst ensuring a high degree of awareness within modern governments, which need to address a highly efficient management of land use in retrieving significant value out of the land. Under such auspices, a possibility to seamlessly handle spatial data contained in each administrative unit can be considered, assuming that the political and economic frameworks remain constant not changing over time, in clear antagonistic view with the GIS sciences' perspective. According to Georgiadou (2009), the environment to use and apply geoICT relies on the provision of rules, legally prescribed in influential text (such as regulations, policies, principles and declarations).

The following sections will provide an insight into the planning system structure of three EU-countries the Netherlands, Italy and Romania with the aim of connecting this structure to the possible use of geoICT in support of daily government operations. The highly connected world, in which international key-players emerge in the geoICT sector in the context of globalisation, requires an increased awareness on innovative trends and possible technology transfers that can be used for designing new provisions in the aid of planning processes.

3. Planning System Analysis

Table 1 Administrative levels in The Netherlands, Italy and Romania

EU	THE NETHERLANDS	ITALY	ROMANIA	
Central Government (-al system)	State level (unitary,centralised decentralisation)	State level (regional, centrally rooted)	State level (unitary, highly centralised)	
NUTS1 Macro-Regions	-	-	4	no legal / administrative statute
NUTS2 Regions	12 Provinces	21 Regions (*Regioni*)	8	
NUTS3 Micro-Regions	12 COROP regions	107 Provinces (*Provincie*)	41 Counties Bucharest (+1)	
LAU1 (NUTS4)	inter-communal level (joint approaches)			
LAU2 (NUTS5)	443 Communes (*Gemeenten*)	8101 Communes (*Comuni*)	103 Cities, 217 Towns, 2856 Communes, 6 Sectors (Capital)	

3.1. Netherlands

The main responsible body, at national scale, is the former Directorate-General of Spatial Policy inside the **VROM** (the Ministry of Housing, Spatial Planning and the Environment, since 2010, the Ministry for Infrastructure and Environment, **I & M**), which became a weaker form after the recent reform in e.g. relation to coordinating central government funding, under the name of the **National Spatial Planning Agency**.

The **National Spatial Strategy** (Nota Ruimte, 2005), formerly based on the Fifth National Policy Document on Spatial Planning and the Second National Structure Plan for the Rural Areas, has is radically rescaled and reformed the Dutch Spatial Planning approach, from the imposin stage towards promoting developments . It is characterised by less detailed r the central government, fewer barriers and greater latitude for other levels of government, members of the public and market parties, in order to promote more effective local land use policies; still, besides entrusting the lower hierarchical levels of governance with such responsibilities, a clear lack of national comprehensibility is to be faced as downturn of these new provisions.

Only in the case of major infrastructure projects, energy supply and city-regions development, the Central Government takes responsibility: within each envisioned area (i.e. complex nation-wide spatial issues in the N and S wings of the Randstad the highly urbanised western part of the Netherlands in the country s Green Heart and in S-E Brabant.), the Cabinet is producing a programme that bring together the principal issues and couples them to investments by local governments and private sector parties.

One central theme inside the implementing agenda of the National Spatial Strategy the basis for developing spatial policy is the integral development of supra-local areas, which must be developed through development planning , thus development-oriented instead of plan-led. In support of approach, improving decision-making on projects relies also on measures such as the integration of permits etc.

Under the new **Dutch Spatial Planning Act** (Wet ruimtelijke ordening **Wro**, 2008) the province can include a vision for a regional area development project in a structure vision. This is a policy-oriented document and thus not legally binding upon municipalities. If the province wants to issue binding regulation, the Act provides for a competence to establish generally applicable land-use regulations which municipalities must translate into local land-use plans. But the exclusion of certain land uses is more likely to follow (for example, building in areas of outstanding ecological value) than the stimulation of a certain sort of land use, as is the case in an area development project. (Spaans, 2007)

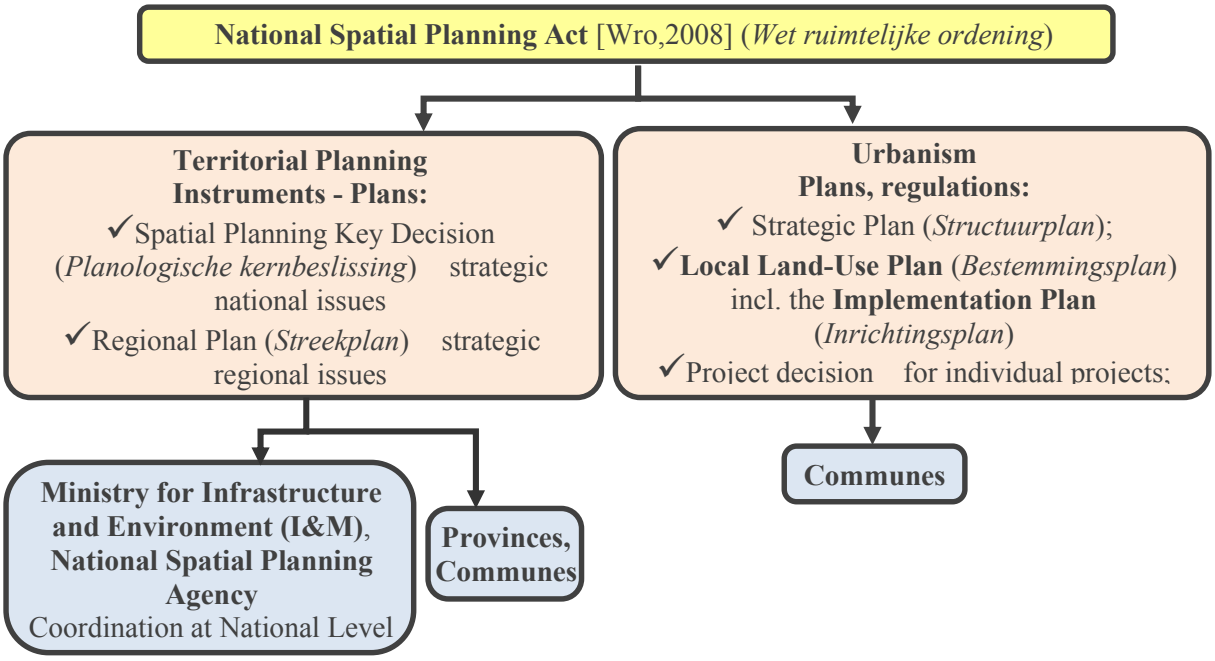

Fig. 2 Planning System in The Netherlands: main legislation, system of plans, administrative competences

The Act defines a partly mandatory set of plans (Fig. 2) specific for each hierarchical level, including the possibility to make exempt of, in some situations. Elements of each plan can be binding on lower authorities. **The land-use plan** (*bestemmingsplan*) **is the only plan that is legally binding** on citizens through the regulation of land use and prescriptions related to land use. This comes with an integrated **implementation plan** (*inrichtingsplan*). A building permit can only be granted if the proposal conforms to the land use and building prescriptions in the land-use plan. (Spaans, 2007) Besides this, local authorities can also formulate a **project decision** for individual projects. Such a plan is less comprehensive, but also legally binding. Upper levels can counterargue through means of **intervention procedures**. Still, such mechanisms are seldom used, due to time-consuming considerations. The secret of successful planning is in extensive intra-governmental negotiation and consultation, entrusting the lower-level apparatus in proceeding with their local issues. As such, the provinces do not have the competence to determine land use regulations on their own. They do provide directions - through i.e. the **regional plan** (*streekplan*) - and approve **local land-use plans** (*bestemmingsplan*), an often simultaneously combined approach. Their influence on local spatial policy is made through **verification**; through **notice of change**, undesirable land use changes can be opposed, yet usually avoided in practice due to again bureaucratic constraints.

By Wro, **the government is bound to make available all spatial plans in digital format through means of the RO-Online portal**. These are displayed as one image to allow the broad perception upon all re/developments of a specific area at once.

Related legislation provides considerations also to the geo-spatialisation processes, such as the alignment with SDI provisions and geo-spatial infrastructure standards. GIDEON, the National Spatial Data Infrastructure (NSDI) adoption was considered through the Geo-Information Geo-Information Council (*GI-beraad*) as an advisory Council of VROM, and the National Mapping Agency (Cadastre). The 2 embodiments addresed were the Space for Geo-Information (RGI) between 2004 2009 and the Geonovum since 2007, the latter as an established knowledge centre for geo-standards and geo-architecture in e-governance. The use of the Standards by municipalities, provinces and the central government itself is enforced by law in a separate governmental Regulation, for which the imposed standards are appended to. Furthermore, the innovation program space for Geo-Information , with the scope to improve the Dutch SDI, made **the framework mandatory for all projects carried out**. This was released in June 2006 as a dynamic document, extendable and improvable in time.

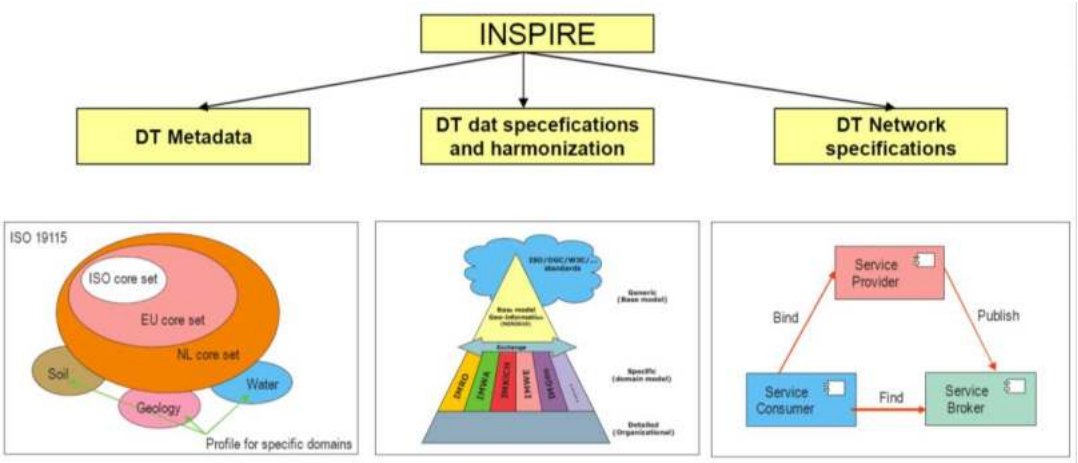

Fig. 3 Standardisation according to EU expectations e.g. INSPIRE (Bulens, J., Vullings, W., Crompvoets, J., Reuvers, M., 2007)

Other ICT relevant initiatives are few **Public Services on the map**, the **National Georegistry** and the number of central government SDI integrated initiatives, such as the **National Geo Data Infrastructure for Disaster and Emergency response management: GDI R&C** (*Rampen & Crisis*) since 2009, the EduGIS project, in which **geoinformation and GIS tools from different sources are made available for educational purposes** (www.edugis.nl) and even e-gov initiatives beyond borders, such as the **joint program X-border-GDI** with running examples including **Spatial planning, Water management, Nature and Tourism, Traffic and Disaster management** (e.g. the Geo viewer for animal disease, the Tourism project eRIGG providing hiking maps, etc. http://www.x-border-gdi.org/en/index.html)

Although only few experiences in applying the Dutch standards in the different profiles are registered, it is expected that it will result in time in an increase in operability in exchanging information over different domains.

3.2. Italy

The territorial fragmentation and lack of coordination between the various planning instruments have been in the past probably one of the biggest obstacles to be faced by the Italian planning profession,

since any action planned could have been extended only within the legal framework of the plan (usually municipal), and also since the effects of the intervention, with the advent of the latest regulations, have regulated the planning profession that attempted to harmonize the classification of the planning instruments, in order to set up an address for all the municipalities that fall in a given area and, overall, to regional level between the individual provinces. (Salzano, 2004)

Law 1150 of 17 August 1942 is still the fundamental law concerning urbanism, in a regulatory framework suffocated by an overlapping of norms not always of an exclusively urban planning character, which have modified but not substituted the previous ones. the need o been constantly postponed since its first considerations back in the 60s. The main planning responsibles are the national government (and in particular the Ministry of Public Works) and the municipalities.

All settlements included in the lists which the Ministry of Public Works is required to train and upgrade, are obliged to do the **PRG** (*Piano Regolatore Generale*), the General Regulatory Master Plan (Fig. 4). Settlements that do not come with PRG must still adopt a **Building Code**, which is more than the minimum of regulation of transformations, and that contains a cartographic attachment called "**Manufacturing program**" (**Pdf**). The PRG is implemented, according to the law, or for direct intervention (planning permission, building permit today), or - for certain areas or parts - by means of a "**detailed plan of implementation**" (**PPE**). The detailed plan is extended to a part of the township, and precise for it the rules provided for in PRG-level detail. It can come to indicate the plannimetric outlines and the elevation of individual buildings (*planovolumetrico*). The **territorial plan of coordination PTCP** has force indefinitely. The municipalities whose territory is included in whole or in part within a territorial plan of coordination PTCP, are required to conform to this the relevant municipal plan.

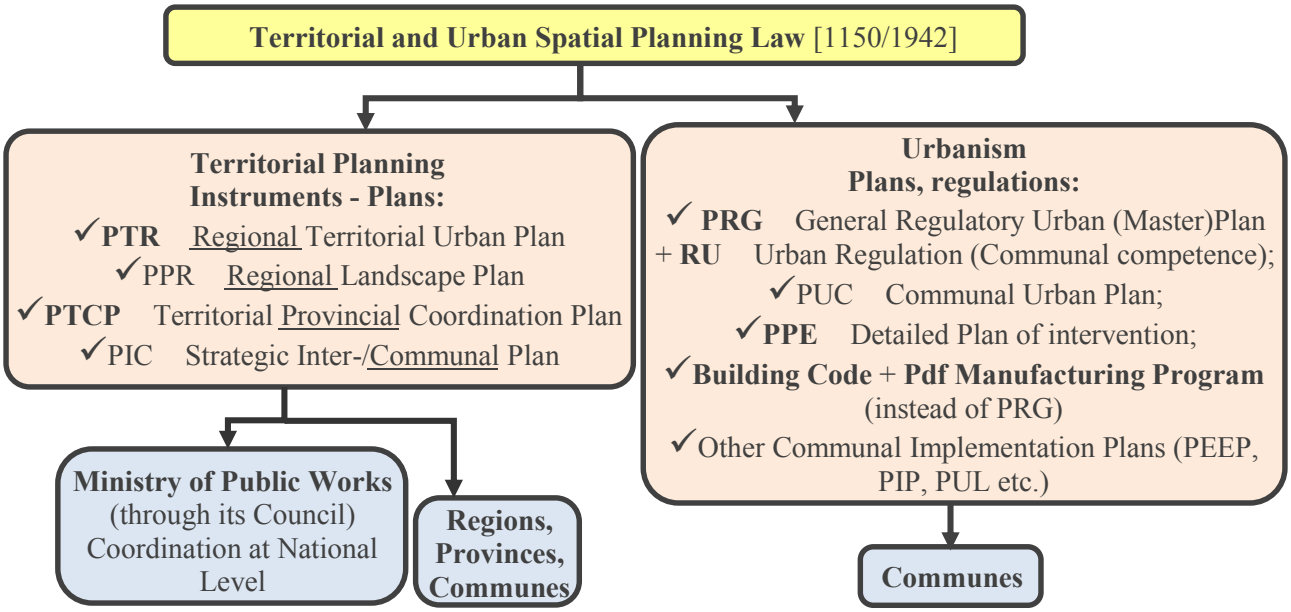

Fig. 4 Planning System in Italy: main legislation, system of plans, administrative competences

The Italian Communes have a central role in the Italian territorial planning processes, by outreaching the possibility of taking initiative and responsibility when coming to territorial planning. Other hierarchically superior entities have only a stimulating role, of guidance and control. The Communes in Italy are a highly variegated reality, with dimensions ranging from 2.5 million inhabitants in Rome to at most 100 inhabitants. This implies the fact that the Communes have absolutely diverse technical

structures and capacities. Some of them, which managed to publicize online their regulatory plans, such as the public oriented service towards the citizens comprising the community, have solved the planning informatisation, but when confronted with the problem of data model provision, even under a pragmatic approach, was generally perceived as scarcely generalizable.

3.3. Romania

Romania still suffers from *a rather widespread reluctance to accept planning as a democratic discipline, mainly because of its strong tradition during socialist times* (Florescu and Mitrea, 2015). After 4 decades of communist regime, characterized by an excessive centralization of the state and a planned economic regime, with an inherited taste for realising fixed general urban plans from the inter-war period, planning in Romania is still undergoing alignment in scope of assuring a greater transparency of planning processes and easing the involvement of local communities and other stakeholders. The current administrative competences for planning are established in Romania by the Law for Urban and Territorial Planning (no. 350/2001, with its subsequent modifications).

There are two main areas where planning activities take place without it being a subject of the national planning law. The first one is the environmental legislation, which stipulates the necessity to realize Management Plans for certain types of natural protected areas, containing provisions regarding land use. The second one is the regional development area, where certain plans are made at regional level (Regional Development Plans PDR) or even at local level (Integrated Urban Development Plans PIDU) in order to motivate the use of structural funds for different priority projects.

Territorial Plans (PATN national level, PATZ regional and sub-regional level, PATJ county level), the General Urban Plan (PUG) and specific Zonal Urban Plans (like the ones for central areas and protected built areas) are initiated by a competent administrative authority and are afterwards drafted by a designer/consultant which is attested by the Romanian Registry of Urban Planners (RUR - http://www.rur.ro/). The selection of the consultant is subject to public procurement regulations. For the other Zonal Urban Plans (PUZ) and for all Detailed Urban Plans (PUD), the command is issued by a private party who can choose to work with any designer attested by the Romanian Registry of Urban Planners.

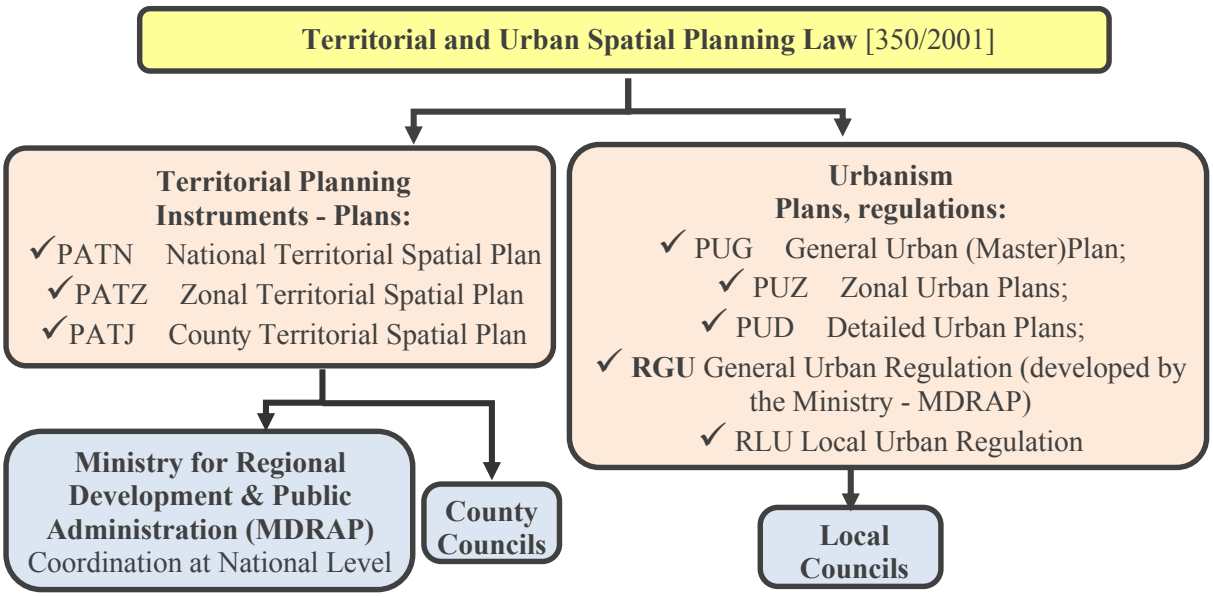

Fig. 7 Planning System in Romania: main legislation, system of plans, administrative competences

The enforcing of all plan provisions is assured through the release of Urban Planning Certificates, overseen by the Chief Architects at local level. Furthermore, the application of these provisions is supervised by the State Building Inspectorate and County Chief Architects.

The application of the planning system in practice in Romania suffers from certain legislative gaps that haven t been covered yet by the successive changes in the planning legislation. Elements regarding the operationalization of different law provisions remain unclear, but it is also worthy to note the lack of correlation between legislative provisions in different domains, especially concerning property rights (Ian i, 2008). Moreover, planning becomes more and more associated with the ab structural funds (Florescu and Mitrea, 2015), which eventually determines a submission of the national planning system to EU- level guidelines, often ignoring the need to focus on urgent local issues such as demographic decline or de-industrialised areas.

Furthermore, an analysis of policies and planning documentations in post-communist Romania highglights the territory s excessive fragmentation at all levels. This fragmented k territory, also caused by a lack of integrated data collection and analysis system, determines a lower impact of planning interventions (Groza, 2009). In this context, although there are some breakthroughs in using GeoICT services to support planning processes (Section 4.1), there is currently a lack of correlation between the planning sector and the ICT sector, with the latter only seen as a tool for decision support in some planning areas.

4. GeoICT services in support of planning processes

3.1. Netherlands

In the case of the Netherlands, IMRO is set as a compulsory standard since 2006 by the Dutch Ministry of Spatial Planning and Environment, for the definition of all land use types. This had been addressed in accordance with the GEMET thesaurus (General Multilingual Environmental Thesaurus coming in the form of a SKOS vocabulary http://www.eionet.europa.eu/gemet), covering for 40 themes of relevance to all levels of government (Hopkins et al. 2003)

An example of geoICT service is the **3D Pilot NL CityGML ADE IMGeo 2.0** a national 3D standard set up by the NSDI ExCo - Geonovum together with the Dutch Kadaster, the Netherlands Geodetic Commission and the Dutch Ministry of Infrastructure and Environment, under an ongoing national programme reaching multiple targets: harmonising the semantics of various representation of classes, attributes, code lists etc.; reaching an agreement on profiles and versions of interface standards such as the OGC Web Map Service (WMS) and Web Feature Service (WFS); coordinating reference systems, image formats, etc. in order to improve interoperability.

Related to public land management, 3D Pilot NL presents its added value covering for 3D cadastre - e.g. describing the properties owned in high rise condominium developments and integrated planning and management of underground and aboveground municipal assets. The integration of surface and subsurface data, the 3D virtual spatial planning environments (e.g. calculating soil volumes of planned tunnels), along with the recording of properties located above and below each other covering for the 3D cadastre, plus a 4D change detection are some of the use cases addressed through this initiative in its attempt to provide solutions within the spatial planning professions. (Trakas et al. 2012)

The 3D Pilot NL shares a dependency on open access to a rich infrastructure of 3D data provision and services. Such model advanced the use of geoICT services to be addressed by the planning community wherever European governments - national, sub-national or local - choose to promote such use. As ICT advances, such best practices of institutional team building and enhanced working policies need to be embedded in nation-wide incentives. (Trakas et al. 2012)

Another best practice example is the **Legal ATLAS**: a new type of corroborated service, in which legal provisions are aligned with the spatial mapping of land use regulations. Working in the form of an internet portal, the Legal ATLAS combines existing technology for disclosing legal texts with GIS. (Quote) Its main asset is the fact that it provides a map-based *normative reasoning* by checking the consistency of two sets of spatial norms for example if a zoning plan at city level fits the overall zoning plan of the province or whether a particular plan is allowed at a specific location.

3.2. Italy

The **Urban-GIS** project initiated as a mosaique of communal urban planning instruments (addressed at local scale) by Lazio Region - Sistema Informativo Territoriale Regionale SITR Area inside the Regional Directorate for Territory, Urban Planning, Mobility and Waste Management - with the primary scope of creating an information system compatible with the Territorial Data Infrastructure (IDT) at Regional level. (Merola, 2014)

Urban-GIS is a GIS tool thought for the harmonisation of all existing urban planning instruments enforced at regional level, with the purpose of creating a single framework alltogether. The purpose of this initiative concerns the multiuse of a facilitated and accessible consultation for all information related to urban plans. An unified legend will ensure the comprehensibility of various destinations provided by the planning instruments enforced. The project is defined in synergy with the other territorial entities (Provinces and Communes), beyond the data provisions of related competence, which consent for continuous updates within the acknowledged framework. This geoICT service performs an efficient monitoring of the current state-of-the-art in Lazio regional planning. In a first phase, the platform will run for internal utility between the sectorial operators and main providers. Afterwards, all citizens will be invited to use the regional Geoportal and provide further considerations towards the utility in consulting planning instruments. For future developments, Urban-GIS considers the insertion of specific protocols in terms of real-time (4D) provisions of wider and more reliable platform dissemination, as long as the continuous upkeeping in terms of data updating is ensured. (Merola, 2014)

NEWPLAN an award-winning geoICT service tackling the disparities at geospatial scale within the planning domain presents the concept of Paperless Urban Planning based on geospatial technologies targeting Workflow Management, while getting the civil society involved as co-designer. NEWPLAN started as a geoICT service based on GIS designed by Trilogis for the Autonomous Province of Bolzano, aiming to aid the central level of the territorial government, merging the urban plans of each municipality onto the provisions of the province, in line with the levels of the planning system addressed (Conti, 2013).

The problem faced by such service was the inconsistency and discrepancies inside the Italian Planning System, when trying to export its use for the neighboring Province of Trento, characterized by different land use policies.

The **Plan4All** project concerned the interoperability and the harmonisation of spatial data in scope of territorial planning. It addressed the synthesis of existing standards at the moment of implementation (2010 - 2013), the metadata profiling for territorial planning, shared data models and the harmonisation

process, relying on a database of existing best practices in Europe at regional and communal levels, taking into consideration also ongoing research initiatives at the moment of implementation, covering for the 7 themes addressed by INSPIRE.

One of the first international workshops (held in Rome in 2010) addressing these issues has managed to consolidate dialogues with the professional orders (architects', planners', landscapers', e cultural associations (i.e. INU, the Italian National Institute of Urbanism) and other interested institutions interested by these topics, evidencing the difficulty in reaching a common dialogue / language between various approaches and cultures in need of interaction. Matters of particular interest in the project focused on: (Vico et al. 2010).
1. Harmonised Data concerning Regional Laws
2. Operativity concerning various Scales and various Types of Plans

All in all, the Plan4All workshop concluded that a Territorial Coordination Plan (PTCP) would clearly establish the role of the Province and the contribution to its main tasks (e.g. provisions of the Communal Structural Plan would be addressed by provisions of the Regional Structural Plan through means of the Provincial Territorial Coordination Plan). In ensuring this, a Compatibility Plan would be consisted as a mosaique of Communal Plans. As such, with time, the Province will properly confront the hierarchical harmonisation and normalisation of the plans at various levels (vertical). To achieve this, a "telescopic" data model and an unified legend (shared dictionary) for addressing geographical objects and norms at various cartographic levels and scales have been defined and tested. The primary scope is to favor data fluxes through various hierarchical levels, whilst ensuring the preservation of certain autonomy at communal level and the integrated management of additional information of specific interests, in an extendable and exportable model (Vico et al. 2010).

The peculiarity (and the difficulty) of the Italian situation resides in the existence of 20 different Urban Laws, which are directly derived from a single national legislative node, albeit oriented in similar directions, giving form to a fragmentation of processes, procedures and cultures which render in a highly complex mode the way towards achieving data interoperability in the same national context. The necessity in proceeding towards the data and metadata models common in Europe must therefore firstly overcome the non-indifferent obstacle of the national level.

3.3. Romania

According to the provisions of Law no. 350/2001 with its subsequent modification, all urban planning documentations have to be realized in digital or analogic format, on topographical support which is revised using satellite images or terrain measurements. The electronic form of a documentation is very important as the law clearly stipulates the need to send the electronic data to the National Agency of Cadastre in order for it to be published on the INSPIRE Geoportal. The ICT impact is even greater on the dissemination of plans, as many local authorities publish intermediary forms of the plans on their websites for the public consultation procedures. In recent years, the development of GIS technologies has led many local authorities to command the realization of urban plans in GIS format, in order to help their management of spatial planning data (permit procedures etc.) after the ratification of the plan.

Breakthroughs in the use of geoICT services in Romania have often been funded through structural funds, including pre-accession instruments. An example is the two Geoportals (one for the discovery of spatial information at national level and the other granting access to geo-products) set upt by the Romanian National Agency for Cadastre and Land Registration (ANCPI) and the Duttch Kadaster International within the PHARE Twinning project *Geodetic network modernization and spatial data inftastructure framework* (Bulens et al, 2009).

GeoICT web services have developed at local level due to the involvement of local public administrations (Bucharest, Galati, Oradea), while at national level they were determined by the need to implement EU Directives, with the creation of portals in domain such as agriculture, biodiversity or water management (Ioni et al, 2006).

The lack of an integrated data collection platform to support planning processes is currently being addressed through the Territorial Observatory project (started April 2015). A subject widely addressed by planning professionals for years, the functioning of such a system has two main objectives: providing support to planning policy, by improving the knowledge on territorial reality and its dynamic, and dissemination of territorial information to the population in order to increase participation in implementing and sustaining planning and development policies (Groza, 2009).

The new Dynamic Master Plan for Bucharest, the capital city s General Urban Plan which is c being drafted, is an innovative example of using geoICT in an urban planning documentation from the analysis of the existing situation (using an integrated, city and metropolitan level database) to the drafting of a set of dynamic planning regulations (Florescu, 2012). The new Dynamic Master Plan aims, through the use of geoICT, to reduce spatial disparities by pursuing flexible mixes of amenities, thus pro-actively engaging with the changing structure of the city (Florescu and Mitrea, 2015).

All in all, while there is progress made in the domain of geoICT services supporting planning processes in Romania, this progress is only partially sustained at central level, with no framework being provided on the use of geospatial data in territorial and urban plans. Moreover, except from some central government initiatives including initiatives of the National Cadastre Agency -, most advances in geoICT service provision in planning have been the result of local initiatives from city halls.

5. Conclusions

Using plans requires the representation of the content of plans in relation to possible decisions so as to choose among alternatives knowing the expected consequences (Hopkins et al, 2003). Consequently, there is a need for decisions about urban development to be based on both analytical models of urban development processes and forecasting (Hopkins et al, 2003). While the authors above consider the implementation of a Planning Markup Language as a step in the standardisation of geoICT services supporting spatial planning, the differences highlighted in this article between different planning systems and cultures underline the difficulty of such an attempt.

A further challenge comes in tackling overlapping jurisdiction from different government bodies empowering a multitude of different regulations applied. The Metalex developers (2009) reached the conclusion that land use regulations issued by adjoining municipalities categorised differently, determine the land use `regime' in these municipalities as uncomparable. More than anything else in the world, in this era of globalisation governed by commerce and consumerism, planning also needs to go global. The interoperability of planning instruments and services is the process to be ensured so that all the related professions are able to address similar issues in similar ways. A unified *legend*, together with aligning part of the planning processes addressed by different administrations, should ensure a better outcome in the 4D attempt on Smart Planning Processes.

As we have seen in the case of NEWPLAN, systems must be designed in such a way that once a service model is available it can be reused and/or cope with ever ever-changing requirements of the geo-information users, thus ensuring some degree of sustainability and resilience (Acharya 2009). Basic provisions, such as the ownership concerning Land Administration rights held based on statutory law,

common law, customary traditions and informal use, should be a value input clearly addressed by geoICT services such as Legal ATLAS' MetaLEX (NL) or NEWPLAN (IT). Although constant efforts are made in geo-technology diverse applications, the absence of the actual reliance of harmonized planning systems in which to make use of these (see the case of NEWPLAN) is clearly noticed; hence, a further question to be addressed is: How would a Smart Planning System look like be defined?

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