E-Governance

&

Spatial Planning

Decision-Making

ECTP-CEU   Young Planners Workshop 2015

11th Biennial of European Towns & Town Planners   DUBLÍN

Índex

CONCLUSIONS

Introduction

Presentation

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Dear reader,

The European Council of Spatial Planners (ECTP-CEU) strongly supports and promotes the annual Young Planners Workshop. One of its central objectives is to bring young planning professionals together from different parts of Europe. By doing so, participants experience in a very direct way how different viewpoints and approaches of different planning cultures can bring on a variety of solutions to specific planning issues. The Working Group creates intensive Networking, but is above all designed for learning on the spot by discussing and valorizing input from many young professionals. A variety of methods, instruments and techniques relevant for spatial planning is presented during the workshop; this way, participants experience the relevance and dynamics of spatial planning as it is implemented in different cities and regions throughout Europe. By tackling real planning projects, the planning professionals can contribute to real improvements of our environment, our social condition and our economy. The added value the spatial planner can offer is definitely the integrative approach by visualizing the consequences different sectorial decisions can have on the spatial development of a specific place.

This year's Working Group focused on e-governance and spatial planning decision making. At the 11th Biennial in Dublin, titled 'Making cities work, Technology in planning practice', the call for proposals led to a wide range of submissions from many different parts of Europe. It is because of this enthusiastic response that the 2015 event became a big success with the plenary presentation of the Young Planners Workshop at the Biennial as a highlight. The Working group pursued their discussions after the Biennial, reaching the conclusions that are presented in this e-book.

Let me recommend the e-book to all - young and older - spatial planners, members of the ECTP-CEU member associations throughout Europe, not only to inform themselves on the topic and the approach by different teams, but also to encourage young planners to partake in the 2016 Young Planners Workshop event.

Finally, let me conclude by thanking Ignacio Peman, member of the ECTP-CEU Executive Committee and representative delegate from the Spanish association AETU, who not only initiated the young planner's workshop, but is the untiring promotor and organizer of the working group, as well as final editor of this e-book. Muchas Gracias!

Introduction

Ignacio Pemán

ECTP-CEU Young Planners Workshop Chair

1. Objectives and challenges.

1.1 New technologies, spatial planning and participation in the framework of European challenges

This publication contains the findings of the workshop carried out between April and October 2015 on the topic "E-Governance, Spatial Planning and Decision-Making", whose results were presented in Dublin (Ireland) on October 15th-16th 2015 within the framework of the XI Biennial of European Towns and Town Planners "Making Cities Work; Technology in Planning Practice".

An expansion of the concept of e-planning on planners, policy makers, advisors and consultants is foreseeable in the 21st century. This will entail the application of geospatial technologies by planners for the benefit of shaping local planning   and by citizens for finding new ways of participating, especially young people, in planning decision-making processes by ICT, all of which is explained in detail below.

1.2 New technologies, spatial planning and new paradigms of cities

Urban resilience, besides resisting natural disasters and their subsequent recovery, means developing the cities' capacity to change and adapt, in response to various crisis situations. New technologies are extremely important for planners for several reasons: it allows them to draw up new maps with much broader and more accurate information. This permits combining geotechnical information concerning rain and flooding, or rises in the river water level, providing new information to take decisions about new land occupation. This information, supported by new technology, enables city decisions to be adapted to climate change and future disasters such as earthquakes and floods within the new paradigms of the resilient city.

Secondly, innovative new technologies provide a new management system method for the city. Smart cities include the ICT sector as well as public and private investors, and partners from other sectors (building, energy systems, transport, water and waste). The European Commission's Digital Agenda is one of the seven pillars of the Europe 2020 Strategy, and refers to Smart Cities making strategic use of information and communication infrastructures and services in a process of transparent urban planning and management that is responsive to the social and economic needs of society. In the same way, Society for Digital Earth 2020 promotes an expansion of the concept of e-planning impacting on planners and policy makers. Thus, new technologies are bringing positive effects in the cities and not only in the most developed cities. As Anthony Townsend has explained "the humble mobile phone is bringing new economic and social opportunities to the burgeoning slums of the developing world".

In this way, major spatial data technologies, such as remote sensing (RS), geographic information systems (GIS), and global positioning systems (GPS) offer public decision-makers and spatial planners an enormous amount of available information. So, geographic information systems (GIS), as a public decision-making tool give alternative interactive approaches and multi-functional indicators that include multi-criteria evaluation methods, in the decision-making process.

But, new technologies also have important risks and unanswered questions, which are under debate in this workshop. One of them is the risk of applying mapping technologies to obtain the huge amount of information provided by new technologies but without clear spatial planning objectives. It is important to remember that accumulating information is only useful when the objective is to obtain better cities. Adam Greenfield has explored smart cities' risks concluding that "the ways in which this discourse treats the city as an abstraction, misunderstands (or even undermines) the processes that truly do generate meaning and value — and winds up making many of the same blunders that doomed the High Modernist urban planning of the twentieth century".

Indeed, Smart cities seem to be more of a technological concept than an urban one -Anthony Townsend -   and consequently Cedri Price's statement in 1966 of "Technology is the answer... but what was the question?" is still fully in force. And there is no doubt that the question is how to get a more sustainable city and how to implement the citizens' right to the city.To this end, this workshop has tried to think about how we should apply technology in order to make places more sustainable.

1.3 New technologies and participation

Since the 60s, the scope and channels of citizen participation has been the subject of a substantial rethinking based on studies in the Anglo-Saxon world. Especially important was the work by Sherry R. Arnstein, who described an eight-rung metaphorical ladder of participation. The rungs are organized into three levels: non participation (manipulation and therapy), tokenism (informing, consultation, placation), and citizen power (partnership, delegated power, citizen control). The last degree of participation must empower citizens in the final decisions.

This participative vision of urbanism reflects the conflict between planning's technical expertise and democratic aspiration, which has fueled the ongoing debate. Jürgen Habermas's theory of communicative action criticizes the technocratic conception of public decisions and proposes to implement democratic processes of public decision-making against the instrumental or

technical rationality that is controlled by experts and technicians.

Thus, the EC White Paper on Urban Policy, Cities of Tomorrow. Challenges, visions, ways forward (2011) expresses the opinion that there are opportunities to turn the threats into positive challenges, for example, sustainable local economies are more competitive when the local social participation, including youth participation, is intense and helps the local economic tissue as well as develops a pattern of inclusive economy. The involvement of city residents is crucial to the success of many urban policies, if they are directly linked to advocacy planning and empowerment through access to geoinformation.

New forms of urban governance may emerge to respond to this challenge, based on citizen empowerment and the participation of all relevant stakeholders, especially young people, as they can bring the most innovative uses of social capital. The involvement of city residents is crucial to the success of many urban policies, if they are directly linked to advocacy planning and empowerment through access to geo-information.

The Joint Report of the Council and the Commission on the implementation of the renewed framework for European cooperation in the youth field (2010 - 2018) recognizes that the participation of young people in democratic life is central to youth policy as well as employment and entrepreneurship, education and social inclusion.

In a similar way, the 2013 Charter of European Planning promoted by the European Council of Spatial Planners, underlines the importance of community involvement through active networks of citizens. In order to achieve this, active stakeholders need to get new forms of access to information concerning planning and local decisions, mainly geospatial information. This is a crucial instrument to arouse the points of view of different social agents in debates that accompany public sector and local authority decision-making processes. Establishing youth voice in advocacy planning processes will contribute to real social and political engagement and meaningful participation in shaping the future of their living environment.

2. Projects developed, different perspectives, enriching a complex challenge

According to this general context, papers have analyzed E-governence&spatial planning from two different perspectives: Technology for Design and Technology for participation.

2.1 Technology for Design:

Some works have focused on the influence of new technologies on spatial planning from different perspectives: National scale, regional scale and urban scale. So, the article Technological steps towards integrative cities analyzes the application of new technologies in national scale planning in Malta. The article focuses especially on the W6H concept which is "employed as a basis for integration whilst the effort is currently being upgraded to encompass all spatial data creators and users entities that have a role in the foresight activities of the Maltese Islands". It describes the new technologies as tools "available to planners through to the conceptualisation of a function that integrates baseline and thematic datasets for effective future analytical processes".

For its part, Retrofitting Challenging Urban Environments Towards a Modal Shift in Transportation assesses the overall impact of the Bike share scheme in the City of Cork using ITs in schemes and spatial aspect of the scheme relates the theme to planning. The work reviews "the history of Pubic Bike Sharing Schemes as background to understand the current phenomenon" and it assesses the "Public Bike Sharing Schemes in order to see how technology has aided the retrofitting of challenging urban environments".

Finally, Towards the Metropolitan City: adaptation strategies to climate change using new technologies and integrated approaches... focuses on a metropolitan area of Venice "an innovative method for analyzing and identificate environmental vulnerability using techniques of Remote Sensing" in order to implement adaptation and mitigation strategies. Summing up, this article puts the technology bases in place "in order to create a regional network for a Climate Plan on a metropolitan scale". And in order to achieve

"new paradigms of smart cities and resilience" it is essential to share among Administrations "information and new technologies which permit introducing models of Governance based on the participation and involvement of citizens".

2.2 Technology for People:

New technology as a tool to encourage participation in spatial planning, has been the focal point of the other five articles. Firstly, Centralisation and optimisation of the decision-making process... focuses on spatial planning and the participation process at local level in Slovenia. This Paper analyzes current participation processes describing how participation is working and pointing out four main weaknesses: "Firstly, public opinion is compiled in one of the final steps of the plan preparation. Secondly, every person has the right to comment on the supplemented draft, but invitation to draft disclosure is usually published only in local media and on the municipalities' websites. Thirdly, plan drafts are generally not accessible online. Fourthly, people interested in certain land plots are not notified when decisions regarding their interests are being accepted". Finally, the Paper proposes a method that would allow people to contribute to planning during the earlier planning stages by means of designing a model that would make it easier for users to track changes and that would encourage involvement in planning processes.

For its part, Participation is also the content of Pere IV, from industrial axis to urban Lab, focusing on participation processes at district scale in Barcelona Pere IV. This district articulates the industrial heritage of the district of Poblenou and the objective of the project was to reactivate the district using urban voids and empty plots. New technologies played a relevant role in this process and in particular two experiences: "Constelaciones a theoretical-practical interdisciplinary community which ranges between expanded documentary practice", and "C-installations an app for mobile devices that will enable people to see documents in the same space where they are positioned, carry out and document routes, establishing confluences between connected people".

Finally two works have focused on education at school level. Firstly, Volunteered Geographic Information (VGI)-Youth Urban Governance Toolkit

examines the youth utilization of Inquiry-based discovery conceptualization, as a sustainable toolkit for community mapping, generating user-modified maps, and disseminating spatial data. And Barnetråkk: An ICT Tool for the Participation of Children in Planning Processes and Urban Development analyzes "how participatory GIS can be used as an e-governance tool to incorporate the interests and experiences of children in advocacy planning. In light of the theory on participatory GIS, advocacy planning and urban planning participation, the work examines "the possibilities and challenges that are evident in the use of the map-based participation tool Barnetråkk (Children's Paths) in two medium-sized Norwegian cities".

3. Debate and conclusions.

Debate and questions raised by participants along the working on line (May-October) to prepare the final presentations in Dublin were led by the facilitator of the workshop Jon Manns, who has also written the conclusions of the workshop in the last article of this e-book.

To conclude, I would like to congratulate all participants for their excellent work, the ECTP-CEU Executive Committee and Julian Hills for his support and amazing photographic report of the presentations in Dublin. Finally, I would like to dedicate this e-book to Mihai Alexandru's memory, participant in former editions of this workshop and delegate of the Romanian Association of Planning, who died last November in a tragic accident in Bucharest.

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New technologies, participation and urban planning in Spain

Beatriz Santos

1. Introduction

Contemporary city can no longer be understood without technology and the digital culture that it generates, and therefore, urban management models cannot remain on the outside of these social changes. In this regard, the integration of technology into urban spaces raises two challenges.

On the one hand, the complexity and variety of information sources and databases that support how city works makes necessary the development of new visualization tools about urban spaces which allows users, managers or citizens, appropiate the information to explore the city and take decisions.

On the other hand, digital platforms recover a significant discussion about public participation concept. Urban digital platforms enable us to design different public participation systems and here we have two main options:

a) Setting up information systems that allow citizens to display data.

b) Setting up information systems to open participation which allow citizens

contribute and take advantage of these information for new uses and promote new discussions and projects.

2. New technologies and participation in urban planning

The growing interest in participation extended to urban planning can also be observed in some normative documents in Spain.

At national level, the National Land Law introduces some citizen's rights such us getting information about spatial and urban planning or to participate in urban planning and urban development which establishes the basis for an effective participation of civil society. It also contains the aim/objetive of achieving a greater transparency through the Urban Information System with the colaboration between Administrations.

But, these are subjetive rights that have to be applied by the Autonomous Communities. To facilitate this participation, the establishment of specific channels in regional and local laws and rules which provide in the different planning procedures the information, transparency and participation, is needed.

In the last years, Spanish public administrations have increasingly incorporated in their regulation, at varying degrees, instruments to facilitate information, transparency and participatory processes. Asturias, Catalonia, Aragon and Basque Country, among others, promote the use of web-based technology to encourage the civic participation in the preparation and processing of planning instruments, as well as its dissemination. To this end, figures like Urban Information Systems have been created which can make available to citizens all the current planning intruments information through different websites.

Furthermore, the Autonomous Community of Navarre requires a citizen's participation process prior to initial approval of General Urban Plans and Local

and Special Development Plans which pose new urban developments, with advisory status. This process will be implemented by a Participation Plan, including on-line participation systems. Basque Country, Catalonia and The Balearic Islands also incorporate the citizen's participation programmes in general urban planning procedure.

3. The case of Aragon

3.1 Legal framework

At regional level, Aragon's Urban Planning Law also introduces the right to access to all urban information and contains the Urban Information System of Aragon as the main tool to ensure the information Access and the Urban Platform of Aragon, the first step to facilitate participation in urban planning processes.

But in order to show all this information with a proper quality and in such a way that is easily understable by all, it is necessary to stablish some criteria for the development of planning instruments and also designing and preparation aspects to get homogenous plans and documents. In that sense, Aragon's Governemnt approved the Planning Technical Rule.

3.2 Main actions and projects

During the last years, Aragon's Government has supported the technological innovation and the investment in infrastructures to allow better access to urban planning information by the citizens, a greater transparency and an improvement in the public participation process of the urban planning instruments.

The two main pillars of this project are the Urban Information System of Aragon and the Urban Platform of Aragon, complemented in a necessary way by other instruments like the Planning Digital Diligence, which is essential to ensure

the legal certainty, and the Aragon's Planning Technical Rule. But, in addition to that, to achieve these targets (information, transparency and participation) a set of technological projects has been developed enabling to manage and implement these important changes.

Urban Information System

The Urban Information System of Aragon is a set of tools designed for existing urban information publication and diffusion. Its main objective is facilitate citizen access to the information of urban planning instruments approved in a telematically way.

The main objectives of this project are:

- Collect and disseminate the urban information produced by Aragon's Public Administrations: Town Halls, Regional Councils… This means searching for the last version of the documents and processing them.

- Facilitate knowledge and access to this information. Telematic access is promoted to citizens by a website through which users can consult the urban planning information.

- Establish relationships with other Administrations by integrating their Information Systems adding their vectorial layers such us Environmental institute or Hydrographic Confederation.

- Keeping the information and content update.

It has two parts: the Archive and the Viewer.

Archive

The urban planning file ensures the telematic access to all the information collected from the different planning instruments of the municipalities.

The information is organised by municipalities so that you can write the name of the town/city and it will appear all the urban planning instruments that have been aproved and are currently in place. There are four differents sections: general planning, development planning and modifications of both.

Once you have found the instrument you can download the written and graphic documents: memories, plans, planning regulations… They have been scanning and catalogued previously because all the right documents must have the diligence that ensures their validity and untill now it is a manual process (sign and stamp).

This year a new web tool has been developped that allows make that process digitally and hopefuly future documents don't have to be scanned which will result in a net saving of resources and time.

Viewer

The viewer is a geographic information visualization application where you can check the urban planning information of the municipalities previously digitalised and vectorized. Furtheremore you can get information about current urban plans such us land uses, classification zoning, data sectors…

You also can overlay map layers from other sectorial organisations: Environment Institute, Hydrographic Confederation, Land Register.

The main change is the possibility to download the vector layer of each municipality: land uses and also zoning classification.

Urban Platform of Aragon

The Urban Platform of Aragon is constituted as a central system to make easier the administrative process of the urban planning instruments and also promote a higher transparency of these instruments.

The Urban Planning Department takes an important step in its bid for the e-administration, laying the groundwork for the beginnings of the urban planning files Electronic Process.

The Urban Platform of Aragon will be consolidated as a central service that incorporates the new technologies to all urban procedures, brings transparency to public action regarding urban planning, provides a web environment to municipalities to facilitate the Electronic process of the urban planning instruments and also constitutes the tool which helps greater advertising encouraging a more efficient public participation process and spending up administrative processes.

This project is been developed in two stages: the Viewer and the Telematic Proccesing System.

Viewer

The first stage is already in use; it provides for consultation the different urban plans that are now in processing procedure

Through the web http://idearagon.aragon.es/PUA/ the different plans that are in each stage of the process can be analysed and, selecting one of them, the information of the technical project in pdf will be showed.

Telematic Processing System

The second, and more ambitious, stage is now in progress and will be implemented at the beginning of next year.

It will have three different parts: one for the legal advisors of the municipalities, another for the sectorial agencies involved in urban planning and another one for citizens.

Citizens will be able to make suggestions or allegations in the public information

period through the web. Later they will receive the answer telematically.

Local authorities will be able to ask the sectorial reports through the Platform, when sectorial agencies receive the request, they will send the reports also through the web.

4. Conclusions

Despite living in the twenty-fist century, in the 'information and knowledge society', the participation systems that we usually find in our cities respond to controlled and driven processes that, in the particular case of urban planning, are limited to include public information periods or submitting comments at appropiate stages of the procedure. This is the model, that, por example, we encounter in the development of urban plans.

Public administrations are making a huge effort to improve the urban information and make it available for citizens through telematic means. But, although information is a basic pillar for participation, it is not enough; the use of websites can goes beyond only information and, due to the web possibilities, become in vitual meeting places (fórums) of communication required for creating community.

Therefore, active participation requires three conditions:

1. Information, which adopts formats and digital uses increasingly understandable and accesible to all citizens.

2. "Places" of communication that could be taken to reflect a public spaces, being either analogic urban spaces or digital platforms that through Internet become new digital public spaces.

3. Ability to make decisions, individual or collective according to the draft in

each case. When collective, mechanisms must exit to facilitate a deliberative process and decisión-making processes.

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Papers

Centralisation and optimisation of decesion making process: Revision of spatial planning in Republic of Slovenia

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1. Introduction

In order to achieve public acceptance and a democratic decision-making, planners increasingly rely on social sciences to test public opinion and to understand what the public wants. Improving traditional methods with interactive and collaborative methods (such as workshops, focus groups etc.) is becoming a common measure for improving the level of participation. Engaging public to use modern information and communication technology (supported by GIS system) is one of the collaborative methods of aiding the existing planning process, which is already in use. One of the examples is highlighted in the paper The Role of the Creation and Sharing of Digital Media Content in Participatory E-Planning (Saad-Sulonen, 2012) where the official participation e-tools such as "Tell it on the map" and "Plans on the maps" have been adopted by Helsinki planning department.

In this paper, we summarized the spatial planning legislation in the Republic of Slovenia with focus on public participation and performed a case study on spatial information accessibility. After the assessment, we proposed a model of the ICT based system, which could improve the role of public opinion and raise the level of citizen participation. The model was discussed with representatives of the ministry (Ministry of environment and spatial planning), municipalities and planning companies, to evaluate the pros and cons of the preposition.

2. Spatial planning in the Republic of Slovenia

The objective of spatial planning is to enable coherent spatial development with consideration and harmonization of different development needs and interests with public benefits in the areas of environmental protection, the conservation of nature and cultural heritage, the protection of natural resources, defence and protection against natural and other disasters. Spatial planning is in the public interest. The state and a self-governing local community (municipality) must provide with spatial planning a quality living environment with a use of space which enables the needs of the current generation to be fulfilled and does not pose a threat to the needs of future generations, taking into consideration long-term environmental protection, nature conservation and the sustainable use of natural goods and other resources and overall preservation of cultural heritage (Spatial Planning Act, 2007).

Levels of competence in the Republic of Slovenia

The state is competent for:

- Target setting for spatial development of the state.
- Determining references and guidelines for planning spatial arrangements at all levels.
- planning spatial arrangements of national importance.
- supervision of the legality of spatial planning at the municipal level.

The municipality is competent for:

- Determining references and guidelines for the spatial development of the municipality.
- Determining the use of space and conditions for placing interventions in space.
- Planning spatial arrangements of local importance (Ibid.)

Two levels of competence result in two different types of spatial plans. National spatial plans are made by the state and are additionally regulated by Act Regarding the siting of spatial arrangements of national significance

and the physical space. Municipal spatial plans are prepared by self-governing local communities (municipalities). Slovenia's territory is divided into 212 municipalities. Since spatial planning is a continuous process, all the municipalities will renew their spatial plans in near future. Each of the municipalities has their own form of a spatial plan. Spatial planning act (2007) only prescribes the form as followed: Spatial planning acts contain graphic and textual parts. They are made in digital form, while archiving and access to them is provided in digital and analogue form, and uses different systems to present them in digital form. Bearing that in mind, we have decided to focus in this paper on municipal spatial plans only.

Municipal spatial planning documents are the municipal spatial plan and municipal detailed spatial plan. Municipality can adopt the strategic part of a municipal spatial plan as a municipal strategic spatial plan, which is an independent municipal spatial planning document. The process of adopting municipal spatial plan has seven main stages (Figure 1) and is supervised by the municipality, but carried out by a private contractor (licensed spatial planners).

Stages of adopting the municipal spatial plan

Drafting of the municipal spatial plan begins with a decision adopted by the mayor of the municipality. Such decision is than sent to the ministry and neighbouring municipalities and is published in the official publication and on the Internet. This document contains an assessment of the situation and reasons for the drafting of the spatial plan, the area of a spatial plan (if only amendments of the current spatial plan are concerned), the manner of the acquisition of expert solutions, deadlines for the drafting and individual phases and the reference of institutions performing spatial planning, which provide guidelines for the planned spatial arrangements within their competence (Spatial Planning Act, 2007).

In the next stage municipality prepares a draft municipal spatial plan, regarding guidelines from the national strategic spatial plan, guidelines from the municipal strategic spatial plan, development needs of the municipality and existing development programme for the area covered in the planning
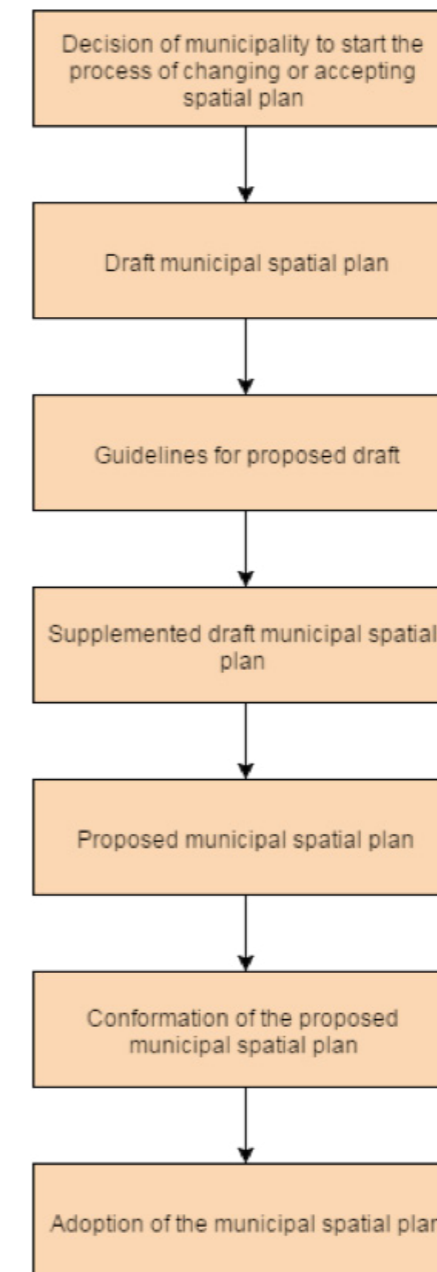
document and other needs (ibid).

Figure 1. *Stages of Municipal spatial planning in the Republic of Slovenia*

Draft is then sent to the Ministry of the environment and spatial planning, which forwards it to the institutions performing spatial planning in maximum 7 days. In 30 days, the institutions then provide guidelines for the proposed spatial arrangements in the document, regarding their competence. Guidelines are sent to the municipality and to the ministries. If the institutions performing spatial planning fail to submit the guidelines, it shall be considered that they do not have any remarks and concur with the draft. In this stage the ministry responsible for environmental protection decides whether a comprehensive environmental impact assessment should be carried out for the spatial plan (Ibid.).

In this stage, the municipality considering the guidelines provided by the institutions performing spatial planning prepares Supplemented draft municipal spatial plan. In this stage various solutions can be presented, which are then assessed in terms of the spatial, environmental, functional and economic aspects. If necessary, a comprehensive environmental impact assessment is performed. If based on the guidelines provided by institutions participating in spatial planning the municipality cannot harmonise the draft spatial plan, it informs the ministry. Within 15 days, the ministry ensures harmonisations between the municipality and institutions participating in spatial planning the guidelines of which the municipality was not able to harmonise with the draft municipal spatial plan (Ibid.).

Municipality informs the public with a supplemented draft municipal spatial plan as part of a public exhibition and hearing, which lasts at least 30 days. Municipality informs public by means of a public announcement in a manner commonly practised in its local area and on the internet. Announcement of the public exhibition must be published at least seven days before the first day of the exhibition. Information provided are: place and time of the public exhibition with the web link to the electronic version of the plan, place and time of the public hearing and the manner of making public comments and proposals with the deadline for their submission. Comments and proposals are then reviewed and position towards them is published in the manner commonly practised in its local area and on the internet. Authors of the comments must be informed by the municipality in writing about its position on the remarks and proposals expressed within the public exhibition. Public announcements

must also contain references of all those land parcels of which the eligible use is changed, except in the drafting of the first municipal spatial plan (Ibid.).

Based on the position on the remarks and proposals from the public, a proposed municipal spatial plan is presented and sent to the ministry. In the next seven days, the ministry then forwards it to the institutions participating in spatial planning to assess within 21 days if their guidelines have been taken into account during preparation of the draft of municipal spatial plan(Ibid.).

A municipal spatial plan is adopted by a municipal council with a decree which is published in the official publication together with the date and number of the minister's decision (Ibid.).

3. Public participation

Democratic theory (Pateman, 1970; Grabow et al., 2006) offers two basic rationales for citizen participation in decision-making:

1. Citizen participation is likely to produce better decisions:

- More complete knowledge or expertise from citizens results in informed decisions.
- Citizen interests will be better articulated and presumably better accommodated.
- Legitimization and implementation of strategies are likely to be easier to the extent that citizens are satisfied, and their various interests are adequately addressed.

2. Citizen participation is likely to produce better citizens:

- Citizenship is enhanced when citizens shoulder part of the responsibility for the formulation or implementation of decisions.
- Active participation educates and empowers citizens at the same time it commits and makes them responsible for civic action.

Arnstein (1969) defines citizen participation as categorical term for citizen power ("Citizen participation is citizen power"). The problem that we are usually facing when dealing with participation is uneven distribution of power. There are have-not citizens that are left out in the process of planning so we need to aim for the system that will deliberately include them in the future.

Citizen power varies from one system to another so Arnstein (1969) divides it into different levels that can be illustrated by a ladder of participation (Figure 2). The ladder has eight rungs, which distinguish between different levels of participation according to the power citizens possess:

Non-participation

There are two levels of nonparticipation: manipulation and therapy. They are used as a substitute for genuine participation and they normally mean one-side communication. The powerholders have the main role in these levels. For instance, they are educating the crowds but they do not hear their voice as a feedback.

Tokenism

Next level of participation is tokenism that moves from one-sided communication to two-sided communication. In this case, powerholders are not only educating people, they also give them a voice. There are three levels of tokenism: informing, consultation and placation. The shortcoming of all three of them is that decision is still on the side of the powerholders.

Citizen power

Citizen power is the highest form of participation that takes power from the traditional powerholders. There are two levels of citizen power: partnership and citizen control. Partnership opens opportunities for negotiation so that participants are equivalent parties in the process. The last rung is reached when the have-not citizens obtain majority or full power in the decision-making process.
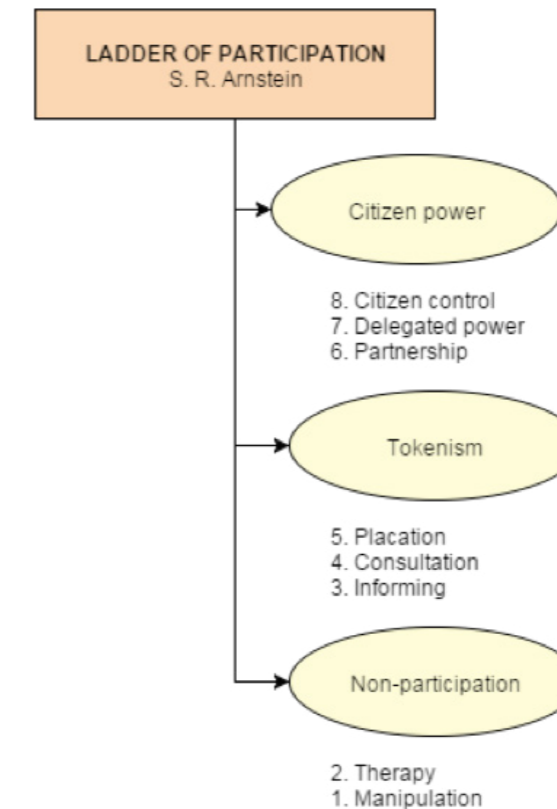
Figure 2. *Ladder of participation (Arnstein S.R., 1969)*

Similarly, Krause (2014) defines five targets and benefits of public participation in the planning processes:

- Positive influence on planning processes by increasing acceptability.

- Decision-making process becomes more transparent.

- Unifying ideas and everyday knowledge.

- Improving the base knowledge.

- Better understanding and cooperation between citizens and administration.

Unfortunately in many cases, public participation is seen just as the part of the process; something that must be done, to fulfil mandatory tasks (Glass J. 1979; Interviews, 2015). Innes et al (2000) claim that traditional methods of public participation in government decision-making often do not work. They do not achieve genuine participation in planning or decisions; they do not provide significant information to public officials that makes a difference to their actions; they do not satisfy members of the public that they are being heard; they do not improve the decisions that agencies and public officials make; and they don't represent a broad spectrum of the public. Public hearings at the local level are typically attended only by avid proponents and opponents of a measure affecting them personally, an occasional organized interest group, and a handful of diehard city council or commission watchers.

The same problem that was highlighted by Innes et al. (2000) can be observed in countries all over the world, and the situation in the Republic of Slovenia mostly the same as it has been confirmed during the preparation of this paper.

4. Participation in Slovene planning system

Spatial Planning Act guarantees followings rights to citizens:

- Individuals or population groups must be allowed to express their interests regarding planning issues.
- All interested persons in procedures of drafting and adopting spatial planning documents must be allowed to participate.

Municipality must inform public with a public announcement and on the internet at least 7 days before public exhibition of the municipal spatial plan draft (or supplemented draft). Public exhibition lasts at least 30 days and includes a public hearing. During the public exhibition, the public can make comments and proposals on the supplemented draft strategic spatial plan. The municipality has 30 days to review and take a stand regarding the comments and proposals and publish it in its local area and on the internet. Municipality must inform

owners of the land on which changes are planned in written form with its position on the remarks and proposals expressed within the public exhibition. Justified and acceptable comments are used and included in the next step of the decision-making process (Spatial Planning Act, 2007).

5. Analsys of spatial information accessibility

This paper is based on a hypothesis, that we need a centralized system which would allow users to browse local spatial plans (images, maps) and easily access data about land plots, such as permissible utilization of space and restrictions and subm9it proposals and comments for the upcoming spatial act or proposed spatial plan. To justify our suggestions, we performed a research on a sample of 20 municipalities (9.4 % of 212), during which we tried to establish whether a citizen is able to access specific data about the specific land plot.

Due to the specific distribution of municipalities (82.5 % of municipalities have less than 14.000 inhabitants, 21.2 % of municipalities have less than 2.500 inhabitants), simple random choice for testing is not suitable. Therefore, we sorted them by the number of inhabitants and split them into 5 classes with at least 35 entities to get as equal ranges as possible. The resulting classes are limited by the number of inhabitants as shown in Table 1. Afterwards we picked four municipalities (at random) from each class for further research. The chosen municipalities are shown in Table 2 and Figure 3.

Number of inhabitants	Number of municipalities	Cumulative (%)
< 2,500	45	21,2
2,500 - 4,000	43	415
4,000 - 6,500	45	62.7
6,500 - 14,000	42	82.5
> 14,000	37	100

Table 1. *Municipality classification (source: SiStat, 2015)*

Municipality	Number of inhabitants
Tabor	1,626
Središ e ob Dravi	2,062
Vitanje	2,244
Kostanjevica na Krki	2,427
Vuzenica	2,717
Rogatec	3,123
Šmarješke Toplice	3,292
Dolenjske Toplice	3,398
renšovci	4,030
Cerkno	4,702
Radenci	5,233
Lukovica	5,650
Ra e-Fram	7,040
Ruše	7,190
Lendava	10,602
Ravne na Koroškem	11,303
Slovenske Konjice	14,524
Ivan na Gorica	16,050
Kranj	55,764
Maribor	111,842

Table 2. *Chosen sample of municipalities (source: SiStat, 2015)*
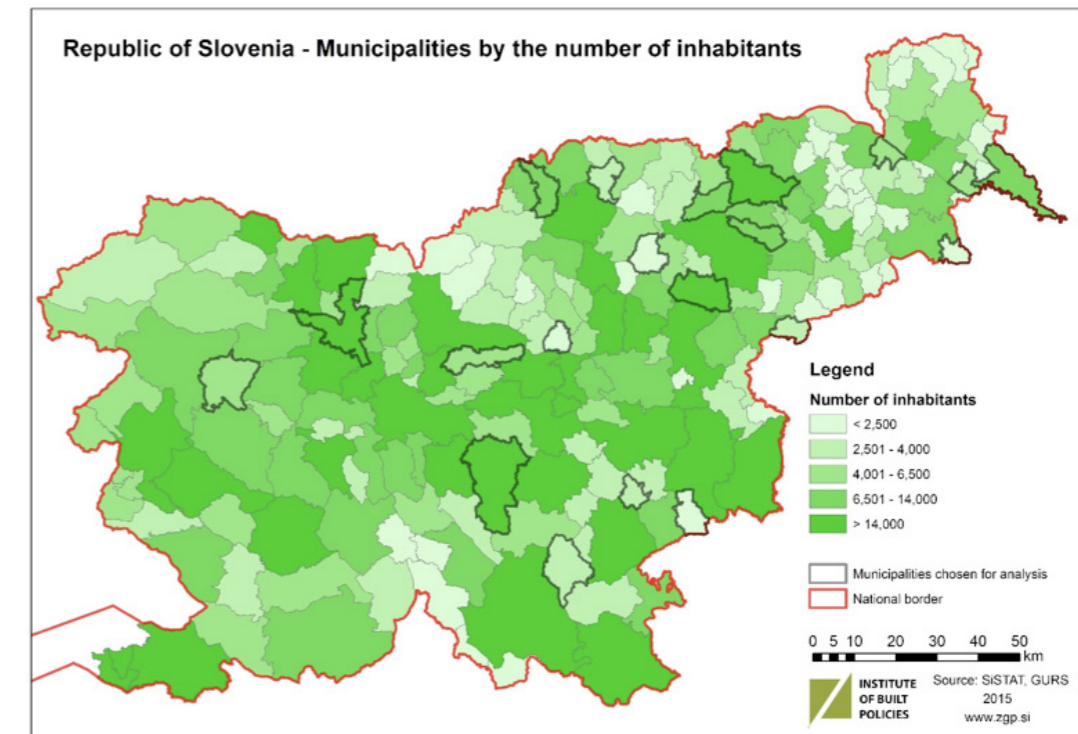
Figure 3. *Municipalities by the number of inhabitants, chosen for*

We prepared a form with six questions that we tried to answer for all twenty selected municipalities. Questions focused on the accessibility of spatial plans.

Our goal was to find out:

- How hard it is for citizen to find spatial plan using the internet (search engine or web pages that specialise in spatial data of municipalities).

- How much information on one land plot can one get using only the internet (information on permissible utilization and implementation conditions).

- To find comments and proposals on the existing spatial plans (document with reviewed comments and proposals must be accessible online by law) as an illustration of the current level of participation in selected municipality.

6. Findings

We determined that there are a lot of data about local spatial plans available on the internet, but they are scattered on several different locations and are not very easy to find. Municipal spatial plans are rarely mentioned on the municipal website, and are easier to find by searching keywords local spatial plan + name of the municipality. The results often lead to the website of the Official gazette of the Republic of Slovenia where the textual part of the spatial plan is available (without annexes). There are a number of documents, which are substantively connected to the textual part of the plan and provide detailed information. These documents are often hard to find and can only be found by using search engines such as Google. During the research, we found one case (Municipality Slovenske Konjice), where all the documents were it one place (Municipal website), but it was hard to navigate from main site to the list. In addition, websites are rarely updated (we even found a case, where the data concerning spatial planning has not been updated since 2007.

Graphical parts of the spatial plan are mostly available on different GIS portals, but sometimes the municipality has their own GIS system (often outdated). A user has to log in to browse data for a specific municipality. Browsing the data outside the municipal borders is conditioned by another login (new window). Mostly data about permissible utilization is available, and sometimes even data about the Spatial planning unit (ID) can be found. However, detailed data are available only by manually browsing the textual part of the spatial plan. The form of the textual part is vaguely determined by Spatial planning act, but varies from one municipality to another, therefore searching can be difficult.

Comments and proposals on drafted spatial plans can be found using a search engine, but they are not linked to the municipal plan documentation and are rarely found on the municipal website. Submitting comments and proposals is generally enabled for the mandatory period of 30 days during public hearing (as is prescribed in the Spatial Planning Act). We were able to find comments and proposals just for a couple of municipalities.

Based on the findings, we believe that the system of spatial planning in Slovenia has some space for optimization. The possibilities can be listed in the following groups:

- Accessibility and centralization: It would be much easier for citizens if they could find all spatial plans and substantively connected documents in one place.

- Form of textual plan: It would make searching for information in the textual part of the spatial plan easier if plans would be made according to a detailed standardized form.

- Cross border viewing: It should be possible to see across the municipal borders, which would be good for connectivity and reaching higher levels in planning.

- Simplification of informing the citizens: For informing the citizens, municipality uses the internet or the manner commonly practiced in its local area. Their target audience should not be only citizens of the municipality and owners of specific land plots, but also anyone who expresses interest (e-notification).

- Up-to-date information: It should be clear, whether citizens are looking at the newest version of the plan and if a new plan is being prepared at the time.

- Ability to submit comments and propositions: Users should be able to submit comments and propositions to planning acts, not only during public hearing but throughout the whole planning process.

The possibilities listed above have a potential to raise the level of potential participation and could ease access to the spatial information for citizens. Taking advantage of the possibilities could raise the awareness about spatial planning and allow citizens to better understand spatial planning, be a part of the planning process and gather information about the municipal plans efficiently. In addition, a centralized system would allow municipal planners

and other who work in the connected fields to view the data and adapt their planning intentions to reach a higher level of integrated planning.

We are aware that not all the suggestions or solutions can be implemented at the same time. In this paper, we designed a model of the e-solution, which would simplify the access to spatial information to citizens. To evaluate the model, we interviewed several representatives of planning institutions and companies. After that, we assessed the model by listing pros and cons of the use and evaluated the potential use in practice.

7. Model

As a solution to the discovered weaknesses, we suggest a centralized system (Figure 3) that would offer overview of all the municipal spatial plans in Slovenia. Proposed system features four main novelties:

Connectivity between municipalities

System should not focus on only one municipality at the time; plans across the municipal border should be visible too. This would help with the development of the space and its perception - most of spatial characteristics are similar in area broader than a municipality. Broader space should also be taken into consideration when preparing (infrastructure) projects.

E-mails with information about changes in spatial plans

Registered user should be able to select areas of interest and be informed via email if there are any changes applied to the area, when did the municipal spatial plan preparation begin and in which phase it is.

Pining comments and proposals on the map

Comments and proposals pinned to the map would show the initiatives openly to interested public. Colour for presentation of comments should be different for comments and proposals, since we learned in interviews that people mainly make proposals for land use changes and they are not contributing to general development of the space. That way they might get an idea on how they can participate and will have overview of interests and ideas of other people.

Educating people about the ways they can participate

During interviews, we learned that only giving people the chance to participate is not enough, because it often shows that they do not know what kind of a role they can play in spatial planning. This is why we should focus on educating people rather than on the participation itself.
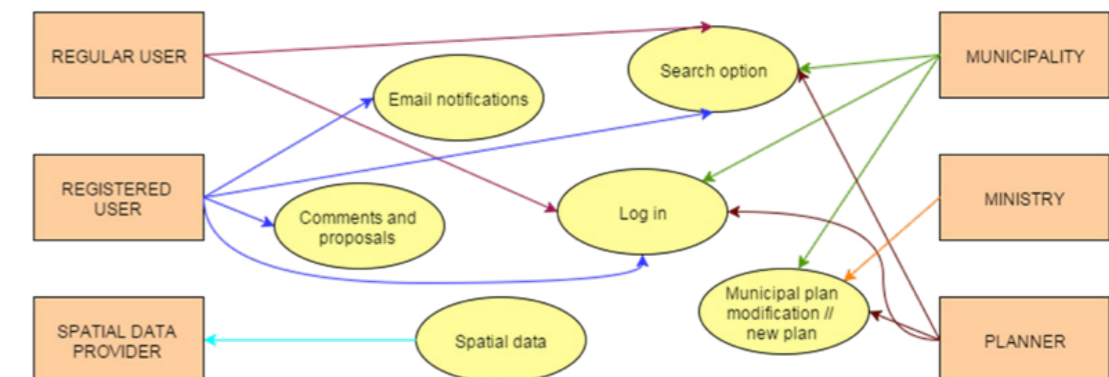

FIgure 4. *Use case diagram of proposed system*

8. Interviews

Interviews were carried out with two representatives of municipalities (Kranj – 51,200 inhabitants, 3rd out of 212 municipalities by the number of inhabitants, Mengeš – 6,600 inhabitants, 67th out of 212 municipalities by the number of inhabitants), one representative of the Ministry of the Environment and Spatial Planning and one representative of a planning company (Locus d. o. o.). Interviews were following the key topics:

- Opinion about the level of participation in municipal plan preparation in the Republic of Slovenia
- Do the municipalities encourage any additional participation besides statutory minimum?
- Are people interested in participation?
- How does the municipality communicate with the citizens and notify them about any upcoming changes?
- Is the planning system in Slovenia too fragmented?
- Would a centralized platform with standardized planning acts raise the level of participation and lead to a better public acceptance of the municipal plans?
- Does public participation obstruct the planning process?

Each interview lasted approximately 60 minutes and was following the key points, but was flexible enough to allow interviewees to express their broader professional opinions.

Interview conclusions can be summarized in the following topics: legislation, public participation, education, and lack of regional planning.

Legislation

Form the last amendment to the Spatial Planning Act (2008), most of the municipalities have started to change their Municipal spatial plans to comply with current legislation, the Ministry expects that 180 municipalities out of 212

will adopt their spatial plans until the end of 2015 (Uranker D., 2015).

Lack of standardized format of spatial plans and lack of inter-municipal communication represent an obstacle in unified planning and optimal land use (permissible and actual land use) (Špenko R., 2015). Currently, the format of spatial plan is loosely prescribed, but there are large differences between municipal plans (such as layouts, table structure, level of details etc.). Unified format could be achieved with detailed policies or regulations subordinate to the Spatial Planning Act.

Land use plays an important role in determining the value of individual land plots (building plots are worth a few times more than a greenfield land plot on the same location). People recognized that issue as an opportunity for earnings from land plot manipulation. As a result, we have spatial plans that often do not aim for optimal land use.

This problem was addressed in 2013 with a proposed property tax, which mainly focused on empty housing capacities but also considered the unused land plots. The proposed tax would tax the land plots that are not in use with higher rates than the ones that would have matching permissible and actual land use (or have ongoing projects), and would therefore discourage the manipulation with land plots. It is expected that a new, changed property tax will be considered in the near future.

Public participation and education

Public participation, when carried out properly, can mean additional work for municipalities. The work they do in the process of planning can result in better public acceptance of the solutions. The overall influence on planning and time consumption might be better that way: the plan might be more accepted and less time used for correcting the mistakes and implementing their (previously unheard) ideas.

Individual citizens are often convinced that their opinion does not matter, or is overcome by strategies and municipal decisions. Furthermore, their

interests are often focused on their land plot and do not consider possibilities of improving living conditions in their settlements. Planning companies need the information from citizens in order to optimize the plan, but often have to rely on official records that can be insufficient. To resolve that problem, some municipalities encourage the citizens to express their opinion before the preparation of spatial plan begins (Ziherl J., 2015; Špenko R., 2015). One of the problems highlighted by M. Jug (2015) is the lack of citizen engagement in settlements, which are only populated by people who work in other settlements. They are often not interested in improving their living environment because they are spending most of their day elsewhere.

All interviewees acknowledge increasing use of online GIS software by citizens, but they agree that some of the data available is hard to understand for an average citizen. Misinterpretation of these data can lead to poor public acceptance and doubt in expert opinion. Although electronic media and GIS solutions can be a powerful tool in communication and participation, they must not be the only form of informing the citizens. Together with public hearings, e-solutions can present a viable source of information for every person, who is interested in participatory planning.

One of the major findings of our research is that enabling people to participate in the planning process is not enough. Public hearings are poorly visited and citizens are mainly interested only in their private land plots. They are often not aware of their power and ability to affect the municipal spatial plan and providing them with the tool to participate is meaningless if we do not raise awareness about the importance of quality living environment and its connection to spatial planning. Bearing this in mind, an important step to improve public participation in the future is to educate citizens about the environment and meaning of spatial planning. People need to gain awareness about benefits of proper spatial planning and they need to learn how to contribute and how to sustain an efficient dialog with the local authorities. This sort of education should be aimed at all age groups (from earliest forms of education), to exceed the individual mind set and to move forward to community based decision-making.

Lack of regional planning

Almost all interviewees agree that spatial planning in Slovenia lacks regional level. Planning is fragmented between municipalities and collaboration between them is rare. Many things could be planned more efficiently if we took broader development instead of success of every individual municipality in consideration. There is a good example of non-collaborative approach in Slovenia in the last decade: we have many new industrial and business zones. Municipalities believed that these zones will be their way to success but they did not consider their size and location so we now have too many zones and many of them are empty.

The conclusion is that some municipalities are too small to take care of all the development themselves and higher level of planning (regional planning) would solve those problems much more effectively.

9. Conclusions

In this paper we firstly analysed public participation and how it is implemented in Slovenian legislation. We tried to acknowledge its weaknesses and propose an ICT system that would help to improve public participation and planning in general. The purpose of the proposed platform is not only to gather public opinion but also to help professionals improve their work, since all spatial information would be gathered in one place. We organized four structured interviews (Ministry of environment and spatial planning, two municipalities and one planning company) where we wanted to discuss our findings and proposals. Our general conclusions can be summarized in three guidelines for following work. Firstly, there is a need for establishing such platform and many different profiles of people would benefit from it. Secondly, during the interviews we learned that people understand their role in spatial planning solely as an opportunity for change of permissible land use. We hope to encourage them to take part of shaping the environment that they live in and realize that their opinion can contribute to development of the space. In order to motivate the general public in participation, we need to raise public

awareness of the space and its importance for the quality of life. To achieve a raise in public awareness, first we have to start educating people. The easiest way to achieve the goal is to include spatial topics in the school system, so children would internalize the values and act according to them later in life.

In conclusion, we hope that steps toward such platform will be made in the future, since we believe it to be very useful and informative. We are aware of the fact that it will take time to implement it and that it takes certain amount of the work to maintain it, but there are several improvements and advantages that will help to improve spatial planning in Slovenia.

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Towards the Metropolitan City: adaptation strategies to climate change using new technologies

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1. Introduction

Until a few years ago, the main - if not the only - answer to climate change was the reduction of greenhouse gas emissions, supported mainly by the ambitious policies of the European Union[1] (Biesbroek et al., 2010). Nonetheless, it is widely known and accepted that climate change and its impact are inevitable even though global emissions were to be immediately reduced by a great margin (IPCC, 2007). It is with this aspect in mind that adaptation policies, plans and actions became part of the responses to climate change. Adapting to its consequences has become a need that can no longer be postponed, especially considering the increasing risks to which population, infrastructures, economic and strategic sectors, environment and ecosystems are subjected. Adaptation measures have therefore sided with mitigation measures, despite their very different characteristics. The reduction of greenhouse gases is a global challenge that cannot be complete without everyone's commitment. Therefore, mitigation measures have a global reach – they try to change the current development model and use of resources. Of course, mitigation also has localised applications such as the

increase in energy efficiency of buildings, the reduction of private cars with the support of public transport etc., but it remains a global challenge in which everyone must play their part. Adaptation is instead a strictly local challenge. It is the duty of a specific territory with its inhabitants, infrastructures, municipal and ecosystem services, to find and implement adaptation measures that are suitable for the specific risks it must face without affecting the environment or lifestyle. A successful adaptation plan only depends on those who implement it and it is only able to defend a specific territory (Musco et al., 2014; Carmin et al., 2012). More specifically, it will be the cities and urban areas as a whole, with their increasing number of inhabitants and constant need for land, water, air and green areas, which will have to adapt to climate change, because they will be the ones subjected to risks and the most vulnerable.

The objective of the article is to outline a possible adaptation approach of the cities' territorial.

government activities. Thanks to the experiments carried out as part of the European "SEAP Alps" project, we will show how the analyses and techniques produced thanks to the use of "new technologies[2]" (remote-sensing[3]) are useful in developing information that can support the planning of "climate proof" territory. The aim of the work was the drafting of guidelines to implement adaptation topics into pre-existing plans such as the SEAP, which so far had always been directed only at mitigation. In the first part, the article will explain the connection between climate change and the city, stressing its characteristics and outlining its relationship with adaptation and resilience. In the second part, the "SEAP Alps" project will be presented and the guidelines that have been developed in cooperation with ten Municipal Administrations of the Venice metropolitan area will be described. Finally, there will be an in-depth analyses of the process employed – through the Remote Sensing technique, informative levels were developed, useful for analysing the vulnerability of the territory to the effects caused by climate

[1] With the publication of the 'Adapting to climate change in Europe – options for EU action' (CEC, 2007) Green Paper and of the 'Adapting to climate change: Towards a European Framework for action' (CEC, 2009) White Paper, the European Commission has recognised the need for an adaptation strategy for all Member States.

[2] New technologies refer to Information and Communication Technology (ICT) and modern geo-referenced information management systems, i.e. geo-databases.
[3] Remote Sensing is the technical-scientific discipline whose purpose is to collect qualitative and quantitative information as regards objects through a sensor that measures the electromagnetic radiations emitted, reflected and transmitted by such objects.

change. Such analyses were carried out in preparation for the identification of adaptation strategies.

2. Cities and climate change

In the last few years, the relationship between climate change and cities has become increasingly closer. There are several publications that stress the close link between the activities and lifestyle of those living in the city and greenhouse gas production, i.e. the main causes of the increase of the global average temperature (Rosenzweig et al., 2011; Musco, 2008), but there are also many publications that identify the cities as the places most vulnerable to the effects of climate change (Bulkeley e Tuts, 2013; UFPP, 2009). The risks caused by climate change have quadrupled in the past 30 years, causing both human and economic losses (UNISDR, 2012). These risks are also known as natural hazards and are generally attributable to extreme weather events such as: storm intensity, urban heat island, drought and flooding as well as sea level rise and coastal erosion (IPCC, 2007a). Historically, cities and urban areas have been perceived as a refuge from these calamities because they are far away from nature. Nowadays, however, they have become dangerous places and sources of disasters (UNDP, 2004; Pelling, 2003). In the light of this new perspective, cities become both a problem and a solution.

Carte et al. (2015) identify three main reasons for which cities occupy a central position in the implementation of adaptation measures:

- Urbanisation is the distinctive characteristic of the twenty-first century and the population residing in urban areas is destined to increase enormously in the next few decades;
- The design and planning of cities create unique microclimates that modify important variables such as temperature and wind (think about heat islands);
- Thanks to the low resilience of infrastructures, high density of population, large number of poor people and great concentration of economic and

strategic sectors, cities are particularly vulnerable to climate change.

For all these reasons, it is essential to bring the adaptation question to the foreground as well as mitigation and to plan and work on an urban scale.

3. Adaptation, risk and urban resilience

In 2010, the "Cancun Adaptation Framework" implemented under the "UN Framework Convention on Climate Change" (UNFCCC) established that adaptation to climate change must be faced with the same priority level given to mitigation to reduce greenhouse gas emissions. Since January 2013, 15 EU Member States have adopted national adaptation plans and strategies. (European Commission, 2013a, 2013b).

But what does adaptation mean? The IPCC (2007b, p.76) defines it as:

«*Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned. Examples are raising river or coastal dikes, the substitution of more temperature-shock resistant plants for sensitive ones, etc*».

In the past few years, adaptation has therefore become intertwined with the concept of "resilience". In fact, the support for the creation of a "climate-resilient Europe" is among the latest European Strategy objectives concerning adaptation to climate change (European Commission, 2013a). The concept of resilience ("climate resilient", "climate-proofing" and "resilient city" are increasingly common terms) has its roots in ecology, though it has recently taken on a wider connotation and has been adopted by many research sectors and traditions. (Zhou et al., 2010; Leichenko, 2010). The United Nations Office for Disaster Risk Reduction (UNISDR, 2012, p.92) defines it as such:

«Resilience means the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of the hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions».

"Resilience", i.e. the ability of any organism, individual or organisation to face and recover from the effect of an unsettling action, is opposed to vulnerability, i.e. those elements that favour the likelihood that a system suffers from damage (Graziano et al., 2013).

This way, the concept of adaptation is linked to a wide perspective of urban resilience. The assessment of risks and of the resulting vulnerability supports an adaptation approach in urban areas, where the identification and reduction of extreme event risks caused by climate change lower the frequency and/or intensity of shocks to the urban system (Carter et al., 2015).

4. The "SEAP Alps" Project

"SEAP Alps" is a European project co-financed within the "Alpine Space 2007-2013" Operative Programme with 12 partners from Italy, Austria, France, Germany and Slovenia. Its main objective is to promote the planning of sustainable energy at a local level sharing a common methodology among all partners. More in detail, the project aims to integrate adaptation into Sustainable Energy Action Plans[4] (SEAP) through the following actions:

- Raise awareness of the long-term political component to produce and use energy in a sustainable manner and manage the consequences of climate change;

- Favour the integration of different tasks in territorial government activities;

- Develop a phase to analyse the vulnerability to climate change and combine it to the Baseline Emission Inventory (BEI);

- Identify actions to manage and reduce vulnerability and combine them with actions to support energy saving and renewable energy;

- Monitor the implementation and effects produced by such actions.

In this way, new SEAP countries will be able to consider actions to decrease CO_2 production and increase renewable energy as well as to evaluate strategic actions to adapt their cities and improve their resilience to climate change.

4.1 Methodology

The project implements the "SEAP Alps Methodology: Integration of adaptation in SEAPs", which contains the guidelines agreed upon by the partners to integrate the existing procedure - which only considers mitigation - with considerations on adaptation. The document defines mitigation as all those activities that can limit the effects produced by human activities on climate change[5], and adaptation as all those actions suitable to reduce the possible impact of climate change on the territory.

A specific methodology[6] was developed for the Venice province[7] starting from the general indications, in order to implement the integrated mitigation and adaptation approach on a local scale[8]. This methodology is based on 6 phases (tab. 1):

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[4] In 2008, after having adopted the "Climate and Energy" Package with which a reduction of greenhouse gas emissions by 20% by 2020 with respect to 1990 values was undertaken, the European Commission launched the new Covenant of Mayors project. Local signatory bodies undertake to reduce emissions and must draft a SEAP, a plan that outline s the actions and policies to develop to reach the objective established. For further information on SEAP in Italy and Europe, please refer to Magni e Musco, 2014.

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[5] The IPCC (2007b, p.84) defines mitigation as: «Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to Climate Change, mitigation means implementing policies to reduce greenhouse gas emissions and enhance sinks»
[6] The methodology was developed by a working team from the Università Iuav di Venezia and the Envionmental Service of the Venice province with the active cooperation of 10 local municipal administration.
[7] The Venice province which, just like other nine provinces in Italy, is facing an institutional reorganisation towards a Metropolitan City.
[8] In April 2014, a need for an approach that combine mitigation and adaptation strategies was met at a Community level thanks to the Mayor Adapt Initiative, which integrates the Covenant of Mayors.

- Phase 1: Analysis of PAT strategies. In this phase, the political agenda of the municipal administration is analysed using PAT strategic guidelines.

- Phase 2: summary of existing projects/actions. The projects/actions initiated on the territory by other public or private/public bodies are also briefly analysed in addition to the PAT strategies.

- Phase 3: Analysis of "new vulnerabilities". In this phase, the municipal territory is analysed to identify main/new vulnerabilities.

- Phase 4: new adaptation actions. In this phase, new actions to reduce vulnerability emerged during the analysis phase are proposed and built.

- Phase 5: identification of the planning tools that can best implement such actions. This is a very delicate phase – in addition to identifying the most suitable planning tool for each single action, the most suitable regulation system (bonus or restrictive) must also be selected.

- Phase 6: monitoring. The results of the implemented actions are monitored using suitable tools and technologies.

RECAP OF THE PROCESS

	1	2	3	4	5	6
STEP	ANALYSIS OF PAT STRATEGIES	SUMMARY OF EXISTING PROJECTS/ ACTIONS/	ANALYSIS OF "NEW" VULNERA-BILITIES	NEW PROPOSED ACTIONS	TOOLS CONNECTED TO THE NEW ACTIONS	ANALYSIS OF PAT STRATEGIES
CONTENT	This phase considers the political agenda of the municipal administration put into effect in PAT general strategies.	In addition to PAT strategies, all projects/ actions/ regulations that other public or public/ private bodies implement are also listed.	Thanks to the technological support form the Venice Province, the municipal territory is analysed to highlight the main/new vulnerabilities.	Drafting of new actions to deal with the vulnerabilities identified by the new analyses.	Selection of the tools available to implement the new actions - If needed, integration of the tools with bonus of restrictive systems.	If possible, drafting of solutions to monitor the actions

Table 1. *The table sums up the methodological steps identified in cooperation with the Venice Province and 10 Municipal Administrations of the future Venetian Metropolitan City. Processed by Denis Maragno, Filippo Magni, Michele Dalla Fontana, Sara Verones, Giulia Lucertini, Francesco Musco*

The new process will be implemented alongside the existing procedure to draft SEAPs. This will make it possible to follow activities both during the drafting of SEAPs as well as where they have already been implemented. Technically, the territory vulnerability analyses will be added to the CO_2 baseline emission inventory (BEI), which is useful to identify mitigation strategies. The aim of our methodology is to develop evidence-based climatic planning to help policy-makers during the decision phase. In fact, thanks to the risk and vulnerability assessment, a territory is zoned according to the possible impact of climate change on the various urban areas. In this way, areas are ranked according to their vulnerability level, to highlight those where intervention is a priority (Maragno et al., 2014). Special attention was paid during their development to favour the cooperation and integration between the tasks and actors who live in the territory.

4.2 New technology for territorial analysis

The main problem during the analysis of the vulnerability to climate change of a territory is posed by an unsuitable knowledge base to support the process. Usually the Public Administration does not have the necessary information bases because it is not included in current planning tools. Information such as m2 of vegetation, height of plants, solar incidence, private and public soil permeability, etc. is hardly available at a municipal level. To solve this problem, it is possible to use new technologies, which can be classified as ICT (Information and Communication Technology) as they enable the creation of suitable territorial and environmental information.

As part of the project, the Province of Venice obtained extremely innovative data through an aerial survey[9] (covering 3000 Km2 i.e. the entire province). The survey made it possible to collect 4,000 high- resolution images that, thanks to the Dense Image Matching[10] technique, enabled the creation of a 3D digital model of the area (Hirschmuller, 2008).

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[9] Survey carried out by UniSky, spin-off of the Università Iuav di Venezia.
[10] Before a 3D model using "Dense Image Matching" (DIM) is produced, an aerial survey overlapping the images both transversally and lengthwise is created. In the second phase, a state-of-the-art software (based on the DIM algorithm)can be used to extract 3D points through the identification of correspondences between the primitives extracted in two or more images.

The data acquired guarantee the possibility of generating high-resolution raster images - DSM (Digital Surface Model) and DTM (Digital Terrain Model) – with a precision of 25 cm (Pixel 0.25 m). The DSM reports the altimetric data of all natural and man-made elements in a specific area, while the DTM reports the morphology of the territory without man-made creations and vegetation. This process allows us to collect information at a cost that is 10-fold less than with other methods such as LiDAR.

These models and the precise information they contain enable us to create new information, analyses and thematic visualisations such as:

- Surface composition (distinguishing whether it is permeable or not every 0.25 m), height and volume of urban buildings;
- Energetic potential of buildings with renewable sources (Wilson et al., 2000);
- Roof slope and orientation;
- Potentially floodable areas;
- Visualisation and calculation of waterproof areas;
- Assessment and mapping of urban green (public and private) and its relative height;
- Sky view factor[11].

These technologies make it possible to create a digital atlas that can distinguish permeable and impermeable areas every 25 cm. In addition, thanks to the third dimension, it is possible to calculate the volume of natural and man-made areas. Furthermore, on top of analysing vulnerability, indicators such as the Sky View Factor, solar incidence, permeability/impermeability ratio, density etc. will support the drafting of adaptation and mitigation strategies.

Urban classification divides the urban fabric into classes using a hexagonal grid, which highlights which hexagons are subject to water vulnerability and

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[11] The Sky-View Factor (SVF) indicates the fraction of sky visible from an observation point. The higher the SVF the greater the heat loss. For example, a narrow and deep valley has a low SFV and therefore reduced night-time cooling, whereas a plain has a high SVF and is subjected to greater cooling.

heat accumulation (figure 1). If you look at fig. 1, you can clearly see how well vulnerability is highlighted (hexagons with a well-defined perimeter).
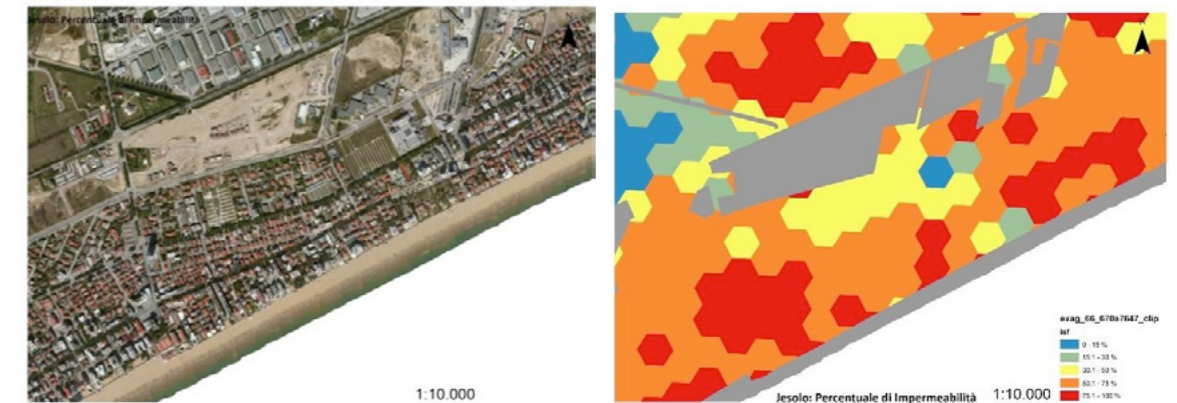

Fig. 1-2. The images show the results obtained with the remote sensing technique. The information obtained via the processing of DIM data (Dense Image Matching, with a precision of 75 cm) has been processed and integrated into hexagonal grids (of different sizes, ranging from 6 to 130 metre-long sides, divided using an automated calculation process). This way, it is possible to visualise and obtain environmental and territorial information for every single cell in different scales. The technique was studied to make it easier to read information (using a colour-coded grid) and to help the decision process. In the example, part of the urban impermeability analysis. Processed by Denis Maragno

These kind of outputs are available for the entire municipal area. Thus, we are able to represent, with easily understandable maps, the territorial areas with a high impermeability percentage (fig.3), useful to identify where actions are required firstly in order to handle issues related to runoff. Figure 4 instead portrays the opposite information, which is the areas classified by the permeability percentage. Figures 3-4-5 provide us with information helpful to deal with water issues, whereas maps such as one in figure 5, which describes the urban volumetric concentration, is useful to identify areas with possible cases of overheating (Urban Heat Island). This kind of phenomena is indeed more frequent in areas with high concentration of buildings.

This kind of knowledge is provided by a public administration, the Province of Venice in this case, therefore any information are available to the public and particularly to the local authorities operating in the provincial territory. The layout (grid of colours) of the vulnerabilities analysis it was thought to be easily understandable by a wide public, not only technicians.

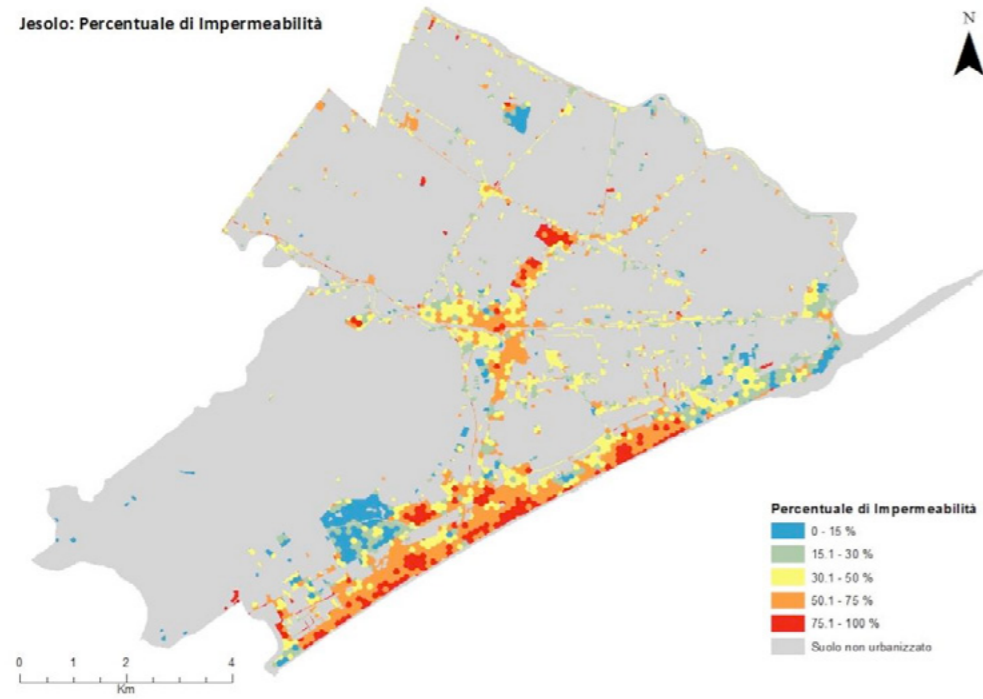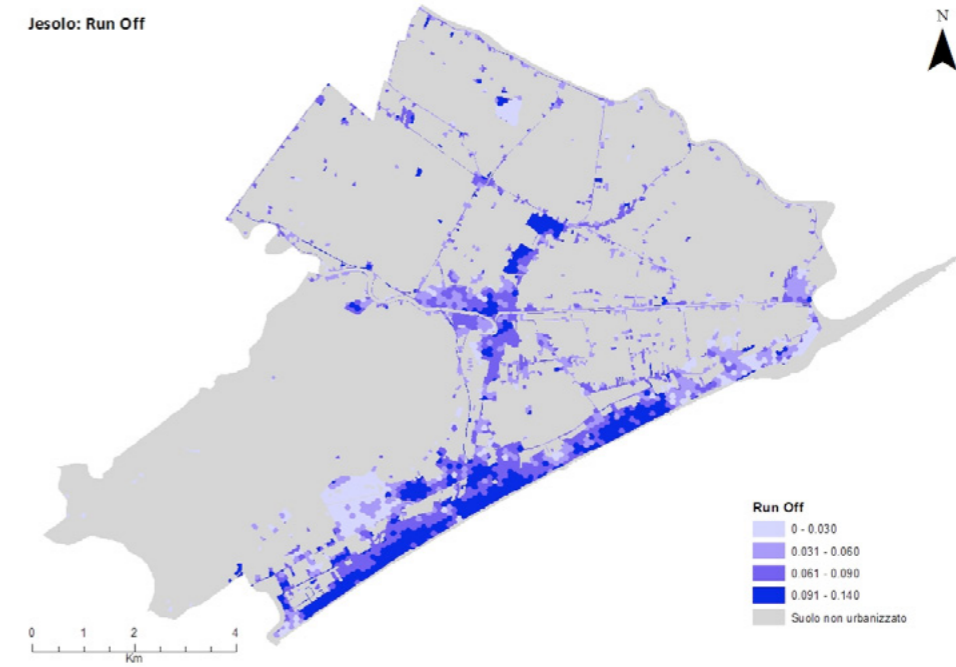Fig. 3 *Urban impermeability map - Processed by Denis Maragno*

Fig. 5 Map of the possible run-off with a precipitation of 75 mm of rain in half an hour - Processed by Denis Maragno
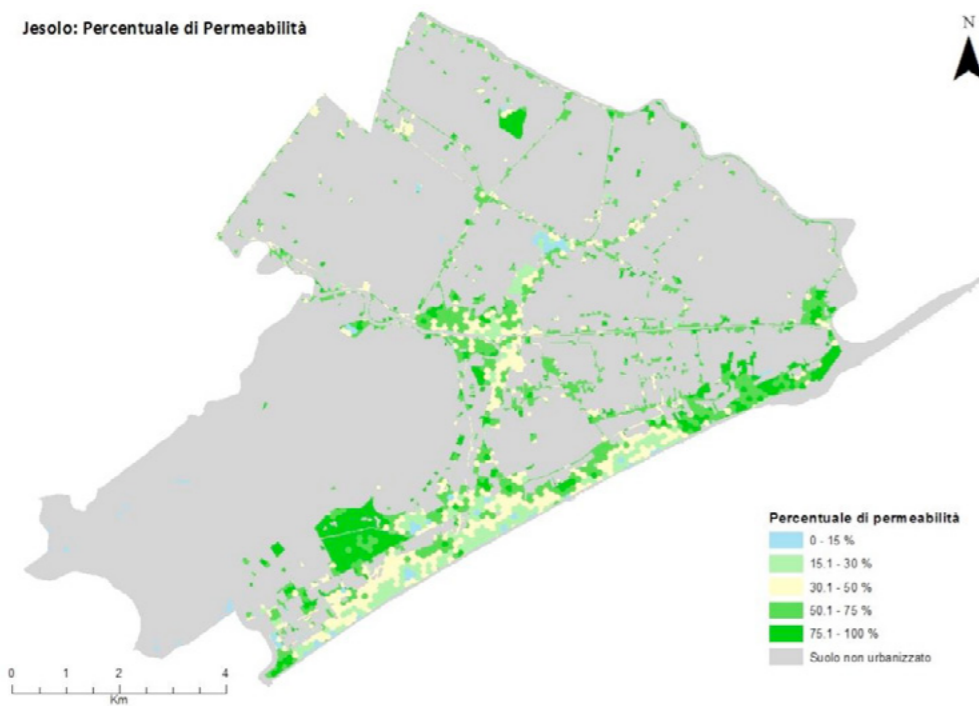

Fig. 4 *Uban permeability map - Processed by Denis Maragno*

4.3 Expected Results

The new SEAP must and will consider strategies to reduce risk exposure and increase urban resilience to risks connected to climate change. These kind of analyses, as well as almost all initiatives related to climate change, are not compulsory. It is therefore important the sensitivity to the topic by local governments and their willingness to cooperate. This type of analysis is important also to make local authorities aware of possible vulnerabilities affecting their territory. At this point, the actions will be divided into:

- Structural or steering actions, aimed at avoiding or reducing risk exposure (building standards, green roofs for the protection against global warming and to re-use water, green infrastructures,etc.);

- Actions to raise awareness and involve citizens;

- Actions deriving from the use of the ICT technology, useful to increase the collection, analysis and sharing of information.

The project has now reached its conclusive phase. The working group is now involved in working tables with the Province of Venice and the Municipalities of the metropolitan areas to draft the first technical attachment concerning the adaptation to climate change.

5. Conclusion

Climate change and the adaptation to its consequences are destined to remain among the most urgent questions in cities and urban areas over the next decades (Carter et al., 2015). It is therefore essential to develop systems and methodologies that can analyse, assess and support policy-makers in the development of policies, plans and actions to counter not only climate change in general, but also its most immediate effects. To do so, an in-depth knowledge of the territory and its socio-economic systems is essential as well as the tools currently in use. Mitigation and, even more so adaptation measures, will be more effective with a higher integration

of existing regulation and strategic frameworks, with no need for radical changes or additional bureaucracy. Mitigation and adaptation actions are usually not compulsory; the aim of this project was indeed to draft a process in which specific actions to contrast climate change are integrated into the regular planning tools. New technologies played a key role to make visible the vulnerabilities and risks to the local authorities. Thanks to the cooperation among technicians, the scientific apparatus (university) and public administration, the experience gained during the project has indicated that there is a way to adapt to climate change. Municipalities, institutions and associations welcomed the work carried out, so much so that we can hope for future collaboration. By continuing on this path, it will be possible to encourage sensitivity towards an integrated approach to climate change more effectively which, now more than ever, needs the direct involvement of local administrations and the population.

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Pere IV, the citizen's axis. From industrial axis urban Lab

Pere IV, the citizen's axis. From industrial axis to urban Lab

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Elia Hernando, Andrea Olmedo

1. Introduction

Pere IV, the diagonal axis that articulates the industrial heritage of the district of Poblenou and challenges the Barcelona's grid of Cerdà, has witnessed diverse urban transformations that contribute to the progress of the city of Barcelona. But at the same time has seen how its interstitial sections have been forgotten. Now it is the moment to act transversally involving citizenship, local administration and private sector.

The neighbours of Pere IV have organized themselves around a citizen table that coordinates, together with technical profiles, the dynamazing of the axis. The street is looking after a project of reurbanization that the administration has postponed several times. However, the neighbours report that the physical conversion, which is needed, is not enough to acquire the real change that should go through a renovated way of managing the city, which must tend to collaborative policies, cooperative alliances, open data access and recovery of the empty spaces as urban commons.

The process started to transform the area around Pere IV is a reaction to the current situation, where the urban growth cannot be anymore a strategy of the local administration to finance them, together with the fact that the society today has become an interlocutor mature enough to take corresponsability in

the city management achieving a higher democratic level of living together. Moreover, the opportunity today, provided by technology, to share with others information and any kind of data increases the capacity of the society of acting collectively. Therefore, the level of empowerment of the citizenship is high enough to demand a transformation of the public policies, about city management, as well as a reinterpertation of the roles of the different agents, who not only inhabit the city, but build it daily.

Most of our needs have a spatial answer, so they could be solved if we could have some space to temporary develop activity, we need to take the commitment to build it up. There are plenty of empty spaces, blocked for different reasons: urban planning, economic causes, heritages motives or current law unfulfilment. Moreover technology gives us today the chance of being data generators and collectors, in order to know more about the state of the empty spaces in our cities. A virtual platform, which lets us combine the spatial needs that the society has with the offer of empty spaces, would empower the citizens enough to affect in the urban policies agenda.

2. Theoretical framework and context

2.1 Unused spaces as urban resources

The consideration of empty spaces has been tackled from very different perspectives such as architecture, geography, anthropology or art. The architect Ignasi Solà Morales (1995) developed the idea of terrain vague defining it so: "Apparently forgotten places where past memories predominate over present, lacking of interactions. They are obsolete spaces, strange, out of the loop of the productive structures". From an anthropologic perspective Kociatkiewicz & Kostera (1999) designated empty spaces as "places without sense. They don't have to be physically isolated with fences or barriers. They aren't forbidden spaces, but places empty and inaccessible due to their invisibility. (…) The vacancy can't be erased; it can only be ignored, expelled from the borders of the reality perceived, invisibilised and carefully forgotten. If something is insignificant, it is imperceptible" Marc Augé (1993) worked on the idea of non-places, and expressed that the places, the full ones, are defined

by their social uses, and not by the constructions they present. In this sense, the empty spaces are not considered as places, due to the fact that their uses are vague or even absent.

The previous authors define the empty spaces starting from concepts linked to perception, insignificance and absence. Moreover they consider the temporal variable, when they make allusion to memory, obsolescence or oversight. The vacant spaces become a kind of urban palimpsest, that during a lot of time have been considered mistakes during planning process, "whites in the cartographies" (Vasset, 2007) that had been left over after structuring the spaces that where categorically important. (Bauman, 1999)

Every form of vacancy can be referred as "unused spaces", including more than empty lots of land. Unused space is nearly always space that has been shaped for a particular use, but is now, temporally, waiting for a new. The change of use of spaces is not an immediate process. In between two active moments, the space remains empty, and sometimes the vacancy state is perpetuated. Therefore, each crisis, and change in the productive system, causes a new situation that the city has to face in relation to vacant spaces that, as said before, report about the city, its economic state and its history.

After all, the next decade the massive scale of vacancy means the usual spatial task will be inverted from "program seeks building" to "building seeks program" (Rietveld & Rietveld, 2014) Thus, unused spaces are considered as resources that can respond to the demand of social movements, and innovative initiatives, which are able to build up new opportunities for the society. Quoting Signorelli (1999) "In the urban condition, the control of a resource is a source of power" makes us understand that the capacity of managing these vacant spaces would involve an empowerment process.

In this sense, fostering and facilitating temporal uses is the strategy in order to foster the self-management of the city taking vacant spaces as resources. Besides being in-between solutions further to various deadlocks and crisis, temporary uses can also stimulate the economy (i.e giving free spaces to people in the hope that they can develop a profitable business and thus

expand and pay taxes) or renew the urban environment (Andres, 2013)

This paper expects to go in depth into the possibilities brought by the vacant spaces in the current urban context, exposing the specific case of Pere IV, in Barcelona. Therefore, the empty space is seen as an opportunity to test new ways of managing the city.

2.2 Unsustainability of urban growth

The way the local policies have been understood and the role played by the urban growing developments, in Spain, have left a territory full of infraused infrastructures, abandoned lots, obsolete factories, vacant premises, that have become today inherent of our urban landscape.

The city has been taken not as the place to do business, but as the place from which do business, giving answer to the demand by supplying massively spaces to the real state sector, without taking in account the public interest, and the demanding social needs. Urban planning was converted into a tool in the service of private economic interests. It gave to the capital the opportunity to dispose of the products created and built, following in this way, the spatial logic of neoliberalisation (Franquesa, 2007) and the postfordist model, in the urban field.

The welfare of the society has turned from being a global request to become a personal and communal demand, appealed from the daily life and the proximity spaces. It is necessary that urbanism transcends its urbanistic perspective, localist and institutionalist, and acquires an urban attitude (Subirats & Montaner, 2012). The city of today has been disappointed with the tendency of urbanism of betraying the principles and the purposes that it should have supported. The current moment reclaims an urbanism able to prevent from degradation, guarantee housing, struggle against segregation, provide services, generate employment, and create opportunities (Nel·lo, 2001)

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2.3 Arts and Telecommunications

From the seventies of the 20th century several artists and art collectives have worked with telecommunication systems. Depending on the period they have been using the data transmission and reception through telephone lines, radio waves, satellite or internet. This fact has made possible a real time connection between people geographically disperse and has made possible for example thelematic dance, installations based on telepresence or online collaborative pieces. These projects as Giannetti said, are expanding the spaces of the art and for the art and dilating its temporary dimension. These breaks with the idea of art focused on the object and transform the televisive media into a meta-art media allowing its spatial temporary ubiquity. (Giannetti, 2002, p. 110)

In 1988 Kit Galloway and Sherrie Rabinowitz founded the 'Electronic Cafe International' in the frame of Los Angeles Olympic Games. The first experience took place in a Santa Monica cafe in California. They activated an interdisciplinar community conformed by artists, technics, designers and neighbors. Their objective was to organize meetings where telepresence has a fundamental role: interactive dramaturgies, metadesign environments telephone operas or teleconcerts. Electronic cafes proliferated in Europe, Asia, South America or Australia keeping them in permanent connection between themselves. During a period of ten years this experience has been an interconnected work space that changed the course of the collaborative arts with telecommunications.

Karlis Kalnins begins to use the term Locative Media in 2003 in the Art and Communication Festival of Riga (Wilken, 2012, p. 243). He used this expression as a category to designate the processes, prototypes and applications that are based on the interaction of the screen interface with the here and now of the urban space. In Actuality both parts, interface and space, melt in a hybrid space: one is the extension of the other one. This intermediate space of computerized interaction is crossed by information layers. The particularity is that these systems are often asking our location to give us access to applications and sites and our actions and movements become a storable field into private databases.

There is a practices corpus around locative media, whose novelty is not the conceptual approximation, but in the media used to develop these projects. (Manovich. 2006, p. 225) Following André Lemos we can find some projects' lines that use the informative mobile technologies. (Lemos. 2008) The first group is called 'Electronic urban annotations', these projects bring in new forms of writing the urban space with mobile devices, giving for example the applications 'Yellow Arrow2' or 'Sonic City3'.

The second group is called 'Mapping and geo-location', projects that add information to maps that represent communities, as 'Neighbornode4' , 'Peuplade5' , or that allow to signal and trace with a GPS device, as in the case of 'SUR-VIVALL7'. The third group is the 'Games for mobiles based in the location', on-line games that use a mobile device with GPS in an urban space, like 'Uncle Roy All Around You8' or 'Senhor da Guerra10'. The last group is called 'Smart mobs', political mobilizations-aesthetic coordinated with mobile devices to realize an action and propagate it quickly.

We are focused on the second group, 'Mapping and geo-location', and therefore we focus on projects that create P2P maps that represent communities. There are clear references to the project of Naomi Spellman, '34 North 118 West', that invites people to listen to the industrial Los Angeles through an application for tablet by navigating on marked maps. In the same way '[murmur] (hear you are)' of the CFC Media Lab of Toronto shows the histories of the city inhabitants, that are showed by exposed telephones. In this line 'Urban Tapestries (Public Authoring in the Wireless City)' from Proboscis is an online platform for the construction of the collective memories of the space through its documentation. 'Amsterdam Real Time' form Esther Polak is an online interactive map in which they trace the routes of citizens that carry a GPS over the course of two months.

'Loca' project by John Evans, Drew Hemment, Theo Humphries and Mike Raento encourages participants with low tech receptors to navigate through the semantic content of the space of the city by means of the broadcast of messages that are in points of his routes. Inside these ways of interaction between the physical and digital space we find 'Vectorial Elevation, Relational Architecture #4' by Raffael Lozano-Hemmer. This work consists in the

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interaction of the people in the online digital space that influences the physical space through the changes in an illuminated structure installed in the city of Mexico DF.

All these different projects have in common a reflection on the notion of space itself and it Is relevant to see how to order the space, how to represent it or how to implicate to social agents of this space to promote the social interaction. This condition allows a connection between these projects and other contemporary art expressions as public interventions, social performances or other public space art projects. (San Cornelio, 2008)

For this analysis we focus on a relative new line on locative peer to peer that connects local communities with communication issues through opensource projects as online collaborative cartographies, participative archives or specific apps. It is important to underline the critical point of view with the origin of these technologies; the aim is to empower the communicative dynamics in low tech communities; and the contribution to the digital qualification of their members. It is the case of 'Megaphone', an Antoni Abad project or 'Ojovoz', an Eugenio Tiselli project. Both of this works split off a critical approach to locative media, going beyond the interaction between the person and the computer, and the interpersonal interaction through computers, mobile telephones and networks (Parés, 2014, p. 21).

3. The transformation of Pere IV

3.1 Context

Pere IV is an old industrial axis in the city of Barcelona. It crosses from the East to the West the Poblenou district, that during XVIII and XIX concentrated the spatial demand for the location of factories out of the walls of the city of Barcelona, allowing proximity to the harbor, good connections to France (road and train) and access to water for the productive process, that acquired from Besós river, on the west border of Barcelona. The industrial origin of the district made of Poblenou a workers neighbourhood. A strong cooperative

tradition and a high social commitment is the legacy that district inherited from its industrial past, and is today perceptible in the life of the district.

Fig. 1 *Pere IV crossing the neighborhood of Poblenou*

Poblenou has experienced various transformation projects, in order to rebuild the area in a context of urban deindustrialisation. The most important one, and with the biggest impact, is the 22@ Plan. It is a master plan, from the year 2000, with the aim of converting the industrial area into a district of activities based on knowledge and technology, preserving, in this sense, the productive conception of the district.

The trace of Pere IV challenges the grid planned by Ildelfons Cerdà. The master plan of 22@ purposed to enlarge the structure of regular blocks over historic geometries, keeping some traces and different industrial heritage buildings. The strategy of the plan is to increase the edificabilty of the areas destined to buildings that locate knowledge and technologic activities. The strategy of

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increasing the roof built in the area had the aim of attracting new business capable of transform the activities and uses of the district. Moreover, the master plan considered a huge infrastructure and TIC development, in which Pere IV played an important role, so it was planned to become an equipped axis, where the infrastructure passed through it.

The economic crisis and the management deadlocks, due to property issues or heritage preservations, made Pere IV a forgotten old industrial axis, full of empty spaces. More than the 40% of the premises and workshops at street level are nowadays empty. Plenty of industrial buildings and a lot surface is vacant, waiting for a new use.

Fig. 2 *Empty lots in Pere IV*

On the other hand, different public facilities and cultural projects are landing in the area of Pere IV, giving to the area a cultural attractiveness that fosters de dynamistaion and increases the flow of people. For the last decades, artist collectives have inhabit the area, and the municipality build up two spaces in old industrial buildings under the name of "Fàbriques de creació". Other projects like the History Museum of the City rehabilitated an old industrial building to locate an exhibition space for industrial history of the city of Barcelona. The transfer of different university campus is a wager made by the municipality to reinforce the transformation of the district into a knowledge productive area. The latest project in Pere IV is the construction of the Smart

City Campus, in an old industrial complex, property of the municipality and ceded to two big technologic businesses.

3.2 Origin of the opportunity

As it is said before, Poblenou counts with a strong organized and mature society capable to claim intervention of the administration where and when needed. In this context has started the transformation of Pere IV. The neighbors association and other social collectives claimed the transformation of an area that has been forgotten due to the successive projects developed in the nearby areas. Pere IV, the most important industrial axis of the city of Barcelona, is today and example of obsolescence. Its 3km of length pass through very different areas, but all of them share an image of deterioration that remains to an urban periphery more that to an structural axis of the city of Barcelona.

The demands were heard by the municipality that started a project of reurbanisation, in order to convert Pere IV into a civic axis. The project began with a one day participation process ruled by the administration. A lot of people took part in the process, but they didn't get to an agreement of the proposal for the street. A core group, integrated by influencers of the neighborhood selected by the administration (presidents of associations) was summoned to work together so as to get an agreement. The beginning of the construction works has been delayed several times because of the lack of agreement, and loss of political interest. In the end, and due to the past municipal election in the city, all the political groups got engaged with the project and agreed to start it as soon as possible, finally regardless of who governs.

From this core group and more specifically, from the neighbors association of Poblenou, appeared the idea of going further in the transformation of the axis. The administration proposed a reurbanisation, a physical transformation that would give to the street a peaceful character. But they expressed the need of acting and affecting other aspects regarding the street. They considered that the transformation wouldn't go only through the reurbanisation, but together with a dinamisation process, paying attention to cultural, social and economic

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activities. Because of this, their founded a citizens table, where different people discussed and started the transformation process of the axis.

The table is organized in different commissions: activities, urbanism and organization. People interested in the process, and professionals who supervise the process form the commissions. In the activities commission, there is an expert in participation and mediation and in urbanism commission, an architect. The most popular one is activities. They meet weekly to discuss, propose and organize activities in the street in order to communicate, make visible and involve more people in the transformation process. The number of attendees is variable, depending on the activities to organize. But there is a fixed group of 8 people. These people respond to different profiles: neighborhood association president, artists from an artist residence located in the Pere IV street, a mother attracted to the project from the parents association of her daughter's school (but not in representation of the association), the president of an association of Heritage conservation. Moreover, some neighbors as interested individuals (different ages, some employed others not) All these people were engaged in the table from the very first day. Since May of the year 2014 different artist collectives have appeared in the meetings, proposing activities and offering their art to communicate the process. There isn't any selection process. The meetings are open to everyone.

3.3 Proposal for the transformation of Pere IV

The citizen table has worked on the visibility of the process, with the aim of involving more people and entities in the table. They have organized several activities, such as historic tours, bike routes or an art festival.

The goal of the process would be to transform the area around Pere IV, now physically neglected and forgotten in the collective imaginary into an active and dynamic axis, where to test new ways of managing the city from the resources already built and with the mature and organized society that inhabits Poblenou.

Therefore, the vacant spaces, in any form and condition are taken as urban commons, in which temporary social and collective activities could be performed. The table bet on activities based on communal benefit and social economy. These activities not only can give an answer to a spatial need, or resolve the problems caused by vacancy, but also can test new initiatives, visualize the work of entities that cannot afford a rent, or even give the opportunity to transform the uses of the spaces dictated in the master plan.

Fig. 3 *Vacant spaces in Pere IV*

Pere IV could become an urban laboratory where to experiment and experience new ways of managing the city, by recovering not only spaces but production systems or relation commitments. The approach of transformation should keep the image of industrial and productive axis, should not forget the cooperative capacity of the neighborhood and be able to empower the citizenship enough to take part in the management of the city and its spaces.

The huge amount of empty squared meters concentrated in the area of Pere IV, waiting for a use to accommodate, required a strategy where citizenship, administration, private sector redistribute their roles between users, landowners and facilitators. This approach on recovering empty spaces, regardless of their ownership, in order to give the opportunity to develop temporary activities, demands an involvement of the municipality, facilitating the process. The very first thrust of the process is irrefutably bottom-up, and it should keep its character. Consequently, the administration shouldn't take an impelling position, but an active role is required, in order to look for a global

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strategy of the process, along the area and the time.

Regarding the concept of smart city, and taking advantage of the coincidence and proximity of the smart city campus, the process of Pere IV have the opportunity to transcend the limits that technology marks, and develop a concept of smart city based on citizenship. Smart citizens are those who are able to manage their city, influence their municipal agendas and take part in the decisions concerning the city and the public spaces.

In order to map the gaps, produced by empty spaces, and open the information collected is used the tool offered by the project CitizenSqKm, which aims to explore and extend the potentials of a community owned and managed telecommunications network, increasing civic engagement and benefiting the citizens. This project gives the opportunity to link the process with other projects held in Poblenou and working with the same tool. The methodology used combines conventional digital methods with more recent participatory and qualitative evaluation methods, such as Ethnografic Action Research and the Most Significant Change, methods currently being used to document the impact of information and communication technologies for transforming communities.
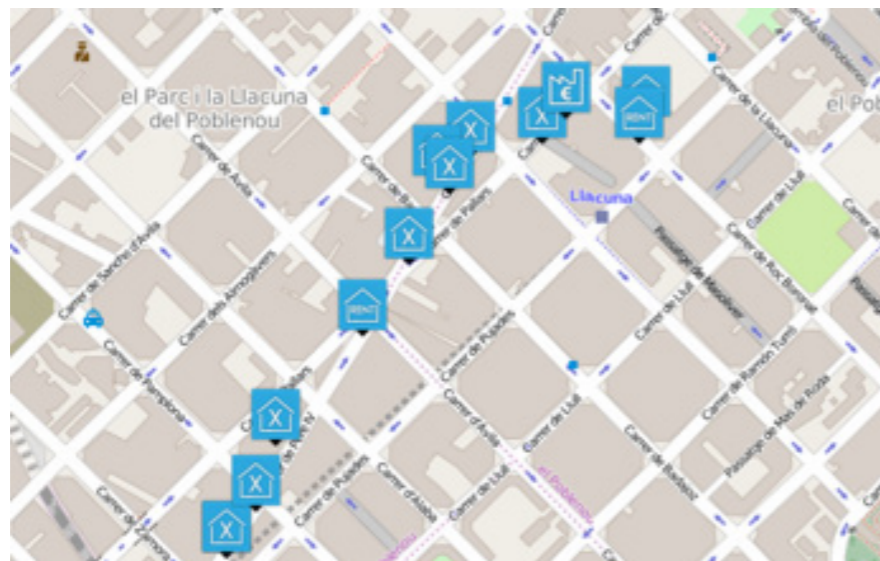

Fig. 4 *Screenshot of the CitizenSqKm scenario about empty spaces*

4. Locative media at local social processes

Contemporary telematic communication is georeferenced and the servers where these data are stored are managed, organized and disseminated by big transnational telecommunication corporations. The location is one of the omnipresent parameters in a social telecommunication context in constant information exchange, data transmission and reception and its corresponding metadata. The expansion of wireless networks, GPS systems and the use of smartphones have added in the first decade of the 21st century a fundamental element to reality: the real time massive geolocation of people and contents.

However the called MediaCity or Smartcity is distant from being an opportunity to involve in an equal way prosumers and technological corporations that monopolize the communication nodes. The principles of responsibility, sustainability and scalability are distant from being fulfilled. The set of problems regarding the copyright, the technological break or the transfer of knowledge is the central axis of a line of projects in the intersection Art, science, technology and society.

From the contemporary creation field appear subversive expressions of this kind of cartographic panoptic that belongs to military investigation and is based on traceability devices and follow-up strategies. Currently there are relevant experiences concerning the use of locative P2P technologies to fulfill the needs of local communities. It is very relevant to explore the possibilities of new visualization interfaces to access the georeferenced information in physical space, the possibility to create personalized and DIY communication networks to cowork in new forms to inhabit our urban and rural space.

4.1 Collaborative online platforms to reinforce social networks

Looking for spaces of expression of the local and personal knowledge is a necessary task. It is urgent to give visibility to these communities, their networks, their communication protocols, and also their mutual affections and informal networks. It is necessary to pay attention to this way of subjectivation to which Guattari refers (Guattari, 2005). It is necessary to contribute to the

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empowerment strategy of these groups that should be able to have fully personal or collective access to distributed power and influence, and to employ that strength when engaging with other people, institutions or society.

One of the main situations of those groups is the lack of communication between the members of the same group and mainly with other agents, collectives or groups in the same place. There are exceptions, but mainly they have very little online presence and due to this reason they mainly use privative social networks and platforms. In a key moment of rethinking urban processes, Gentrification in Pere IV Street and in Poblenou neighborhood we can find together real alternatives to the development encouraging modernity and think and develop this transmodernity of which Enrique Dussel talked about. (Dussel, 1999)

Fig. 5 *Workshop Pere IV*

This could facilitate the construction of another agency, where the knowledge, production, circulation and distribution are extremely related to the context of the people, happening and interrogating and affirming the cultural experience. (Vila, W and Villa, and, 2010, p.61) This could be done by the

activation of strategic devices, specifically made for each community, that contribute in reinforcing their communication processes. The main objective of these projects is to contribute to the realization of community sociopolitical cartographies that reconfigure problematized spatial-temporary contexts.

They are generating online participatory archives as diagnosis devices that show the multiplicity of visions at present time, either individual or collective, about the process of physical, social and political urban transformation as well as their problems and conflicts. It would be useful to utilize this diagnosis over the map to activate online and offline actions that affect public space.

An example of social locative media communication is Megafone.net, a project promoted since 2014 by Antoni Abad, a digital artist pioneer in the exploration of other social and communicative uses with mobile phone technology. Megafone is configured as an invitation to social groups that are dominant structures that marginalize the borders of society: people with functional dysfunction, illegal immigrants, political refugees, displaced communities, sex workers and professional sectors of motorcycle taxi drivers.

4.2 Online collaborative archives and cartographies

Constelaciones experience

Constelaciones is a theoretical-practical interdisciplinar community which ranges between expanded documentary practice, creative coding, audiovisual experimentation and digital artivism based in Hangar, in Poblenou neighbourhood. This collective is developing a webdocumentary project with the aim of connecting people with different technological profile and encouraging them to build a collective online archive to share the memories about the reconversion.

Constelaciones proposes a digital collaborative archive of the Pere IV elitization process for different agents and neighbors to document the change process and propose new strategies for public space. It is an online platform where this documentation is showed on a navigable map which facilitates an

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online video tool for creating people common routes and detects confluences between them.

Fig.6 *Example of the interface of the app*

Through an app for mobile devices people will be able to watch documents on the same space where they were positioned, realize and document routes, establishing confluences between connected people. The process is accompanied by the activation of physical thematic routes for mapping neighborhood resources and needs. Also Constelaciones encourages digital qualification labs to facilitate access to opensource technologies for people lacking of digital skills.

5. Hopes and possibilities

The city of today, the present city is a consolidated territory located in a moment of change. Using the significance of the adjective current given by Foucault (1999) so as to describe a process of transformation, of mutation, a constant movement of construction, the current urban context, should be read in key of repogramming and transformation. The analysis attributes and diagnosis

parameters should tend to the interpretation and the action of the people and the places in the city, giving special consideration to time, inseparable from space.

It's definitely good that vacant lots have a social use, even temporarily. It is civilised and smart that citizens contribute in improving their neighborhoods. But on the other hand, we have to be aware that it could be dangerous for municipalities to delegate the responsibility to care and create spaces to these citizen initiatives. The commitment of the administrations should be strong in this process of change. Our society needs an administration capable of playing the role of facilitator, in order to foster the autonomy of a citizenship mature enough to take de responsibility of their actions, and the conscious of their power.

Unfortunately, the rigid planning processes of the 20th century have become so institutionalized that community stakeholders rarely have the chance to voice their own ideas and aspirations about the places they inhabit. Processes like the one run in Pere IV, and in the framework of placemaking, can break down these silos by showing planners, designers, and engineers the broad value of moving beyond the narrow focus of their own professions, disciplines, agendas. The expectations of the process in Pere IV are not only to succeed in achieving their goals, but also to become a scalable and replicable model.

Today we need urban proposals that abandon the industrial conception of urban planning in order to bet on the management of possibilities. According to that, the process of transformation of the area of Pere IV is planned to be developed taking in account the following aspects, and attempting not only to transform the area physically and socially, but also the roles in city management

- Rehabilitation, reappropriation and recycling of urban spaces as strategies more sustainable than building new structures.
- Prototyping action so as to test the response of them in a short time period.
- Temporariness, as a catalysing factor. Taking temporary interventions

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not only as tests, but as ephemeral or even movable activities, in order to let them to be adapted to new needs.

- Transcend ownership concept limits, standing up for the capacity of use.
- Bet on P2P logic, cooperativism and horizontal collaborations.
- Collective responsibility
- From Plan project to plan process

6. Conclusions

The Smart city dynamics greatly facilitate the so-called cybernetic capitalism. These dynamics promote the translation of urban environments into information flow data. Interpersonal communications, commercial dynamics, the location of resources and people, human and environmental processes, become storable data. And this data becomes an element that companies and municipal corporation are able to track and monitor. We have to underline the reduction of human processes into data streams which is reductive and dangerous. The wall, the profile, the message with limited characters and the real-time location of all is a simplistic reduction of one's life experience.

This tendency to monitor the cities with the aim of generating prediction about urban processes has several contradictions. It is essential that in a system of collection, categorisation, and uploading data and connection based on the cooperation of the so-called smart citizens, they are educated in resources sharing for greater efficiency in the city. But it is exactly at this point where we encounter a problem. The city is not understood as a public space and there are no tools for sharing this information. Also, there are no mechanisms to assure the peer to peer governance improvement based on the data that they are giving. Moreover, the city is understood as a connected network between government institutions and corporations. The users have an active role at uploading but passive role in taking decisions. In the same frame of mind corporations manage on their own, the condensation and dissemination of these data, blurring the liberal separation of public and private spaces.

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Maltese technological steps towards integrative cities

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1. Introduction

Understanding how urban ecologies operate and how one can relate to the changes required for social change, entails a deep understanding of the structures that make up that society. This scenario is evident when one tries to understand how policy makers present their studies for decision-takers to act upon. In an ideal world the decision taker would have acquired knowledge of what planning entails, the situation at hand, the acquisition of a mental image of the area under study and would theoretically be able to decide on an outcome as based on such knowledge. Reality shows otherwise, since this process entails the full knowledge of how the data process is handled, how that data delivers meaningful information, which results in knowledge and eventually an informed decision is taken. However, the entire enterprise is based on access to information or the lack of same, to acquisition of information on the urban/rural structures and the environment in its wider aspects. Dealing with advocacy groups, non-governmental organisations and interested parties requires that the planner has a solid understanding of the physical, natural and social parameters that society is permeated with. A planner debating a decision on how to mitigate on urban sprawl would be required to understand how such urban ecologies morph from small hamlets to town and cities and eventually to metropolis, in addition to an understanding of the interactivities

that occur between the players as based on the sociological pillars: politics, religion, education, family and economy. Each part plays a crucial role in its attempts to sway a decision one way or another. Without basic information across the fields planners may find barriers being set up that may thwart informed decision-making.

1.1. Technologies and informations systems

With the advent of a plethora of technologies and information systems, such knowledge can be readily placed on the planner's desk. Technologies vary from digital replicas of analogue files and documents, to OCRing (extraction of text from scans) documents that allow searchable options, to real-time data capture and finally to dissemination to the interested and general public. The process enables the lessening of pressure on the planner in terms of potential accusations of withholding of information to the potential for the NGOs and interested parties to be equipped with the same information which would enable them to reach informed opinions and to debate change.

The case employed within the Maltese Islands was aimed at reaching these goals where the planning process would be enhanced by the digitalisation of the entire planning process and the subsequent structuring of information and eventual dissemination. This paper is aimed at helping planners understand the processes required to virtualise cities and the steps Malta took to create data layers that help this process. It concentrates on the unique situation where the legislative and operational tools available to planners were taken up through to the conceptualisation of a function that integrates baseline and thematic datasets for effective future analytical processes. The process is ultimately aimed at acquiring knowledge leading to the implementation of a smart cities approach where the data on every item and the relative flows are monitored in real time and where scenarios can be built to reflect the outcome resultant from every variable tweaking. As an example, understanding the effects of a new tall building would entail the insertion of a dxf model in a city model, the pooling in of spatial layers from transport, utilities, infrastructure as well as social information, with the resultant output where the different datasets are integrated in a model-based system and the scenarios tested as based on infrastructure load, increase in traffic, a growing elderly component

and a myriad number of different variables. Though the latter can reach unsustainable proportions for the model, the choice of variables would be based on the knowledge gained from the expertise on the ground and other planners' knowledge-base.

In Malta, this process entailed the foresight requirement to enable smart-cities implementation, bearing on the virtualization of the planning process, the vision of a paperless system, the creation of a physical ICT (Information and Communications Technology) structure, funding options and methodological approaches to virtualisation. The ICT structure is essential for valorisation of the smart-city approach due to its capabilities in integrating disparate datasets, gather-once / use-many functionality and ready take-up by the planning discipline as governed by the need to base all development on the use of a basemap as its core, working from a centralised approach to governance but a bottom-up approach to creation and use.

The Malta experience depicts a scenario where data is held by the legally designated data-creation bodies, where data is made accessible through a web-service model that point the dataset toward a common-core server.

1.2. Limitations to achieve the goals

The concept of place is a not an easy one to understand. People struggle to visualise the ambience of a city when described by another person: they have to conjure their vision of what that street could look like, how it is structured, the dimensions and scale, the spirit of the place, a distinction atmosphere better termed genius loci. This, whilst at the same time trying to listen to the thematic aspects being described by the other person. Imagine an architect trying to describe how a new development would look like once completed. The planner rarely visits the area and might recall what it looked like some time back or if ever, thus communication at the stage is hindered by background noise. The Malta process sought to integrate various technologies to enable both

parties and even more such as third interested parties to visualise the area through technologies. The integration of spatial systems through to a 3D model has helped the process greatly. The model was based on a Lidar scan of the island, averaging a point density of 4.3 pts/m², with a classification of ground and nonground, which resulted in a DSM (digital surface model – includes terrain and buildings) and DTM (digital terrain model – no buildings) of the islands.

This process is still hindered by various factors; lack of an integrated information structure across all government entities, lack of protocols requiring standardisations as well retention of analogue systems only (paper-based) and the silo-effect mentality where data acquired by one entity is seen as the domain of that same entity and thus required protection and guardianship.

Malta is driving its efforts to digitalise these processes and has been successful in its initial phase to digitalise the planning stream through internal investment whilst also accessing external funding to implement various tools and data capture. This it did through the knowledge that online maps, GPS (global positioning system) devices and smart technology have now been around since the late-1990s such that the university generation and the subsequent generation, have been exposed to virtual tools to a level that has been unprecedented some years ago. The older generations may need further aid to reach this level through training programmes as a clear understanding of the spatial-awareness is required. In order to employ this process, Malta took up this process through a project aimed at creating a series of technologies and protocols aimed at generating a virtuality of the islands (Formosa, Magri, Neuschmid and Schrenk, 2011). This process to move from analogue to digital systems entailed scanning, the digitalization of the application process, the submission of digital plans, a GIS-based (geographical information system) planning process and acquisition of technologies that enable data capture, input, analysis and output. One such project entailed the creation of Malta in 3D using LiDAR (Light detection and ranging) technology and the ERDF (European Regional Development Fund) project entitled "Developing National Environmental Monitoring Infrastructure and Capacity" (MEPA, 2009).

2. The legislative aspects

The steps that MEPA took to understand spaces include various iterations of its legislative tools, as regulated by the Development Planning Act (DPA) of 1992 and the Environment Planning Act (EPA) of 2001, which were replaced by the Environment and Development Planning Act (EDPA) of 2010. In addition to these main tools, MEPA is governed by a series of subsidiary legislation that regulate planning and sustainability as well as the public participation process. In fact, the uniqueness of the amalgamation of the planning authority and the environment entity created the scenario that other legislative tools where integrated within the parameters of the governance such that the planning side now has a series of protocols for the datacycle that will be retained in place once the two entities part ways. Thus, in conjunction with the EDPA and its subsidiary legislation, a series of other tools were integrated, such that planners now have a plethora of objectives to follow in order to ensure that the data cycle is tackled in its entire process. These tools relate to access to standardised processes for information-creation which is being tackled from various legislative loci such as the Data Protection Act (OJ, 1995), the Århus Convention (OJ, 2003a; OJ 2003b), the Freedom of Information Act (OJ, 2003c; Malta Government, 2012) and the INSPIRE Directive (OJ, 2007), in addition to other guidance documents that are targeted to enable the smooth and free flow of effective information. MEPA through its Information Resources and Technology Unit (IRU) has created a series of protocols that ensure further governance through metadata structures, lineages, adherence to the European Environment Agency priority dataflows and its own ISO standardisation.

These tools enabled MEPA to create a process that focused on its core function as a creator and user of spatial data. The organisation uses geodata in almost all of its business processes and has invested heavily in spatial resources and capacity. Users have multiple-level requirements, such as those who need to create data within a defined application process, others who carry out spatial analysis and data creation and editing processes as well as casual users such as the general public who require view and occasionally download services.

Thus MEPA sought to create systems that provided a system that ensures a "capture once use many times" policy, employs a data owner/custodian mind set, implements data and quality standards, introduces metadata and discovery tools as well as disseminates data to the general public in a mixed charging mode: free for environmental related datasets and chargeable for other datasets as per time taken to run such queries.

how such urban ecologies morph from small hamlets to town and cities and eventually to metropolis, in addition to an understanding of the interactivities that occur between the players as based on the sociological pillars: politics, religion, education, family and economy. Each part plays a crucial role in its attempts to sway a decision one way or another. Without basic information across the fields planners may find barriers being set up that may thwart informed decision-making.

3. Methods and processes

The method employed in the effort to integrate the different functions across the planning and technological fields is that termed the W6H (CMAP, 2002), a concept that was taken up through another discipline; criminology, which through its spatio-temporal concepts and requirements to convert thematic data into a spatial format, initiated a process to convert analogue data into digital forms. The ability of employing spatial data to form an analysis based on a what, why, who, when, where, why not and how phenomena (W6H) outlined by CMAP has helped spatial planning tremendously. GIS analysts seek to investigate each of the W6H pivots to identify patterns to reach conclusions on whether correlations exist or not. The six pivots (Who, What, When, Where, Why, How and Why Not) concept was employed as a basis for integration whilst the effort is currently being upgraded to encompass all spatial data creators and users entities that have a role in the foresight activities of the Maltese Islands. The main trust of this model is to ensure that all the process involved in the identification of activities relating of GIS analysis as integrated with other thematic data, are understood. The main functions were amended to focus on planning aspects:

- **What** categories of city-function can be identified: plans, streets, basemap, infrastructure, etc? What routines can be identified (category analysis)? What relationships are there between development applications and other variables?

- **Why** does a phenomenon occur? Why do applicants focus on specific zones (commonalities of a pattern – root cause of a sprawl trend)?

- **Who** carried out the activity? Who witnessed the illegal activity? Who was the victim (offender and target profiling)?

- **When** did an enforcement occur (temporal analysis)?

- **Where** did the infringement occur? Where did the applicant hail from (geographic analysis – environmental analysis) – (opportunity and routine activity)?

- **How** did an activity occur (deductive approach - classification and modus operandi analysis), how will climate change effect the coastal regions, environmental considerations?

- **Why not** investigate unrelated variables to elicit if some type of relationship exists (correlation between data layers)?

GIS has enabled information to be mapped over time. This means that statistics, such as those related to crime levels, could be understood in spatial contexts. As indicated in the W6H structure any data that has a link to a geocoded system can be analysed. In this way GIS has brought to the fore situations where previously non-spatial data (attributes) can now be linked to a spatial dataset and that same data would be integrated into a new GIS layer. Such a structure enables the evolution of thematic data to geographical data (locational data based on points on the earth) to a spatial construct (relationship between entities based on the earth) and across a temporal dimension. MEPA's role in this process was to create the base data to enable this foresight process.

4. Strategy employed

A series of procedures were introduced and which served as guidelines for the whole data management process. It aimed to identify sources of redundancy and multiplicity, and enhanced a streamlined dataflow methodology leading to a one-stop-datashop environment. Whilst the strategy covered the main data management issues, it delved into ancillary services such as data creation methodologies, GIS services and research & information practices. On a logistical side it also outlined document management, data acquisition process inclusive of scanning and digitising, as well as dissemination processes inclusive of pricing policy, archival services and dissemination processes.

4.1. Data Management Strategy (Why/Why Not)

This section identified the issues relating to data management within the organisation based on the complete data cycle. It investigated the processes required from design, data gathering, input, analysis and output as well as data dissemination procedures. A generic data model was identified for thematic data models that were implemented for the different processes. In addition, metadata and lineage system procedures and templates were drafted. The steps covered the following themes:

- *Define data structure for the organisation, planners and clients*
- *Create Data Model*
- *Draft Meta-Data strategy*
- *Data management strategy for monitoring and maintenance purposes*
- *Create procedures for data creation*
- *Integrate model in line with imaging and knowledge-based systems*
- *Harmonise structure in line with data storage function*
- *Establish data request and feedback procedures*

4.2. Implement document management solution in line with strategy set out in 4.1 (How, Where)

This section aimed to establish guidelines for the setting up of a repository system that aids data management control and maintenance. This was reviewed in line with the electronic-applications process, a service contract and other projects.

- *Establish a repository system with version control, management and searching facilities*
- *Devise procedures on use of repository system and provide training to users on both methodology and system*
- *Evaluate the possibility of developing on-line lineage forms for different data types*
- *Create streamline procedure to identify which system to use: e-applications or repository systems, mail-registry*

4.3. Document digitisation/uploading (When, What)

This section aimed to establish guidelines for the setting up of a data acquisition process in line with the data management and document management steps outlined above. The process looks at the required data formats, the necessary applications and any ancillary hardware requirements.

- *Review in line with point 4.1 above*
- *Scanning and conversion of documents*
- *Uploading to website – intranet/internet*

4.4. GIS data creation (Who, How)

This phase reviewed the current spatial data structures and layers within MEPA. The process aimed to source all data layers and developed common storage locations. It identified the available resources and GIS skills as well as bringing forward the need to follow strict meta-data and lineage procedures. Figure 1 depicts such a process that laid the foundations for the data management process, from remotely-sensed imagery to polygonal and point data to analysed outputs.

- *Set up a dedicated IR/GIS Unit that hold the necessary expertise*
- *Set up a pool of technicians within each MEPA Unit that report to the IRU management in order to ensure data cohesion*
- *Create and manage GIS data layers for inter- MEPA units*
- *Identify use of lineages and meta-data (as per IRU documentation). Incorporate in model*
- *Prepare layers for EEA uploads and convert to full-UTM until SIntegraM (a new ERDF project) is completed*
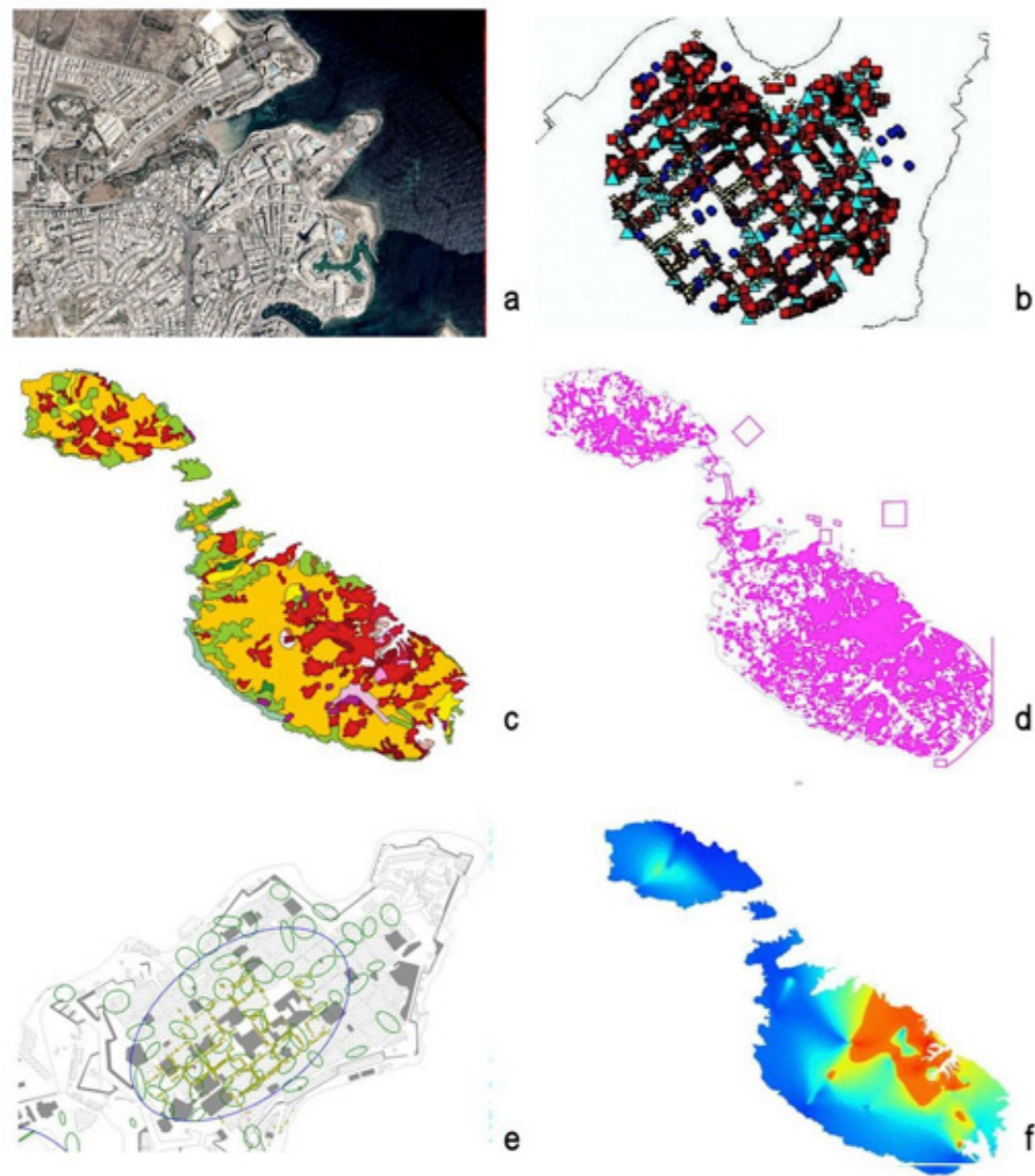
Figure 1. Process to create the first digital layers for eventual spatial data integration

(a) aerial imagery acquired for planning purposes and to be used as a basemap;
(b) creation of spatial layers from analogue data through automated vector data conversion and direct manual inputting, where figure depicts building locations by type;
(c) creation of maps for international reporting; Corine Land Cover CLC2006 that depicts landcover categories of the islands;
(d) finalized development application layer that is created at application stage pending a building permit, which layers shows that the entire islands are effected;
(e) first analysis based on spatial statistics which employed spatial statistics such as NNH (Nearest Neighbour Hierarchical Clustering) to elicit the concentrations of activities in specific zones, herein depicted as ellipsoids;
(f) hotspot analysis enabled through the data conversion and integration process, which figure depicts the spread of benzene in air prior to the elimination of lead additives in fuel.

4.5. Dissemination Policy and Management (How, What)

This phase reviewed the data dissemination policy in order to streamline its services towards a harmonised approach. It reviewed issues such as pricing policy, publication options, marketing of data services, and dissemination through webservers. Figure 2 depicts the outputs emanating from the integration of various technologies, proprietary and open-source that integrated the spatial layers and disseminated such through a dedicated mapserver.

- *Draft dissemination options document*

- *Draft process for MEPA-wide data dissemination and external charging rates through IR – one stop-shop for streamlining of data transfer into and out-of MEPA, where all data requests to MEPA are channeled through one source: currently IR.*

- *Update periodic monthly data updates*

- *Updating of IR-related intranet/internet webpages (NSO press, LN/GNs)*

- *Creation of interactive products and selling-point on website*

- *Presentations by MEPA staff to be converted to swf flash and uploaded on the net*

- *Disseminate data through on-line queriable datasets (refer to NSO StatDb)*
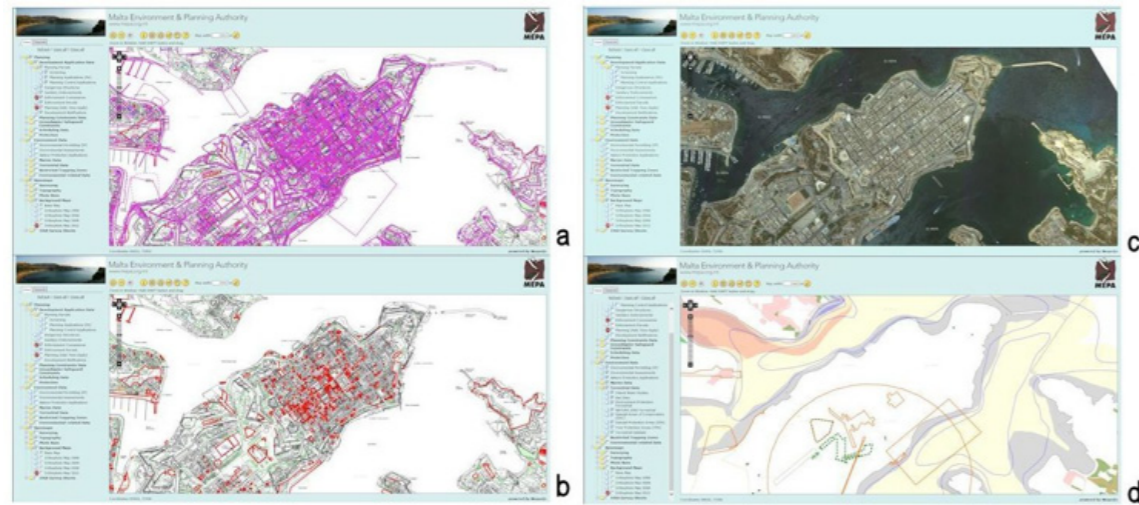
Figure 2. Data dissemination modes;

(a) establishment of a common dissemination format employing the basemap and thematic data inclusive of development application layers;
(b) highlighting of enforcement areas, eliciting the irregularities identified through the spatial analysis;
(c) integration of ortho-imagery with the basemap through a pyramidical structure where detailed layers are loaded as users zoom into the zones under review;
(d) initial thematic analysis, such as protected zones identified through the inputting stage and which depict the different land uses and potential activities or restrictions that could take place in such areas.

The output system showed that the limitations experienced through the use of tools that are not universal to all browsers, point to the need to create a system based on web map services that follow the INSPIRE dissemination rules, with the relevant security system put in place to ensure system integrity.

The method identified issues that related directly to operational and implementation operands inclusive of budgeting, resource requirements, capacity, tendering and post-project maintenance. Malta partook to these activities through various means: in-house business plans, national and international legislation transposition, acquisition of funding and capacity building exercises. The crux of such projects lies with the eventual management

and retention of the knowledge gained and its extension to other entities; a process that would ensure knowledge gain across the nation. The initial costs were significant, running close to EUR5million, with maintenance envisaged at EUR50000 plus retraining activities, which costings are mitigated through reduction of expert time on recreation or redundancy elimination.

5. Taking the Next Steps

The next phase that attempts to integrate the planning data with all other governmental entities' data within a central core has been initiated and is planned to take up the MEPA process and expand it to all entities enabling instant access as well as enabling societal benefits such as post-disaster management. The project entitled SIntegraM: Spatial Integration for the Maltese Islands: Developing Integrated National Spatial Information Capacity is aimed at satisfying three aspects: building the necessary infrastructure, enhancing the human capacity and ensuring a legislative and mentality shift in ensuring the free exchange of data and established dissemination protocols.
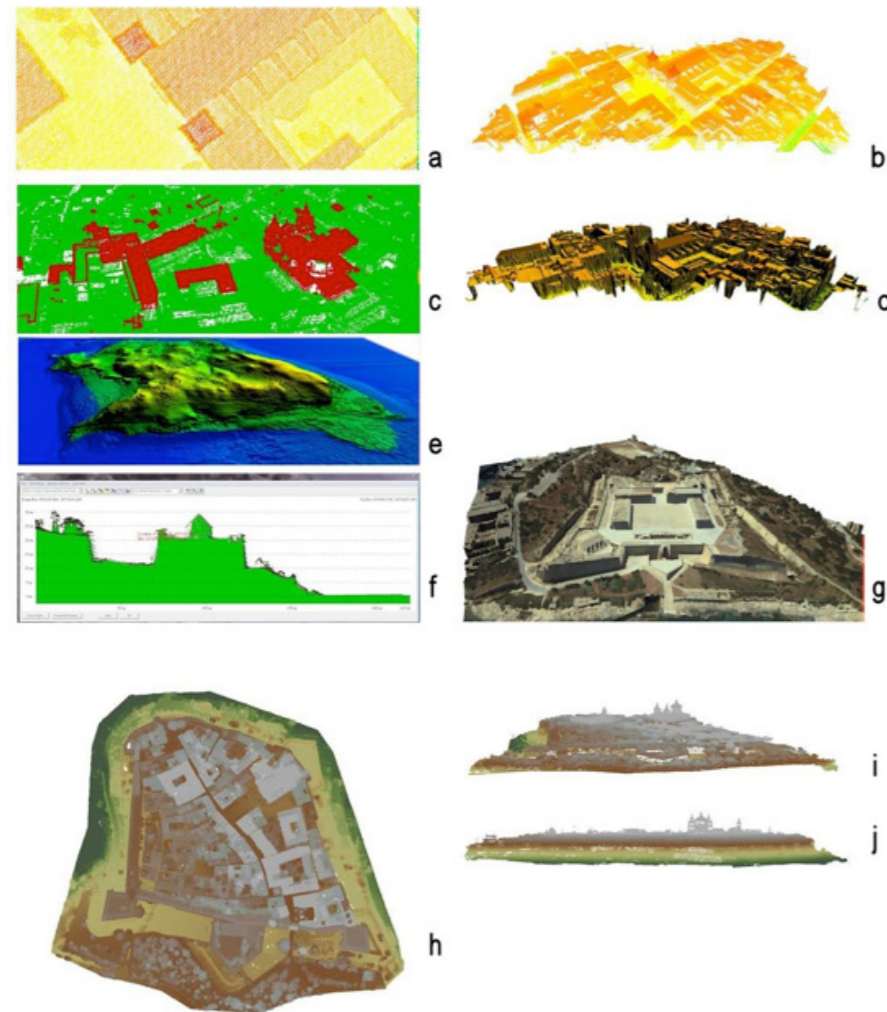
Figure 3. Steps towards smart integrated cities:

(a) LiDAR scan at 4 points per m.sq. was run to enable a time-stamped baseline for post-scan change analysis;
(b) 3D output based on figure a) where the height differences in the DEM (Digital Elevation Model) is analysed;
(c) extraction of potential illegal height developments, where the highest points are analysed against the established height limitations;
(d) TIN development layer outputs is resultant from a rasterisation of the LiDAR point data, which result enables users to view the zone in a 'landscaped' form;
(e) sea-level rise analysis that can predict potential zones that could be inundated as well as zones that were inundated in historical eras;
(f) cross-sectional analysis that planners employ to view landscapes and development shapes;
(g) 3D printed output enables planners to view the eventual outcome of their decisions;
(h-j) entire medieval city plan preparation in 3D visualisation enables users to interact with the LiDAR data and view the point files from different viewpoints.

The outcomes from the infrastructure aspect include the development of a new Basemap for the Maltese Islands, the alignment of all spatial data in a common projection, the creation of an online dissemination and analysis spatial information system, the setting up of necessary infrastructure to enable the entire data cycle (design-input-analysis-output-reporting) and the development of the necessary infrastructure to future preparedness. The outputs from the new project will enhance the outcomes from a project funded by ERDF that enabled MEPA to create an entire nation point cloud, rendered full public access to the information and enabled 3D views to all. The move towards a smart city approach will employ these datasets, integrate them within new infrastructure and allow immersive interaction within the new datasets, literally ensuring that planners are able to view the effects of their decisions in realistic scenarios. Figure 3 depicts such outcomes through its depiction of base point data (averaged at less than 15cm height accuracy), development processes, thematic analysis, and dissemination of derived data such as TIN/DEM models through the web-services or download services.

The second aspect will strive to building human capacity in the spatial themes across all governmental entities, whilst the third aspect will ensure adherence to the INSPIRE Directive and relevant legislation as well as the creation of a series of protocols that enable the free exchange of data and knowledge across the entities.

6. Conclusions

In conclusion, the creation of a spatial information system for the Maltese Islands was simply the first step at attempting to understand how to create systems for employment by planners in a realistic and achievable scenario. The project was successful in its attempt to bridge the gap between analogue information and spatial planning information that depends heavily on locational data. Through an analysis of the legislative tools and the implementation processes undertaken to initiate the process that will eventually lead to a smart city data construct, the results show that the base-data steps taken will

ensure the eventual integration of baseline and thematic datasets for effective future analytical processes. The Malta case study was only made possible through the intervention of various initiatives as delineated by the different Directives and conventions as well as national legislation. As both planning and environmental data were readily available, these processes were easier to employ and the resultant project outputs showed that it was possible to create new tools and systems that planners could use in their day-to-day professional activities and knowledge development. The next step, that of integrative processes across all government entities aim to further widen this knowledge which will result in new data integration such as geological, underground infrastructure, street furniture, watersheds, road networks and hundreds of other currently stand-alone datasets.

Interestingly, the process is not without its successes and lesser achievements. The impact of such an activity in the Maltese state is not insignificant, with the resultant pressures effecting directly and indirectly the modus operandi of the entities that partook to the activity. Training, realignment of job descriptions, new staff intake, re-training and capital expenditure were experienced. The drive enacted by the entity running the process resulted in a cascading effect on other entities that might not have been ready for such a change and in turn bottlenecking occurred that might slow down the expansion of the process across other entities, leading to slower uptake of the national process. This said, the fact that the activity was successful in the driving agency and that the impacts have already been experienced have enabled the laying of the foundation-stone for information integration leading to smarter environments.

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Volunteered Geographic Information (VGI) -
Youth Governance Toolkit

AUTHORS:
Nuha Eltinay

1. Introduction

With the evolution of the British modern town planning action in the 19th century, the utopian living concepts were extremely fostered by early European planners and governmental spatial planning policies, to liberate the city structure from the industrial urbanisation legacy into more environmentally balanced and human oriented urban livelihoods. Recently, movements towards sustainable socio-economic development parameters acquired significance worldwide, parallel to the utopian eco-cities paradox in response to, the proliferation of extreme climate change impact on urban livelihoods and natural biodiversity systems.

Advocating that regulatory frameworks and operational management mechanisms, pioneer more balanced human-natural ecological system, beyond the "inspiration of green movements". (Jeroen van der Heijden, 2010.p.1), these revolutionary practices introduce a new model of the "utopia-paradox". Here, the delivery of innovative governance extends from the management of land ownership and planning polices, to economical market assessments and secured financial funds for infrastructure and construction services, with the participation of all community age groups and local stakeholders.

With the youth running high risks of unemployment rates, social exclusion

and marginalization, the integration of this governance public participatory model into the European spatial planning policy, will categorise profile emerging models for formalizing youth involvement in their city urban planning practices. The lack of strong accountability mechanisms for youth societal and political engagement in the decision making process, will remain jeopardizing the political and economic stability of the European governing bodies and institutional organisations, unless concrete measures are to take place at the regional level.

This proposal comes in line with the 2009 Lisbon treaty to "encourage the participation of young people in democratic life in Europe". The European Commission (EC) has launched the 2014-2020 Erasmus+ Programme for Education, training, youth and sport, to tackle the escalating socio-economic challenges facing the large metropolises development frameworks in the EU countries. Nevertheless, evidence have shown from the previous 2007-2013 Erasmus program evaluations, that outcomes were limited to theoretical policy reforms with the lack of well-structured application of practical implementation schemes. (Erasmus European Community Action Scheme for the Mobility of University Students).

Accordingly, this paper will target the utilization of the young people skills, to benefit from and contribute to a knowledge-based urban planning governance, and local community sustainable economy. Fostered by youth growing geo-literacy and accessibility to inexpensive mobile location-aware devices, the hypothesis of Volunteered Geographic Information will be formed to empower the digital agenda of community participatory planning, through the employment of young people ICT skills.

The ideal of Volunteered Geographic Information (VGI)-Youth Urban Governance toolkit will establish a multidisciplinary approach, in support to the implementation of the European Innovation Partnership on Smart Cities and Communities- Operational Implementation Plan (OIP) programme, with the adoption of University of California Berkeley's Center for Cities and Schools Y-PLAN methodological approach.

Policy makers, local governance representatives, the private sector and community stakeholders will benefit from the Youth Urban Governance toolkit simulation model, setting the path forward to empower young people participatory qualitative accessibility to geo communication database, and impact the youth engagement in spatial planning e-governance.

Following the introduction, the paper will present theoretical policy review for the European Commission (EC) Erasmus Programme, and European Innovation Partnership on Smart Cities and Communities:

Operational Implementation Plan (OIP). Research aims and objectives will then be outlined, to identify the key research questions, explore Volunteered Geographic Information system terminologies, and summarize the key debates and challenges behind youth urban governance.

Research methods and approaches will follow, highlighting the translation of the Y-PLAN from theory into best practices, and how this is related to the EU policy action plan. Expected outcomes and guidelines will be set for post 2015 accountability mechanisms, considering the future impact of youth institutional governance socio-cultural shifts. Conclusions derived from the VGI Urban Governance Toolkit will sum-up the young people advocacy planning and awareness expected outcomes, and set recommendation for the EU future planning policy development schemes.

2. Background

Recent spreads in GPS (Geographic Positioning System) information technology, and social networks geo tagging advancements, provided new opportunities for spatial public participation, and civic centered interaction with mapping spatial data, yet the full potential of youth sensing is unleashed.

In order to create synergies between the Erasmus+ Programme, Youth

action plan, and the European Innovation Partnership on Smart Cities and Communities- Operational Implementation Plan (OIP), it is important to understand the conceptual background of each terms, to formulate strong foundations of young people leadership, assisting in gaining sustainable life learning skills for urban governance, and forming a continuum of effective and inclusive citizen based accountability.

2.1 2009 Lisbon Treaty: European Commission (EC) Erasmus Programme

Initially known as the Reform Treaty, the Lisbon treaty was signed by the EU member states on 13 December 2007, and entered into force on December the first 2009. This Treaty has brought in a significant development in terms of the relationship between European institutions and youth, as stated in Article 11"The institutions shall, by appropriate means, give citizens and representative associations the opportunity to make known and publicly exchange their views in all areas of Union action. The institutions shall maintain an open, transparent and regular dialogue with representative associations and civil society".(European Parliament, 2015)

In line with the Lisbon Treaty aim at encouraging the development of youth exchanges and exchanges, comes the Erasmus (European Community Action Scheme for the Mobility of University Students) programme, which was first named after the Dutch Philosopher Desiderius Erasmus of Rotterdam. Being inspired with his passion to expand knowledge and gain new insights across Europe, the European Commission proposed the support for students pilot exchange programmes in June 1987. In order to link the Lisbon treaty and Erasmus, it is worth noting that the Lisbon Treaty open the doors for integrating the young people rights in Urban Planning Governance, and all stage of the decision making, according to the Charter of Fundamental Rights implementation process, presenting the most significant milestone in the development of Children's Rights since the European Union establishment, the background to the EU Youth action programmes will be briefly outlined, bearing in mind the inclusion of 'youth' as a concept in European policy.

EU Youth Strategy 2010-2018

In April 2009, the Commission presented a communication entitled 'An EU strategy for youth — investing and empowering. A renewed open method of coordination to address youth challenges and opportunities'. The new strategy invites both the Member States and the Commission, during the period 2010 to 2018, to cooperate in the youth field by means of a renewed open method of coordination. The strategy invites all Member States to organise a permanent and regular dialogue with young people. Furthermore, it encourages a more research- and evidence-based youth policy. In November 2009, the Council of Youth Ministers adopted a resolution on a renewed framework for European cooperation in the youth field for the next decade. It is based on the Commission's communication of April 2009.

Youth in Action programme

On 15 November 2006, Parliament and the Council adopted Decision No 1719/2006/EC, establishing the Youth in Action programme for the period 2007 to 2013. This document forms the legal basis of the programme for its entire duration. The programme concerns young people aged between 15 and 28 (in some cases between 13 and 30). It aims to inspire a sense of active citizenship, solidarity and tolerance among Europeans from adolescence to adulthood and to involve them in shaping the Union's future. The programme promotes mobility within and beyond EU borders, non-formal learning and intercultural dialogue, and encourages the inclusion of all young people, regardless of their educational, social and cultural background. It helps young people acquire new skills, and provides them with opportunities for non-formal and informal learning with a European dimension. Particular attention has been paid to the access of young people from Roma communities, through an annual priority focus in 2009 and 2010. Volunteering is a core part of several EU programmes that mainly promote the mobility of volunteers, such as the Youth in Action programme (notably through the European Voluntary Service), Erasmus+ and the Europe for Citizens programme. The emphasis will be placed on funding projects with a volunteering dimension in the EU's action programmes, such as the Youth in Action programme.

(European Parliament, 2015)

In 2007, the Lifelong Learning Programme was established in continue to the actions launched under the previous programs, with emphasis on reflecting the "European dimension" of education and training. Exchange

between Individuals, institutions and countries within the European Union and European Economic Area took place, developing partnerships between schools, universities and adult educational organizations.

By 2013, in-services training courses and joint curricula research thematic networks were running on different disciplines, yet the quality and relevance of Europe's youth oriented educational and training schemes did not reach it's expected potential, leaving the approximate of six million people unemployed with levels reaching above 50% in Spain and Greece. At the time where two million job vacancies were available, with extreme shortage in skilled staff availability in the local job market.(European Commission, 2013).

Accordingly, the Erasmus+ seven year programme came into action in January 2014 by the European Parliament, with a budget of 14.7 billion Euros, targeting more that 4 million people to receive support for study, training, work and volunteering opportunities. With the goal to allocate two thirds of the budget for learning opportunities abroad, the reminder will be allocated to support partnerships between youth organizations, educational institutes, private sector, local and regional authorities and non-government organizations. Erasmus+ develops lifelong learning programmes, and vocational education international dimensions, to promote synergies with civil society organizations, and cross fertilization throughout the fields of youth non-formal and informal learning, via the Erasmus+: Youth in Action Programme.(Figure 1)

In accordance with the Lisbon Treaty 2009 and the European Commission 2014-2020 Erasmus+ Programme mentioned above, the proposed VGI Urban Governance toolkit is targeted to support "Europe's human talent and social capital, while confirming the principle of lifelong learning by linking support to formal, non-formal and informal learning throughout education, training and youth fields". (Erasmus Programme Guide, 2015).

Moving beyond the mere crowdsourcing public policy of knowledge exchange and random sample of poll surveying, the following paragraphs will explain how the Operational Implementation Plan (OIP) Citizen Focus Priority area instrumental design solutions is used as a guideline for the Implement the
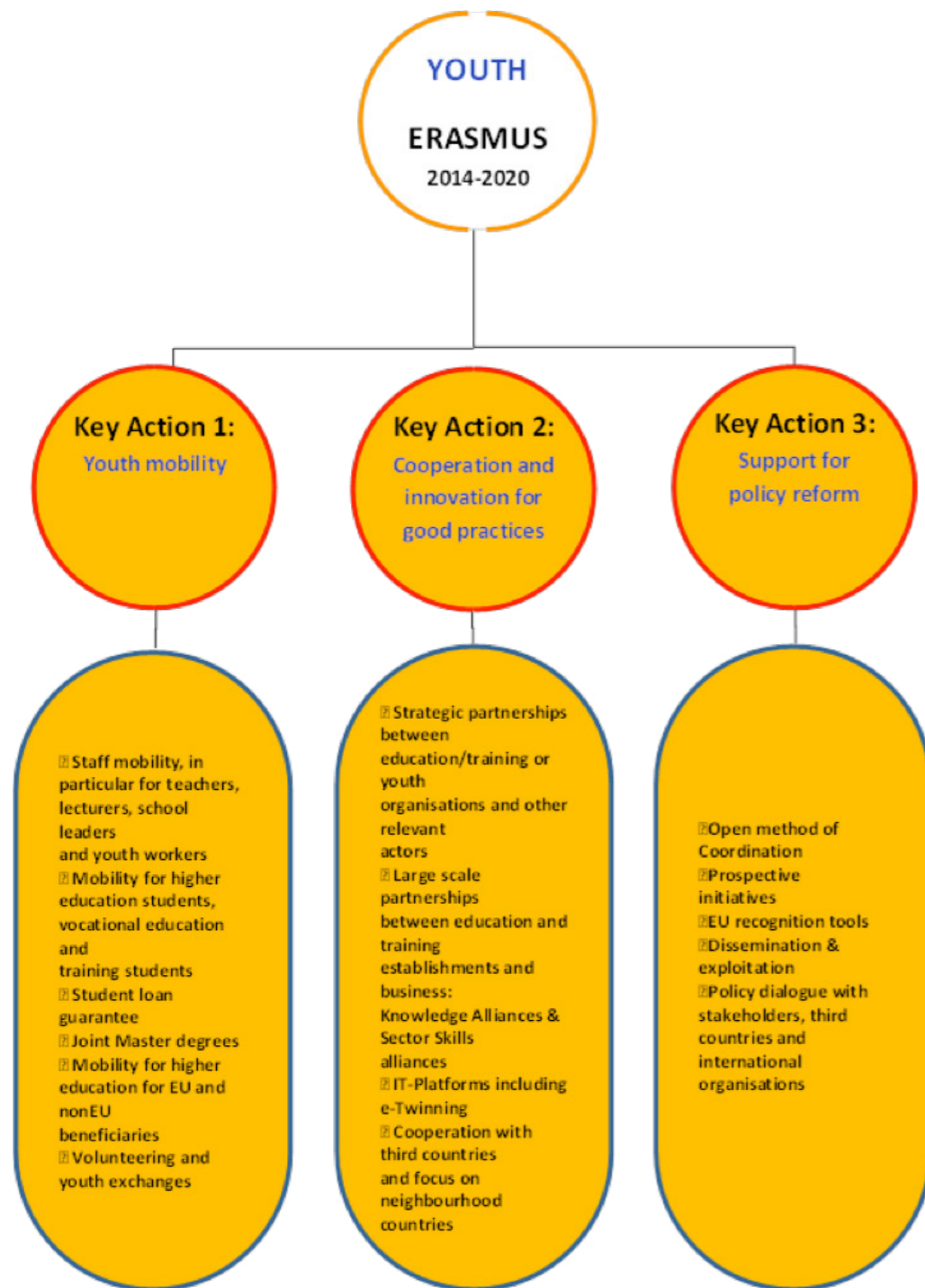
Fig.1 *European Commission 2014-2020 Erasmus+ Programme Key Actions*

EU Lisbon Treaty and Erasmus policy outlined, with the assimilation of the Y-PLAN and the European Cooperation in Science and Technology (COST) Information and communication technologies action TD 1202 on "Mapping and the citizen sensor". This new approach of reinforced task-based youth engagement in the place making design process will widen our perspective into youth innovation data collection instruments, and how to visualize and combine environmental observations with narrative urban qualities, to generate predictions and evidence based planning decisions.

2.2 European Innovation Partnership on Smart Cities and Communities

Operational Implementation Plan (OIP)

The European Innovation Partnership on Smart Cities and Communities has recently issued the Strategic Implementation Plan (SIP), in the purpose of laying-out the framework of the EU Partnership, to achieve *"a significant improvement of citizens' quality of life, an increased competitiveness of Europe's industry and innovative SMEs together with a strong contribution to sustainability and the EU's 20/20/20 energy and climate targets"*. (Strategic Implementation Plan, p.3)

Working within three main themes, Sustainable Urban Mobility, Sustainable Districts and Built Environmnet,Integrated Infrastructure Processes, eleven priority areas are defined as gudelines for actions, providing detailed implementation criteria todevelop advance smart cities institutinal capacities within the European context (Figure 2).

The VGI Youth Urban Governence toolkit will focus on the Citizen Focused priorety area, where EU funds are accumulated for projects targeting the itersection between human capacity, civil society ,local community groups, Information technolgy, transportation, and energy in the urban enviornment. Here, "citizen-led projects scale" are introduced as drives to identify citizen based problems leading to instrumental design proposals. That would assure targeting the most significance local obstacles, and the configiration of the

most effeicent planning solutions, reflecting local citizen insights, voices, and needs.

The OIP Maturity model, can work as a foundation for the Volunteered Geographic Information (VGI)-Youth Urban Governance toolkit, to determine the state of youth accessibility progress to achive development goals, and progress funding budgets and implementation time frames according to realistic measures. Successful practices will be used as information base of approaches to disseminate knowledge at the EU regional level, and provide insights for learning from world wide city models
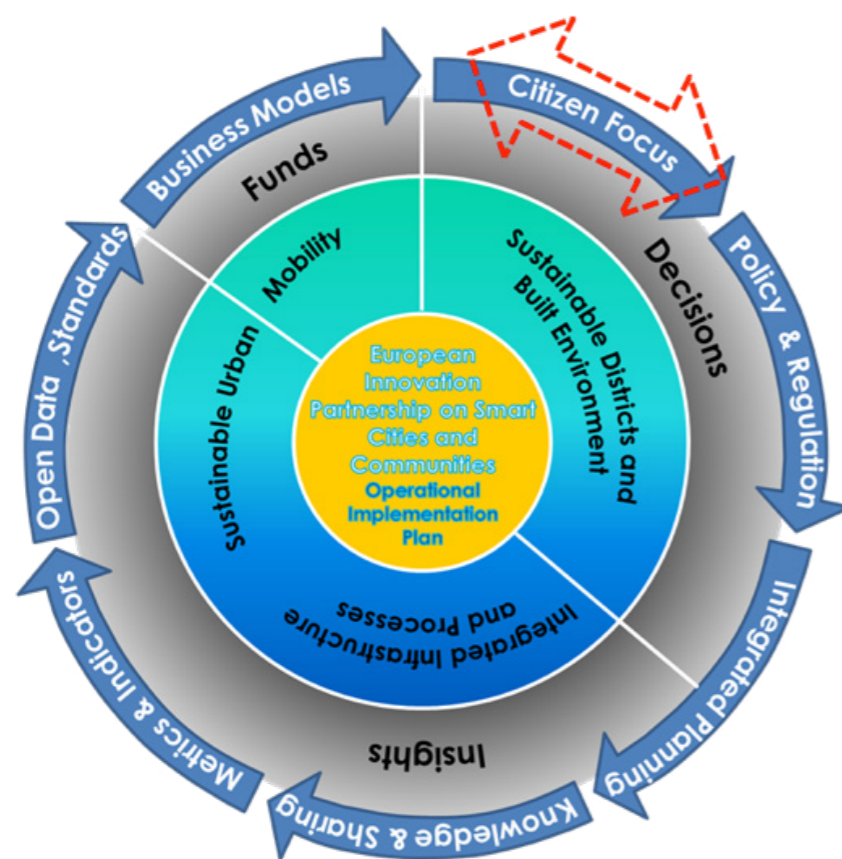

Fig.2 *European Innovation Partnership on Smart Cities and Communities*

3. Aims

Aiming at maximising the benefit of the digital era to empower the youth utilization of Inquiry-based conceptualization ICT tools, VGI will work as a as sustainable approach for community mapping, enhancing youth participation in generating user-modified maps, and dissemination of urban spatial data. In support to this objective, it is worth noting that young people aged 16–29 have made higher computer and internet usage than the rest of the population on a daily basis." Four out of every five (80 %) young people used a computer on a daily basis in 2014(Figure3).According to the 2015 statistical data for the Eurostat resource, ICT surveys for EU state countries on access and internet connectivity have shown nearly 20 percentage points higher than among the whole population (63 %)" Eurostat Statistics Explained. (2015).

Having considered the figures above, this paper objective is to examine the youth utilization of Inquiry-based discovery conceptualization, as sustainable toolkit for community mapping, generation of user-modified maps, and dissemination of spatial data.

In the pursuit of innovative youth applications of social capital as spatial citizens, equal access to digital geo-referenced data and urban land-use policies, will gain particular attention, by understanding the key concepts of geo-collaboration techniques, and highlighting the challenges posed by the youth as obstacles to citizen agency. Services delivery and interpretation of open innovation 'thick' and 'thin' engagement will enhance the youth knowledge on urban planning participatory representations and geo-media analysis.
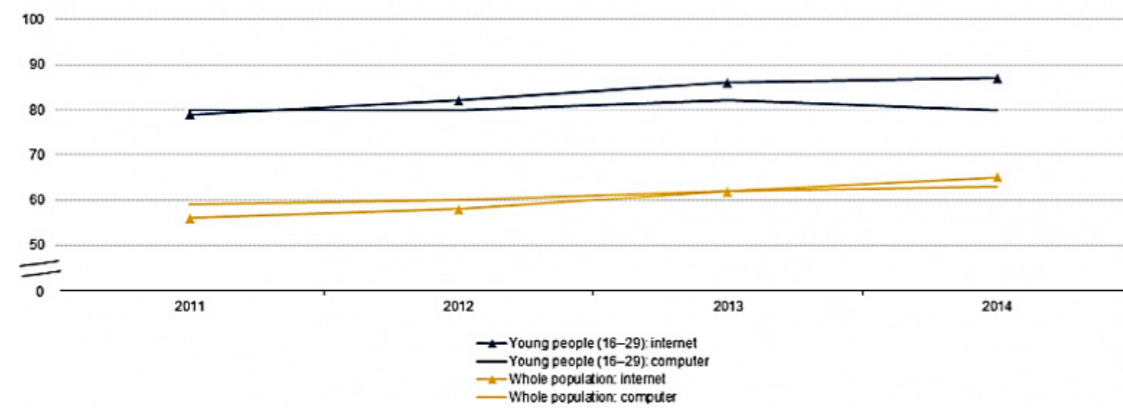
Fig. 3 *Eurostat: Online data on Young people usage for internet and computer*

4. Research Questions

4.1 What is Volunteered Geographic Information (VGI)?

With the beginning of Geographic Information System (GIS) Corps in 2003 Atlanta, Georgia, GIS was utilized by highly specialized experts, to strengthen the local capacity of using spatial information technologies, and develop web-based interactive mapping applications. Restrictions to public usage was highly executed until the reveal of the Open Street Map editing tool, that goes beyond legalization of map technical resources and restrictions on accessibility, to vector based editable map, which allows the public to upload GPS track logs in innovative, productive and effective manner.

VGI is Defined as "The harnessing of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals". Volunteered Geographic Information can work as a great vehicle to empower youth urban governance, and participation in spatial planning community practices.(Goodchild, 2007). Thus, the acquiring of holistic analytical approach is important to understand the impact of capacity building, and skills attainment on youth labor market flexibility and employer institutional demands.

4.2 What are VGI key concepts and Liability Risk Management techniques?

Bearing in mind the previous points, the financial and technical complexity process accompanied by acquiring, updating and maintaining government institutional datasets remain the VGI main obstacles. Stated at the AGILE'2014 International Conference on Geographic Information Science "Accurate and timely maps are a fundamental resource but their production in a changing world is a major scientific and practical grand challenge.

Citizen sensing has the potential to radically change mapping, however the quality of citizen sensor data, is variable and activity is often relatively uncoordinated".(Fonte et al, 2014). It might be said that, VGI data provided by the young can act as reliable and updated spatial information for industry and citizens; nevertheless, further investigation regarding the key concepts below, is necessary to understand the geo-collaboration legal liability, and how to integrate voluntary information into authoritative Geospatial Data Infrastructure.(Teymurian et al,2013).

Geo collaboration

Geo collaboration is an emerging area of study examining how spatial information and communication technologies can be designed and adapted to support group interactions that use geographically-referenced data and information These group interactions normally focus on tasks such as the spatial data access and exploration, problem-solving, planning, and decision-making (Maceachren., et al, 2004).

Crowd sourcing

Data acquisition by large and diverse groups of people, who in many cases are not trained surveyors and who don't have special computer knowledge for using the web technology (heipek, 2010).

Social network

Social network provides functions that allow participants to inform, discuss, vote and share (Steiniger., et al, 2012).

Web 2.0

Web 2.0 is a platform that facilitates interactive collection and share of intelligence through blogs, wikis, podcasts and social networking sites interoperability, user-centered design, and collaboration on the World Wide Web (Ganapati, 2010).

Why is VGI system proposed as a Tool for Youth Urban Governance?

While it is generally agreed that VGI "provide an understanding of current practices involving the acquisition, description, storage and distribution of VGI arising from citizen sensors", this tool will be maintained for Youth Urban Governance, to extend the role of the youth from data providers, to contributors influencing the city planning decision making process.

The provision of capacity building programmes for the expertise and training of citizen sensors will also be targeted as part of the proposed toolkit Liability Risk Management techniques, to identify possible risks and set evaluation standards of risk occurrence against magnitude of VGI harm.

Current levels of youth socio-economic challenges are the main drive behind exploring the context of EU governance policy, and impact on shaping the future of European labor markets, and youth urban governance. Thus, falling into the interest of the 2009 Lisbon Treaty goals, accompanied by the legally binding Charter of Fundamental civil, political, economic and social rights, the implementation of effective streamlined institutional working methods, will impact youth skills and employability levels, and open the doors for integrating the young people rights in Urban Planning Governance.

5. Methodology and Approach

In support to VGI citizen participation terms above, this paper outlines the European Cooperation in Science and Technology (COST) Information and communication technologies (ICT) action TD 1202 on "Mapping and the citizen sensor", as a strategic initiative funded by the European Union to help enhance the role of youth citizen sensing in community mapping. With the high crowdsourcing data volumes available to the youth, Ubiquitous cartography and collaboratively contributed geographic information, the TD 1202 focus on acquiring and managing the reliability of VGI observations. (COST, 2014).

COST ICT action methodological approach will be applied as VGI Urban Governance toolkit quality assessment tool, to assure safe and secure resource control when implementing VGI into organizational datasets. Monitoring, regular checks and quality assurance of spatial data contributed by the public, enable GI organization to employ continuous identification of VGI new risks, regular usage of rating, and feedback system on contributed data.

Having considered the legal investigation on VGI legality, best practices on the engagement of young people in research based urban planning will also be applied. The methodological framework for the University of California, Berkeley Center for Cities & Schools, Y-PLAN (Youth—Plan, Learn, Act, Now!), will be utilized with the demonstration of ITC mobile devices and GIS technologies, "presenting evidence-based solutions for a client and panel of authentic stakeholders with the power to act on young people's ideas". (Y-PLAN, 2014).

Young people participation in community mapping, personal interviews, and site observations, is considered as the paper main approach to deliver the unique EU model of scientific based problem definition, for Youth Urban Governance.

5.1 YPLAN: Conceptual Framework

Starting in 1999, an interdisciplinary course was initiated between the Department of City and Regional Planning and the Graduate School of Education, with the goal to extend the engagement of schools and young people beyond community development projects, to foster learning experiences for all participants. Considered as a form of Social Enterprise for Learning (SEfL), the YPLAN project methodology is based on the "youth civic engagement in city planning", and the "use urban space slated for redevelopment as a catalyst for community revitalization and education reform". (YPLAN, 2010).

5.2 YPLAN: Stakeholders and technical application guidelines

With the partnership of government agencies, the private sector, community groups and young people from different educational university and school levels, the YPLAN allows "young people to use their intimate knowledge of the environment to provide innovative and positive suggestions" (YPLAN, 2010).

Students: Y-PLAN builds the capacity of young people to effectively contribute youth-driven data and insight to the planning and policy making process; develops college, career, and community readiness skills.

Communities: Y-PLAN builds the capacity of civic leaders to value and use youth insight to create better plans, policies, and more healthy, sustainable, and joyful places for everyone.

Further support for this approach was accompanied by Lave and Wenger (1991) call "a community of practice", where the YPLAN challenges the urban planners to deliver their technical design proposals in easy terms for the youth to understand, and used to develop wider perspectives about their surroundings. Accordingly, the following diagram interrelated to urban planning, as guidelines for the youth methodological assessment to their cities environmental qualities.

Here, typical urban planning policies are introduced to the young people, within exploratory practical conceptual frameworks by city planners, to help them make sense of their cities, and the quality of life for the people living there. Students learn how to process observational studies for their surrounding in the fields of housing, transportation, public spaces and schools. Results are then refined, evaluated, and considered for public consultations to reach into the best result of enquiry by design proposals.

Associated with Europe 2020 objectives of enhanced economy, mobility, education and employment, the integration of the YPLAN methodological community based planning , with the utilization of VGI as digital learning educational tool, will improve youth active citizenship, intercultural dialogue and the EU social inclusion policy reforms. This new Europe model of urban governance can have a great impact on youth equal access to spatial planning geographic database, and establish structured knowledge of participation in city urban development strategic planning and implementation schemes.
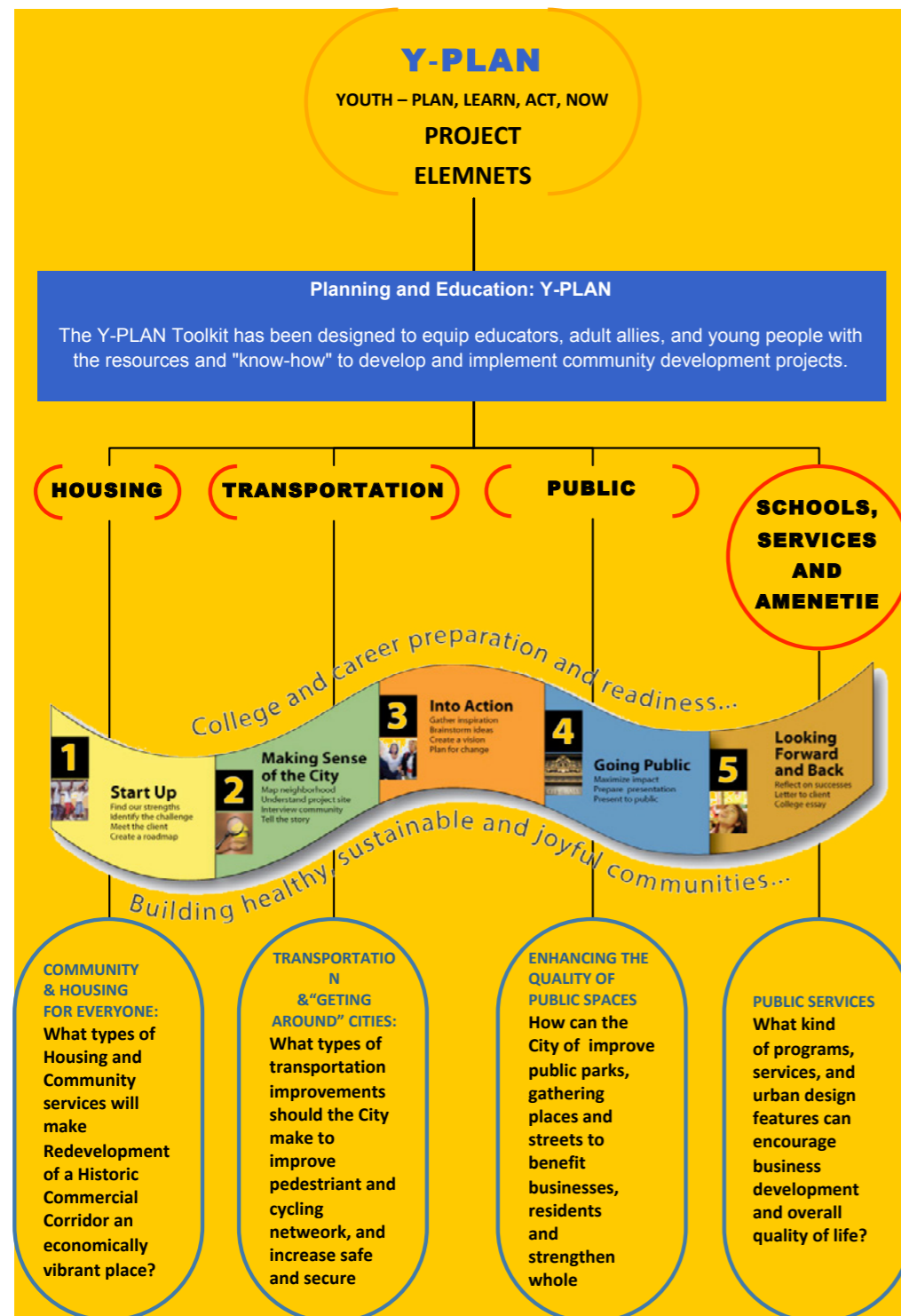
Fig.4 *The YPLAN four elements, implementation phases, and key questions*

6. Expected Outcomes: Post 2015 accountability mechanisms

6.1 Socio-Cultural Shifts: equal access of youth to institutional governance

With the excessive use of youth for ICT technology, social media, mobile devices and cloud computing, the monitoring of youth attitudes and behaviours through voluntary GIS will help assess their needs, and fill the gaps across the EU local governments' institutional services. Updated evaluations to youth oriented community services by young people will help achieving the "standardization of pan-European data so that the diversity of European cities becomes clear". As a result, socio-cultural shifts into better conditions can easily be traced to develop equal accessibility of youth to institutional governance. (Strategic Implementation Plan, p.38)

6.2 Future Capability: equal access of youth to institutional governance

In response to community demographic changes, and technology constant novelty, a shift in city urban planning capabilities and technical participatory approaches need to take place afar form traditional spatial planning policies and administrative boundaries. Greater citizen inclusion in delivering public services will help meet youth societal demands. Institutional governance societal progress can be achieved through establishing local neighbourhood youth engagement (KPIs) Key Performance Indicators, as standardized EC metrics to motivate competitiveness between and among cities, to achieve best outcomes of young people mobilization tools, towards new concepts of smart cities and 'Energy Neutral Neighborhoods.' (Strategic Implementation Plan, p.39)

Equal access of youth to community-led initiatives, raise the awareness of responsibility, improve the sense of social cohesion, and would assure sustainable engagement in public services maintenance.

The form of local energy cooperatives led by young people stimulate new employment opportunities and capacity building programmes, generating inventory on best practices for broader EC planning policies.

6.2 Digital geo-referenced data collection tools: Young people advocacy planning and awareness

Volunteered Geographic Information (VGI)-Youth Urban Governance toolkit, will facilitate the young people integrated participation in long term regional planning perspectives, and short term local city urban management actions. Maximizing the young people use of city open data, will enable resources integration across local municipalities' organizational bodies, and generate innovative smart city infrastructural services (utilities, energy, transportation, waste and water management).

City Urban Visualization method by the young, can work as one of the OIP Citizen Focus potential actions to create an enabling environment for urban planning awareness.

Web technologies and volunteer geographical systems have increased the availability of spatial information at different geographical scales. The knowledge of young people in georeferenced data and massive use of ICT, manifests that their participation in advancing smart cities mobility technological solutions, in the fields of sensors networks, remote sensing systems, and spatial data infrastructures, is highly considerable. Thus, new GIS database must develop to open access of spatial data, providing efficient storage, integration and processing of volunteered geographic information, and overcome spatial data quality management and integrity constraints. Implementing VGI visualization techniques will involve the young in city planning real time view, leading to more realistic understanding of current policies, and wider participatory vision for sustainable governmental plans.

7. Conclusions and Recommendations

The utilization of GIS as a toolkit of youth urban governance can best be achieved through the implementation of the European Innovation Partnership on Smart Cities and Communities Operational Implementation plan, to deliver real value of the Lisbon treaty youth oriented framework, and accelerate actions towards creating scalable smart cities measures.

The employment of young people ICT skills remains a necessity to deliver demonstrable evidence of the 2014-2020 Erasmus+ programmes, and benefit from and contribute to knowledge-based urban planning governance. This approach will overcome youth socio economic challenges, conducting a regional EU policy to help stimulate the next wave of successful initiatives for young Citizen Focus Priority implementation scheme.

The application of the Y-PLAN Youth Exchange partnership with global educational institutes at the level of EU countries, will create a great knowledge exchange platform for VGI Urban Governance toolkit, where a national model of civic centered planning can be replicated to develop community service action projects, and deliver the best practice for the European Commission 2014-2020 Erasmus+ Programme Youth mobility, and strategic youth educational and training partnerships key actions.

VGI Urban Governance toolkit propose the development of the existing YPLAN Studio Experience, by integrating crowdsourcing ICT data collection methods, widening the youth opportunities of capacity building in specialized geo-referenced meta-data provision and quality control activity. With the goal of being influencing contributors, understanding the youth sensors and their voluntary motivations is important to mobilize their skills, from occasional actions into optimally sustained impact on decision makers.

With accordance to the EC Erasmus+ Key action 3 in Support for policy reform, an introduction of VGI Urban governance toolkit open dialogue with the youth and all community stakeholders. This will provide the young with data validation and assessment training skills, necessary to "define the needs

of the map producing community, identify the sensitivity and tolerance of mapping methods to different types of error and uncertainty in VGI and assess the potential role of current VGI efforts as well as of active citizen sensing". (COST, 2014)

In conclusion, the proposal of VGI Urban Governance toolkit, will act as a synergy between the research based Y-PLAN community planning educational programmes, and the scientific based EU funded COST ICT Citizen sensors mapping analytical studies, to achieve the best practices to be applied within the context of the 2014-2020 Erasmus+ Key Actions, empowering the youth direct authority and advisory roles in city urban planning, and decision making process.

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Retrofitting Public Bike Share Schemes into Challenging Urban Environments

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1. Introduction

1.1 Context

Bike-sharing has taken on several different forms over the course of its development, ranging from the initial smaller free schemes, to the larger schemes catering for large cities which incorporate information technologies. Despite these advancements since the 1960s, the concept and the ideas behind the scheme remains a constant; 'anyone can pickup a bike in one place and return it to another'. (pg 10 Bike Sharing Planning Guide)

Over six hundred cities around the world have welcomed bike-sharing schemes, similar to the one in our own city of Cork, Ireland, and more programmes are starting every year. The schemes help the promotion of cycling as a viable, feasible, safe and valued transport option.

The ingenious advantage of these schemes is the adaptability, as well as the ease at which one can learn how to use them. Each city can make and shape its own bike-share scheme. The scheme can be adapted and implemented in a way which is specific to a city's local environment, it's density, the topography, the available infrastructure, the weather, and of course the cultural attitude that exists toward cycling and bike use. Bike- share schemes are very much unique to the city in which they are placed.

The adaptability and functionality of these schemes has seen them, since 2007, grow exponentially across the globe. in 2007 there were 20,000 bikes that were part of bike- share schemes, this had risen to over 700,000 by 2013.

1.2 History

Bike-share was conceptualised in the 1960s and put into practice in 1965 in Amsterdam. The city council chairman looked to implement the first ever public bike share scheme with an aim to reduce traffic congestion in urban areas. He proposed that 20,000 bikes be made available with pick-up and drop-off points with no fee or charge, however this idea was rejected by the city council. The bike-share schemes which we are familiar with today are built around a free scheme, however the idea of no charge or payment for the service never really took off, and those that did remained very small.

These ideas were used a building blocks for future bike-sharing schemes. 1993 saw the implementation of a new addition to the idea of bike-sharing in La Rochelle in France, and Cambridge in the United Kingdom. They both introduced a two hour session system, and became known as 'bike libraries', however they had their limits due to the number of pick-up and drop-off points.

1998 saw the introduction of smart card technology in Rennes, France, as well as the monitoring of bikes for security reasons, their capacity, billing and accountability for damages. This became known as the third generation of bike-share. The most important aspect of the third generation's attributes was the idea and use of smart technologies. This has had a huge affect on the way bike share schemes work around the world. These 'smart technologies' have led to safer and more secure schemes, better real time information for users, increased use, as well as increased capacity. They use a credit card payment as a security mechanism, and has further been built upon by online registration, the inclusion of mobile phone numbers for confirmation details and radio- frequency ID cards used at the stations. Smart technologies make up the central nervous system of every modern bike-share scheme, and are

central to their success.

1.3 Culture and context

Traditionally Irish society has been dominated by one form or transport or another, however since the arrival of the car there has been a decline in the usage patterns of other modes of transport, especially in bikes since the 1980s, a mode of transport which, at one point, proved to be the most popular. This stemmed from our large rural population and settlement patterns. Despite this, rapid urbanisation since the 1980s has changed the modal dynamic and the cultural attitudes of the Irish people. The growth of Irish cities and commuter towns has only added to this, yet the number of people using bikes is up for the first time since the mid 1980s.

The past decade or so has seen the number of people cycling rise 68.5% in Dublin City according to Dublin City Council, 2013. While bikes make up 9% of the total vehicles coming into Dublin City Centre at peak times, these increases have been echoed by the 2011 census which show an increase in bike users between 2006 and 2011 across Ireland. The number of Irish people cycling to work, college and school has risen from 58, 960 to 61,177, the first increases since the 1980s (Irish Times, 2013).

The reasons? Safer roads, tax incentives, government parties and bike-sharing schemes have all played their part in the increased level of uptake and cultural shift which is currently being witnessed in Ireland. Granted, the levels are still over 80,000 short on 1980s levels (146, 962), yet the level of usage is up as cultural deviation away from motorised private transport is underway, slowly, with the introduction, and expansion, of bike-sharing schemes across Ireland (Dublin, Cork, Limerick, Galway, and Belfast).

2. Modal shifts and increasing urban mobility

2.1 European case studies

The concept of bike sharing schemes came into being in 1965, when Amsterdam made 500 free bikes available for users to get from place to place, leaving the bike at their destination, left unlocked, ready for another user. The idea of just having free unlocked bikes on the street soon meant that many of the bikes were stolen and soon many disappeared (www.cyclinguphill.com). After this came the Copenhagen equivalent, which was improved by the introduction of a membership fee, along with an area to dock the bikes with a 'coin refund' system, meaning bikes were less likely to be stolen. Today's bike schemes are much more complex and the technology behind them, are based on the Rennes public bike sharing scheme, which was introduced in 1998 in France, which introduced the 30 minute journey times, the automatic docking stations, and the real time availability of bikes in each station, that paved the way for the bike schemes seen all over Europe today (www.ecf.com). In Europe over the last 10 to 15 years, there has been a huge push for the use greener transport such as cycling over car usage as it not only has less of an impact on our environment, but also leads to less congestion, and overall a better experience of the urban environment.

As with any new technology, it is fundamental that the design is correct in order for it to be successful. The same can be said for such public bike sharing schemes. Two very successful bike sharing schemes, Paris's 'Velib', a scheme designed with the most popular and current technology; and Copenhagen's 'GoBikes', which is at the forefront of bringing new technologies into public bike sharing schemes.

Fig.1 *Comparison photo showing bikes from each of the case studies. Left Middle: Copenhagen, Top Right: Cork and Bottom Right: Paris.*

2.2 Paris - Velib

The Paris bike sharing scheme, launched in 2007, has become the biggest bike sharing scheme in the world, with over 20'000 bikes available to rent. The bikes are simply designed, but effective. They are well built, but clunky which is eliminates theft. They include many of the design features typical of such public bikes, like gears to deal with topography, front and rear brakes, an adjustable seat, a bell, front and rear lights, along with a good sized metal basket to hold your bag and other items, and of course a lock for times when your not near one of the 1'800 stations available. The downfall to the design of these bikes is their weight. These bikes are made in such a way that they are big and heavy, making it difficult to cycle up hills even with the available three gears. They are really only made for cycling on flat topographies. The scheme has an adequate number of stations, and even has the availability of children's bikes (Petit Velib) available at 8 stations, which cater for children from the ages of 2 upwards. This is the first scheme to include children, and is an inclusive design element as it enables and allows children to cycle from

a young age This is something that they will grow up with, and may be less likely to need a car when they become adults, aiding sustainability.

2.3 Copenhagen - GoBike

Copenhagen recently launched 'GoBike' late last year and has included design elements that are out of the ordinary for bike sharing schemes seen across Europe. The difference is not only seen in its overall design; as the bikes look very stylish and not as clunky as the bikes we are used to seeing in other parts of the world, such as in Paris and London. These bikes also include a tablet PC, that allows the user, through GPS, to search for restaurants and other services close by, along with directions. This data is then sent back to a database every 10 seconds, so real time marketing is an option, and this might help pay for these expensive electric bikes. The scheme overall gives all design elements needed (as seen in the other schemes) and then more.

In a city where there are as many bikes as inhabitants, these bikes seem like they are designed for those visiting the city, rather than for those living in it, this is due to the inclusion of the tablet, and also the fact that the bikes are electric and give those not used to cycling a better and easier experience when cycling. The tablet has many advantages such as the ability to check the times for other forms of transport, such as bus or train, which helps connectivity with other public transport systems. Another design issue is the cost of these bikes. It costs almost 9'100 euro to manufacture each bike, not including maintenance. The whole production of the scheme has cost the city government and the schemes sponsors a lot of money to install, seeing as the bikes cost c. 9'100 euro to produce not including the cost of the installation of the docking stations. Seeing as this bikes are electric, they also cost more to maintain then what a normal scheme would.

2.4 Cork - Coke Zero Bikes

The difference between the two European examples of Paris and Copenhagen discussed, and Cork, is population density, and the fact that it is not the capital city of its country, Ireland. The scheme had a challenging start due to the problems associated with the introduction of cycle lanes in 2014. Current discourses claim that the design of these lanes were not car or pedestrian friendly due to the curbed edges found on the contra-flow cycle lanes leading to a number of accidents to both vehicles and pedestrians. Many newspapers have included articles on the scheme such as 'Cork bike-sharing scheme starts with a rattle' from the 17th of February 2015 (The Irish Times), and 'Contentious Washington St bike lane went ahead against Garda advice' from March 2014 (Irish Examiner). That being said, due to the weather getting better in the spring/summer months, the uptake of the scheme is ever increasing and the discourses now being more positive towards the scheme. In comparison to Paris and Copenhagen's bikes, the Cork bikes are lighter and of a more sleek design, this may be due to the fact that Cork is made up of a series of hills, and it would be difficult to cycle up a hill on a heavy bike. This scheme has all the other elements that you would expect from a bike-sharing scheme as discussed in the Paris example. The downfall to the bikes design can be seen in the front basket. Due to its front basket being made out of elastic, its design makes it impractical for it to be used to hold anything of value.

	PARIS VELIB	COPENHAGEN GOBIKE	CORK COCA COLA ZERO BIKES
Population	2340000	1246611	119230
Nº of stations	1800	58	31
Nº of bikes	20600	1260	330
Year of Release	2007	2014	2014
Road Safety Notice on Website	Yes	No	Yes
Easy to Use Website	Yes	Yes	Yes
Membership Price	29-39 euro per year	70kr or c.9 euro per month	10 euro per year

	PARIS VELIB	COPENHAGEN GOBIKE	CORK COCA COLA ZERO BIKES
Technology	Website, App	Electric Bike, Tablet PC, App, Website	App, Website
Short Term Use Allowed	Yes, 1.70 euro a day	Yes, 6kr or 80 cent an hour	Yes, 3 euro for 3 day pass
Minutes Free of Charge	30 (classic), 45 (passion)	30	30
Child Friendly	Yes	No	No
Rservation Available	No	Yes	No
Bike Production Cost	c. 3,200 euro per bike	c. 9,100 euro per bike	N/A

Table.1 *References: www.cso.ie, www.velib.paris.fr, www.bikeshare.ie, www.bycyklen.dk, www.copenhagenize.com, www.nytimes.com, www.procuraplus.org*

3. Policies, Documents and City Governance

3.1 Policy context to public bike sharing schemes

The emergence of public bike sharing schemes in Ireland has coincided with the publication of policy and public discourses relating to the importance of sustainable transport. The focus on cycling as a mode of transport has been continuously highlighted in policy over the last decade ('Bike to Work Scheme', 2009).

3.2 CASP

A crucial element of Cork Area Strategic Plan 2001 – 2020 (CASP) was the creation of an integrated transport system. The strategy focused on the planning, design and operation of the transport system as a whole including the development of cycle lanes in the CASP area. One of the aims of CASP is raising the 'quality of life for all by improving mobility, accessibility and connectivity in the area'; this is to be achieved through the co-ordination of

all key actors in the planning, design and operation of the transport system, specifically relating to cycling as a mode of transport. An integral part of the plan is to make the system more integrated, stating 'the provision of cycle parking facilities at stations and / or the carrying of bicycles on commuter rail services offers sustainable options for integrated journey planning from a customer perspective' (Cork City Council, Cork Area Strategic Plan, 2001).

3.3 The Cork City Cycling Strategy

The Cork City Cycling strategy 2004 identifies the importance of cyclists in the development of a sustainable transport policy for Cork City and carried out research in order to achieve a 'safe and comprehensive cycle network'. The cycle strategy identified primary attraction nodes within cork city including; Cork City Centre, Cork Institute of Technology, Cork University Hospital, University College Cork, Douglas Village, Mahon Point and Blackpool Shopping Centre. In order to achieve the goals of the strategy the following proposals were set out (Cork City Council, Cork City Cycling Strategy, 2004).

The proposed cycling measures within the network include the following:

- Provision of contra flow cycle lanes
- Provision of shared pedestrian/ cycling streets
- Provision of advanced stop lines at signalised junctions
- Removal of suburban roundabouts
- Provision of on-road cycle lanes
- Introduction of traffic calming measures

Development of Proposed Cycle Network:

- Toucan Crossing, Shared Use/Footways, Cycle Parking
- Enhanced facilities for cyclists will be provided in a number of ways: Bus Lanes, Cycle Lanes, Traffic Calming, Contra-Flow Cycling Schemes, Cycle Tracks, Advanced Stop Lines, Roundabout Elimination
- Green Route Networks (Cork City and County, Green Routes, Cork

Area Strategic Plan, 2001.)

3.4 Cork City Movement Strategy

More recently the Cork City Centre Movement Strategy 2012 sets out the objective of increasing the capacity of the transport system in order to facilitate greater access to the city centre. The movement strategy, similar to CASP, is concerned with the environmental impact of transportation on the environment and to promote safe, efficient, economic and healthy modes of movement. The motion put forward by the movement strategy is to encourage a 'path of change' in an attempt to compete with other cities through providing a multi-modal option for people living and visiting the city. This policy measure clearly supports the recent introduction of the Bike sharing scheme in Cork City. The movement strategy encourages cycling as a sustainable mode of transport. It provides a traffic management system that enables safe cycling and access within the city centre (Cork City Council, Cork Area Movement Strategy, 2012).

3.5 NTA Report on regional cities

The 2012 National Transport Authority report on regional cities provides a foundation for development and the implementation of plans for designing environments for pedestrians and cyclists. The investments that have been made throughout Cork City, to facilitate cycling as a mode of transport, have supported improved access, safety and design, as a way forward, these include; the Parnell Place Improvement Scheme Investment (€42,977). The introduction of cycle lanes and the improved traffic movement resulted in a new and more inclusive transportation friendly street layout. This improved integration between taxis, buses and bicycles, has therefore created infrastructure to suit the needs of the public. The Kent station to city centre investment project (€59,110) is concerned with creating cycle lanes and the linking of destinations throughout the city. One of the major design layout changes were seen in relation to the UCC to city centre investment (€42,066), which, despite having created vast negative coverage, possesses the potential for the growth of cycling within the city centre (National Transport Authority, Regional Cities Programme & Accessibility Programme, 2012).

3.6 National Cycle Policy Framework

Ireland first National Cycle policy framework 2009 -2020 is prepared on the values of creating a sustainable transport future. The government strongly recognises the priority of cycle friendly initiatives, especially in relation to creating and designating cycle lanes and routes. They have undertaken this by ensuring they are safe, direct, coherent, affective and comfortable for the user. The National Cycle Policy Framework has led to investment in towns and cities across Ireland to aid bike schemes. This helps to cater for demand, management, and any future developments which aim to create a strong cycling culture in Ireland (Department of Transport, National Cycle Policy Framework, 2009).

As a whole, transport policy in Ireland, specifically relating to Cork, is committed to the development of an integrated and sustainable transport system. The policy initiatives clearly support cycling as a potential mode of transport which can be further explored and utilised throughout the city area.

4. Technology, Communication and Public

4.1 Engagement

The levels of public engagement with a bike share scheme at its inception can indicate any weaknesses within the initial output. These weaknesses may be found within the overall layout of the bike stations, the design of the bikes themselves, the ease of access to the scheme as a whole, along with a range of other issues. One of the biggest factors influencing uptake is the technology used within the scheme. How easily this technology is accessed and how efficiently it works within the scheme, can greatly influence public interest. The technological aspects of bike schemes will be examined here, with a particular focus on Cork; a new bike share scheme, and the largest outside of Dublin, and Copenhagen; a long-standing scheme that has seen great success and engagement since its inception.

4.2 Technology Used

Technology is the central nervous system of bike share schemes. The technology found within the Cork scheme was specially designed, along with the bikes, with unique, custom built software behind it (Fitzgerald, 2015). The most integral forms of technology found within the Cork bikes are the interfaces found at the docking stations stations. The use of these interfaces is the first step in taking a bike for a journey, and is something each user faces. While some users do find that the interfaces may freeze from time to time, their relatively simple use helps create a more user friendly experience. The software found within these stations is similar to what is found in other European cities (Fitzgerald, 2015).

One of the easiest ways for users in the Cork scheme to get live information on how many bikes are at each station is through the mobile app that has been integrated with the scheme. This information comes from the administrators of the scheme, ARUP (Fitzgerald, 2015). By and large, this app seems to work quite well. It should be noted that the app is only available on iOS and Android devices, meaning those with Windows phones are slightly restricted, which could be considered as a minor shortfall. Along with this, it can prove slightly tedious to find the app. A relatively simple search is slowed down by the need for specificity in the search criteria to find the app, an issue highlighted by Flood et al. (2012). For example, if one searches "Coke Zero Bikes" on iOS, or "Public Bikes Cork" on both iOS and Android, the app for the scheme cannot be found. However, one of the key features of a successful mobile app is aesthetically pleasing designed interface (Hussain and Kutar, 2012), w which the mobile app has achieved.

It should be noted, however, that most users of the scheme in Cork rarely feel the need to use the app or website. This may be a testament to the efficiency of the allocation of bikes across the scheme, and the reliability of stations. Be that as it may, it could also be a sign of their limited usefulness once a user has signed up for the scheme.
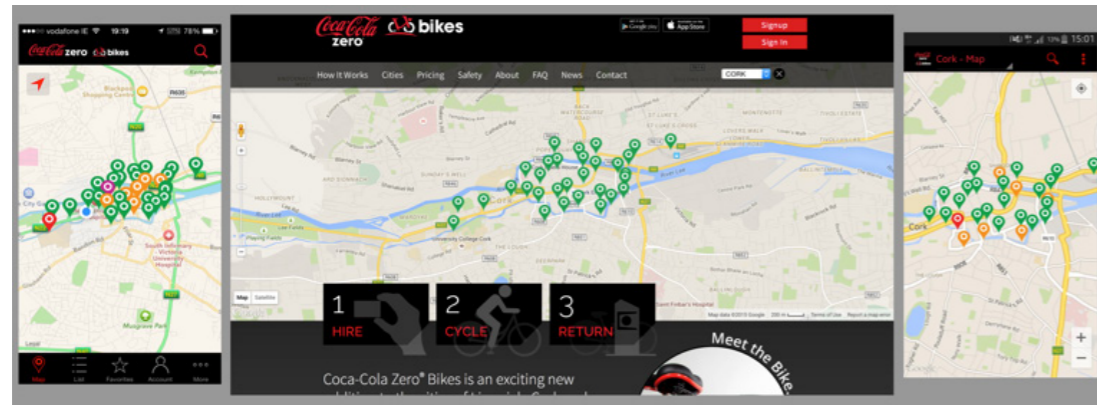
Fig.2 *Comparison of the App seen on IOS Devices (Far Left) and Android Devices (Far Right). The centre Is from the website showing the same map.*

Given Cork's bike scheme is still relatively new, it is only basic systems that are currently in place. In examining more long-standing schemes, Copenhagen stands out as a good example of success. Their bike sharing scheme launched in 1995, and was the first large-scale program of its kind in Europe (Shaheen et al., 2010). As a result of this, it has had time to develop more sophisticated elements within the overall system. For example, an app has been released in Copenhagen called 'I BIKE CPH' that works like a sat-nav for cyclists, providing users with routes that move along bike-friendly parks, contraflow bike lanes, and other shortcuts, and it will soon be able to supply total distances travelled, along with calories burned (Siggard Anderson, 2015). Meanwhile, another app that is still in beta stages uses public data of traffic signalling to give cyclists the speeds needed to travel between junctions in order to meet the next green light, and thus avoid stopping at junctions (Siggard Anderson, 2015). (Piece on Dublin's greenwave here).

4.3 Communication

Communication to users in Cork can be found within the 'News' sections found in both the app and website for the scheme. This easy access to information at virtually any point is a strong strategy. This allows users to easily find

out about any disruptions or developments within the scheme ensures less negative feedback in times of flux. Again, it should be noted that users' use of these resources appears to be quite low.

In Copenhagen, users have taken to communicating with each other for mutual benefit, as opposed to simply relying on direct communication from the scheme's administrators. Through social media, specifically Facebook and Twitter, cyclist are sharing incidents of bike-related police activity and fines, allowing all members to learn from each other's mistakes and avoid receiving similar penalties (Suggard Anderson, 2015). The added benefit of this is active public encouragement of safer streets within the city, along with the creation and nurturing of a cycling community within the city. A similar system could be implemented in Cork with a simple 'hashtag' on social media, which would both promote the idea and allow it to be easily searched for. The importance of technology within the system itself is evident, however, with these suggestions in mind, the importance of technology and social media, which are not specific to the bike scheme, are crucial for the effective use and management of the scheme. Again, showing how technology, not specific to the scheme plays a central role.

4.4 Public Engagement

Public engagement with Cork's scheme has been relatively strong. Total registered users are 4,123, as of the end of April 2015, which exceeds expectations of a maximum of 2,500 before the scheme's implementation. Of these users, roughly one third (1,375) of users actively use the bikes, as of mid-Spring 2015. While average journey times are not held, the most frequently used stations are known. The three busiest stations for both hiring and docking in Cork are Fitzgerald Park, Bandfield and Gaol Walk. Given these stations' proximity to University College Cork, it is quite likely that students make up large a demographic of the registered users. It should also be noted that these stations are currently some of the most westerly stations available, so it is possible, but unlikely, that the non-student population in the western part of the city may use the bikes as part of a longer journey. Many stations show tidal movements, i.e. they are popular origins in the morning and destinations in the evening, or vice versa. Few stations are either primarily

origins or primarily destinations.

Overall, it can be seen that public engagement with the Cork scheme is likely currently focused within the local student population. While this has potential to change, and thus allow stations in other areas of the city to be used more, it also presents an opportunity in the form to the other third level education centres in Cork. Given the statistics currently show that students favour the scheme, it could prove quite successful to allocate stations around the other third level education centres, given the likelihood of quick uptake.

5. Location, Allocation, Relocation

5.1 Spatial distribution

The location, allocation and relocation of docking stations are at the heart of any bike share system; if the spatial distribution is not adequate, how can a model shift occur? The location is, therefore, of immense importance in any bike sharing scheme and may even influence participation levels amongst potential users. The subject question being how technology can aid the sustainable design of these systems, ultimately ensuring, and aiding, the promotion of cycling as a means of transportation. Furthermore, to analyse if technology is the answer to help promote cycling and how can it be utilised? The latest technologies may not be affordable for all; hence, why planners, need to ensure that if technology is used that it is implemented to its full potential and not simply just to follow a fashion.

5.2 Location

In Cork, the locations of the bike share docking stations are all in the city centre, distributed predominately in an east-west pattern (see fig. 3 below) which may limit the number of participants and potential users as the catchment area is not widely distributed throughout the metropolitan region.
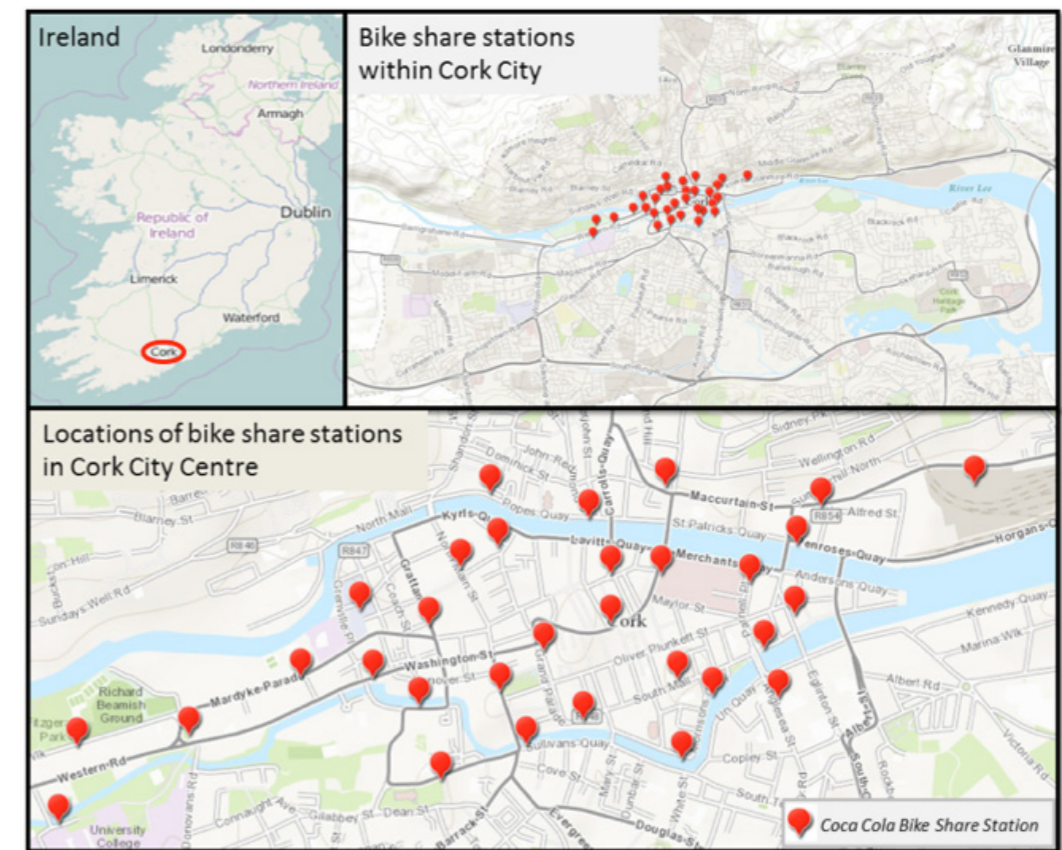

Fig. 3: *Context of where the stations are located (Maps produced on ArcOnline) s from the website showing the same map.*

One technology, Geographical Information Systems (GIS), is a useful tool which can be used to visually analyse the location of docking stations. The locations of the stations where collected using a handheld Garmin GPS device. By simply using basic GIS tools to visualise the stations it is evident that bike stands located at key public transportation hubs, Kent Railway Station and Parnell Bus Station, which are two primary gateways into Cork City for public transport users. It also conveys that stations are located near cultural amenities (e.g. Fitzgearld Park and St. Finbarre's Cathedral), the primary retail centre and University College Cork, which can help to promotes participation amongst daily commuters, in addition to those infrequent recreational users.

Zhang 2011, states that the potential catchment of users of a bike station is reflected through the estimated tolerance time that a person is likely to be willing to walk to a station. Furthermore Krygmans et al. 2004, highlighted that this 'catchment area' is a large share of total trip time, which indicates that the location is key for the success of the scheme. As seen in figure 4 below, an analysis is made of the catchment areas of the stations, with varied distances and walk times.
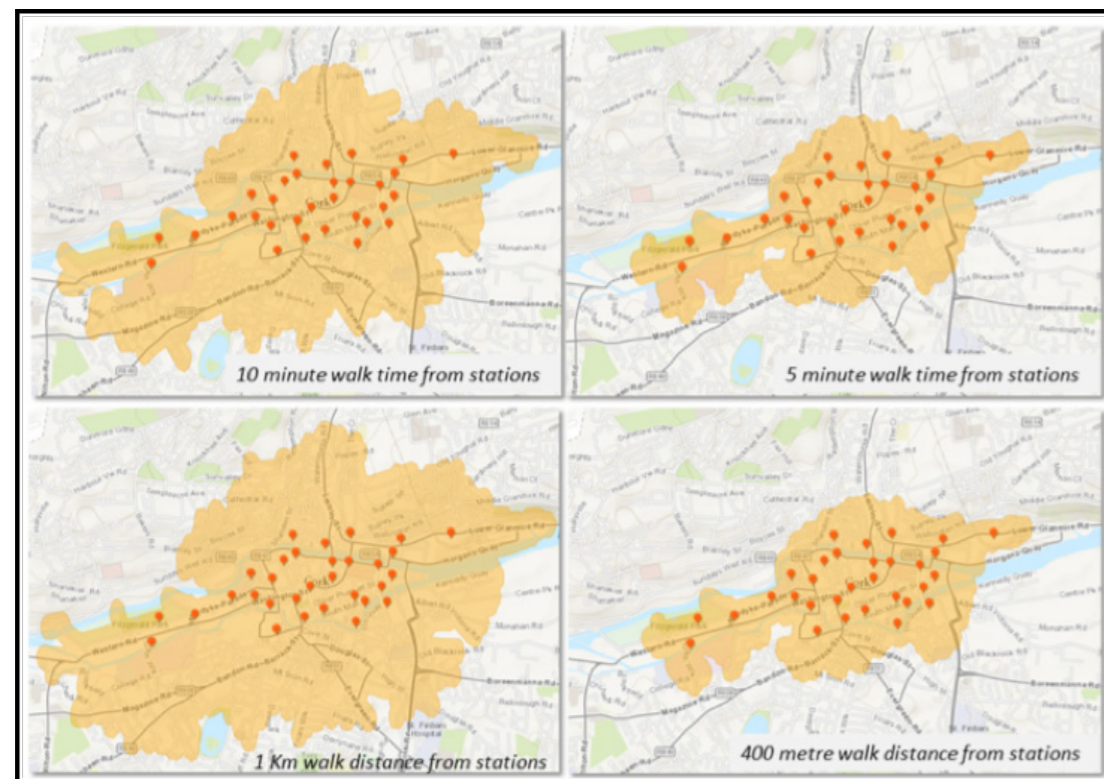

Fig. 4: *Analysis of proximity of stations and potential capture areas.*

Using ArcOnline catchment areas are identified in fig 4 above which convey the areas surrounding the stations which area accessible from a distance and time. In ArcMap, there is a 'Network Analyst' tool which enables the user to analyse of layers of data to determine which routes are suitable for bicycle users, e.g. bicycle paths or no motorway [if applicable], which can be utilised using the 'Quickest Path' tool to critically assess the station

locations to ensure that the locational design framework has been smartly and sustainably designed and situated. If it is found that many stations are not near bicycle lanes, for example, it may suggest that the re-allocation or additional allocation of stations may be a viable option, to help ensure and 'achieve a transport system as efficient and sustainable as economically and socially possible' (Romero et al. 2012). The GIS tools are an excellent way for city and transportation planners to analyse, critic and explore future options, however, spatial data with geographic attributes needs to be input into the GIS system which is not always readily available or accessible

5.3 Allocation

When allocating bike share stations throughout any city the sustainability of design is a key factor to be considered. It should not be a random selection and needs to be thoroughly thought out. Are there adequate users whom it will serve? Are the services surrounding the area likely to enhance the use of the station? Is this an area where users are likely to cycle? (i.e. cycle lanes, adequate roads and good lighting)

Cork city centre is defined with distinctive ridgelines to the north of the city, with topographic comparisons to that of Lyon in France (Cork City Landscape Study. 2008), which means there are some areas perhaps more favourable than others. These slopes are well-known to the city planners in Cork, but what if the planner was unsure of their environment? How will they ensure that the design is customised to the geography of the city? One could walk and explore the city in a more traditional survey method, but there is a technology which can express such topographic patterns in a GIS system. The Ordnance Survey Ireland (OSi) have collected significant 'Light Detection And Ranging' [LiDAR] data for Ireland which is an excellent way to visually highlight the topography of an area, highlighting flat plains and those higher and more steep locations perhaps unsuitable for stations. In conjunction, statistical information can be analysed such as census data, to determine where cyclists reside (fig 5 below) and areas which daily commuting is within a time frame (15 minutes in fig. 5 below) that cycling is a possible option to be used as a transportation method.
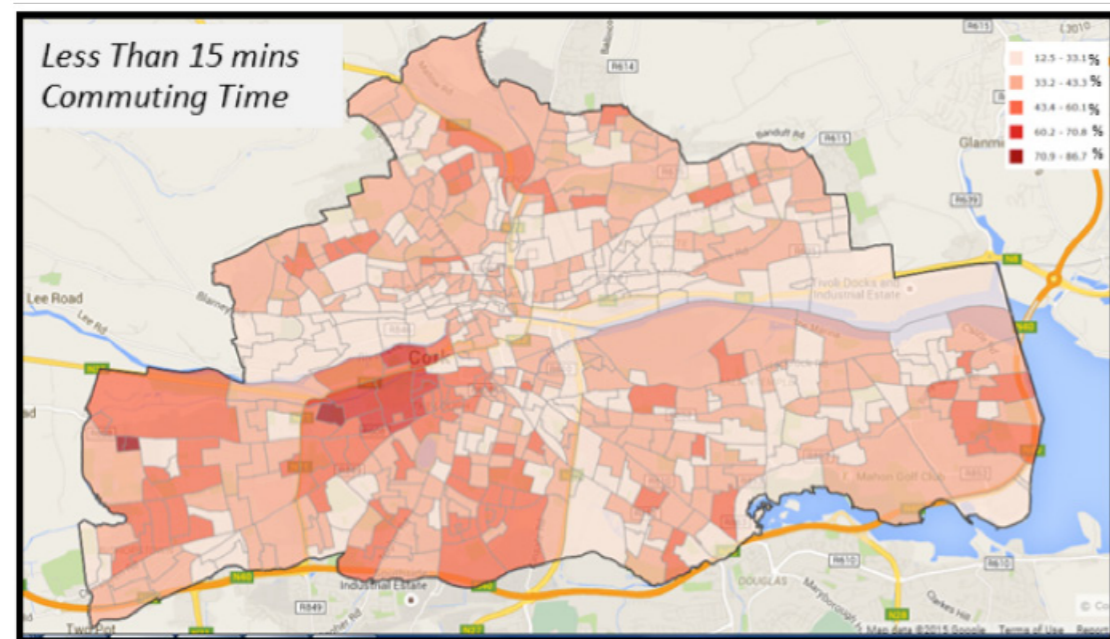
Fig. 5: *Population aged 5 years and over by journey time to work, school or college [Census 2011 Data] (Produced online using the AIRO Mapping Tool)*
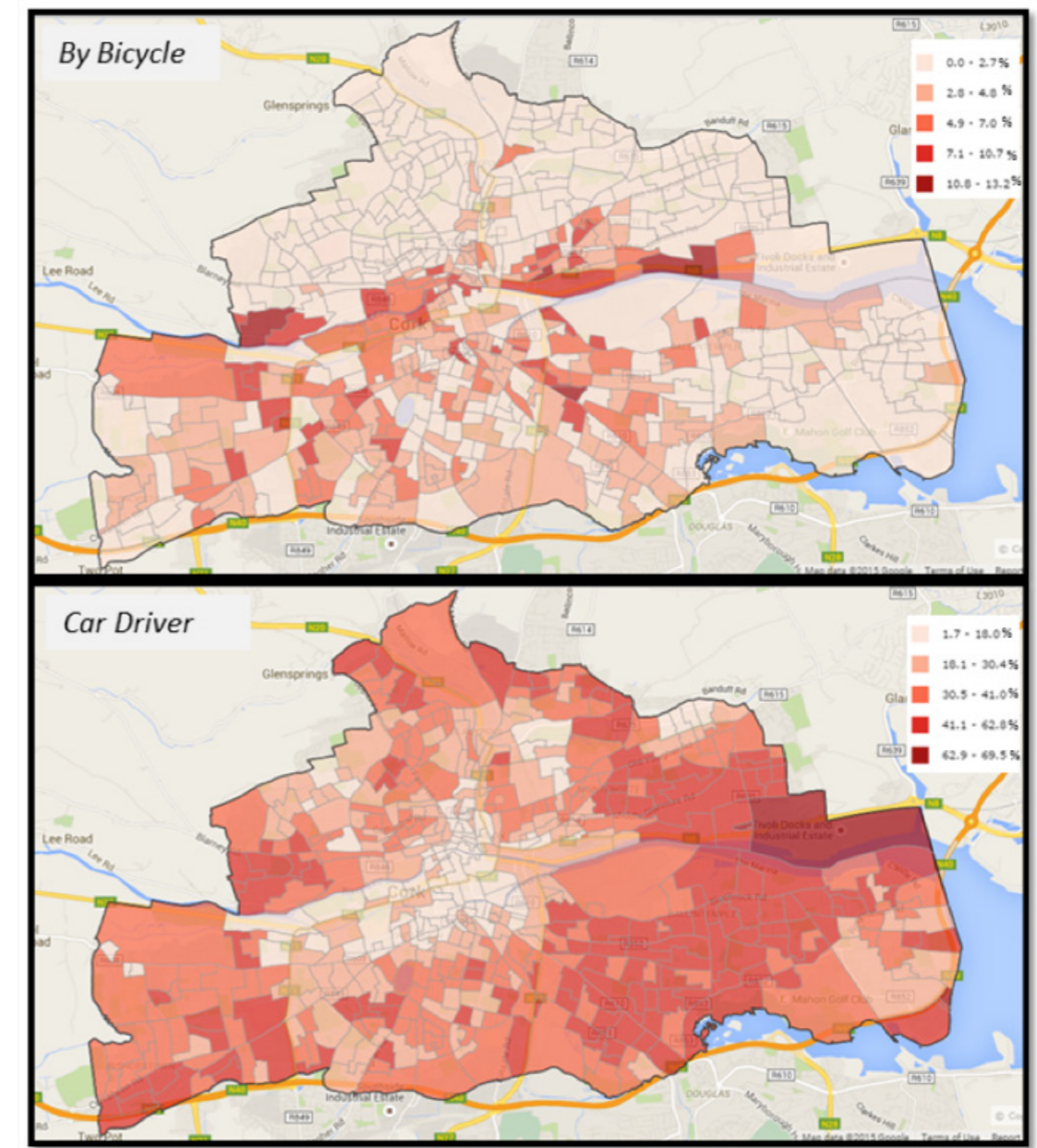

Fig. 6: *Population aged 5 years and over by means of travel to work, school or college [Census 2011 Data] (Produced online using the AIRO Mapping Tool)*

Seeing information displayed visually can often enable a better understanding of statistical information and ultimately, with planner's knowledge of zoning and new developments, it can ensure that the stations are sustainably located in areas projected for future growth, possibly with aims to expand cycling infrastructure if necessary. As indicated in fig 6 (above) there is a significantly higher percentage of car drivers than cyclists in Cork city in 2011. The next national census will be held in 2016 and will prove useful to determine if there has been an increase amongst cyclists in areas surrounding the bike share stations.

GIS technology can help ensure that every station is placed with a justified reason behind it to avoid unsustainable locations and associated uneconomical costs with the upkeep. More so, if technology is integrated with policies that are already published and set out in Section 5, in addition to learning from case studies in Section 3, planners can truly ensure that technology is being utilised in a manner that employs a sustainable bike-sharing system that is accessible to all.

A draft Metropolitan Cycle Network Plan is due to be released this year which will identify both an urban cycle network and a green way network, while also recommending radial, linked, orbital and leisure cycle routes throughout the city and county. Once published, it can be used as a design guideline as to where new stations can be allocated throughout the city to help achieve the national target of 10% of all journeys being made by bicycle by 2020 (Department of Transport, 2009).

An interesting European case worth noting is in Helsinki, where Jäppinen, Toivonen and Salonen, 2013, conducted a study 'to model a hypothetical bike sharing system and quantify its spatial effect on public transport travel times'. It was found that it is possible to increase both 'the competitiveness and attractiveness of sustainable modes of urban transport and thus help cities to promote sustainable daily mobility'. This is sustainability is ultimately what can be aimed to be achieved; a sustainable design network structure through technology.

5.4 Relocation

Caggiania & Ottomanellia 2013, noted that 'the unbalanced distribution in space and time of the bikes among the stations' is a central problem. Conducting their research with the aim to reduce the redistribution costs of the bikes for companies, ultimately ensuring a high level of user satisfaction is vital. This ensures those companies running the bike share schemes see the system as economically viable and to retain lower subscription prices (€10 per annum in Cork). This can ensure equalisation of participation amongst the many variances of socio-economic conditions people may be. If algorithms such as a microstimulation model (Caggiania & Ottomanellia 2013) can effectively ensure reduced cost, would this ensure more efficiency for users or more profit for the company? This perhaps, is an issue which at present cannot be answered. However, the more timely relocation of bikes can be advocated for to provide a utility that is robust and attractive to users, increasing accessibility throughout the city.

5.5 Future

Unfortunately for many commuters who travel by car in Cork City, the car is likely to remain a favourite, as bike stations do not [at present] have any linkage with, for example 'park and ride' facilities. Romero et al. 2012, found that, bike share schemes with longer access times from car parking zones to docking stations makes the public bicycle mode an uncompetitive system against car mode. This is a key issue which needs to be addressed in the future if the scheme is to expand in a sustainably designed manner.

In terms of attracting short and occasional tourist users, it is hoped that amenities in areas outside of the city centre island would be allocated stations, such as Blackrock Castle, Cork City Goal and even the Blarney Stone, to further increase the potential for recreational uses within the scheme.

6. Towards a Modal Shift: What does the future hold?

6.1 Cultural Shifts

Transportation and movement has always, and will continue to be central to social and economic activity across the globe, yet it is clear that the forms and the modes of transport are changing. The impact of increased private motorisation has aided trade from the local level to the global level as the world, within which we currently live, becomes more and more globalised as the time-space gap compresses. We as individuals begin to live our lives at a faster pace and require things to be more efficient, a requirement which increases on a daily basis.

However this rapid increase in privatised motorisation has led many to call for a change attitude toward the costs of incceasded transportation levels. This cost is not just financial, but are costs which affect wider society and the environment, from people's health to road safety, from sustainable development to environmental degradation. While this is regarded as a global phenomenon, it has it's base at the local level.

It is at this level, the local, where, fundamentally, changes can begin to be made in creating and expanding non-motorised transport (bikes). While it is easy to dictate what must be done to accommodate this implied paradigm shift, the process is much more complex and begins with the building of political will which will reflect this sift in the cultural mindset of a society toward non-motorised modes of transportation.

Ireland and Europe has seen such a shift, while the idea may be new to Ireland, the implementation of Bike- share schemes are not new to European cities. In order to have successful implementation of these systems, strong political will is needed to ensure the correct and required support is present, as well as funding, land use rights and co- ordination. This begins by educating political leaders and public representatives on the benefits of these systems and the changes in cultural attitudes towards transportation, efficiency and the environment. An improvement to infrastructure as well as supply to match the cultural aspirations of the public will be essential in catering for this cultural shift.

Ireland alone has witnessed a paradigm shift in usage and interest in bikes. An Irish Times article in 2013 depicted an Ireland that was 'bike crazy', as 'families take to parks, seaside promenades, canals and riversides'. While 'During the weekday rush hours commuting cyclists are at the top of every queue of cars in the towns and cities of Ireland', (Irish Times, 2013). With the increased numbers using the Green Party's 2009 'Bike to Work' scheme, 200,000 people availed of the tax incentive to buy bikes, while more and more people are joining and participating in 'National Bike Week' (www.BiketoWork.ie). The article continues to say 'it would be difficult not to have noticed the rise of the cyclist in recent years', the first since the 1980s.

The 2009 'Dublinbikes' scheme began, and has added to the increased levels of bike usage. This scheme saw a €35million expansion in October 2013 which tripled the number of bikes and doubled the number of stations.

A similar expansion would be welcomed in Cork. The uptake of the scheme has surpassed expectations and the expansion of idea to the suburbs to service these areas and other institutions within the city. This could see an improved transport system within the city, which is accessible to more people.

Investment and political will from local government could see a similar expansion to that of Dublin (see below for station expansion) to coincide with this cultural shift currently taking place, while also aiding a sustainable mode of transport.

The success of these schemes are obvious, and have been realised by one, their growth across Europe, and two their expansion within several major cities, such as Paris and Dublin.

Cork is a compact city and the current scheme could be expanded to the East, past Centre Park Road, towards The Marina and Atlantic Pond areas, as it would be welcomed amenity to the area which has much more to offer the city in terms of public realm.

To the South, Stations at the Lough and Turners Cross areas would also be beneficial to local residents and those who wish to access the facility but deem the ones located at St. Finbarre's and UCC too far to walk.

The West could see the biggest expansion of the scheme. New stations could be located at the Mardyke Sports complex and and intermittently along the Straight Road, heading due West, Victoria Cross, Dennehy's Cross and Wilton could also see the introduction of new stations, with a scope to extending the scheme along Model Farm Road as far as Rossa Avenue and Cork Institute of Technology.

The Northern side of the city is limited by topography however the implementation of stations along Leitrim Street, North Circular Road and the Commons Road, as well as some in Blackpool Village, could be introduced and the possible future provision of a train station in Blackpool could also benefit from a station.

6.2 Opportunities

The opportunities for Cork City are clear, especially within the remit and proposals set out in CASP, which would 'enable Cork to become a leading European city region - globally competitive, socially inclusive and culturally embedded' (CASP, p.7). While the plan looks to integrate 'land uses and transport, improving public transport and other infrastructure and developing the economic, social and environmental capacity of the area', something which an expansion of PBSS would give Cork City the opportunity to do. Regeneration within Cork City and increasing the population living within the City is a key theme to CASP, this, along with the PBSS is a great opportunity for Cork to expand in ways similar to Paris and Dublin.

6.3 Future Capability

These new suggested stations as well as the current existing stations provide a viable alternative to bringing a car to the city. The bikes provide a mode of transport which is cheaper than parking a car in the city centre, and allows easier access to the entire city centre area, while also allowing movement during peak hour congestion. New developments such as the Beamish and Crawford Development Albert Quay, and the potential Capitol Cinema site, as well as the City Centre Movement Strategy will add to the appeal and usage of the schemes. An increased area and time prior to being charged will also benefit the users of the scheme as well as the numbers.

The future capacity for the scheme could be expanded along with the population projections laid out in CASP. The current population of Cork is 119,230 and is currently serviced by 330 bikes and 31 stations for the 4,123 registered users (currently used by 1,375 users on regular basis). The projections, based on CASP, sees the population increase in the city by 30,478 to 150,000 by 2020 (CASP p.37). A feasible increase in the scheme, based on population projections, would see the bike numbers raised to approximately 383 bikes and stations raised to 39 to service, based on current uptake within the city now, 5187 registered users and 1730 frequent users.

The 39 suggested stations should be focused within the city centre, while another, phased plan should be implemented for suburbs. A phased approach using distances could be implemented. The most westerly point being Cork Institute of Technology, the most northerly point would be Blackpool village, and the most easterly would be Blackrock Castle (based on surveys and observations).

	PREDICTIONS	REALITY	SUGGESTIONS
Fleet	300 bikes	330 bikes	383 bikes
Users	2000-2500	4123 (Abril, 2015)	5187
Statons	25	31	39
Area	Kent Station to UCC Linear across the City 1 km circle (4min cycle) 2 km circle (8 min cycle)	Same as predictions	Expansion to the North, South, Easy and West, with the addition of more stations

* References: National Transport Authority Report: Potential for a Public Bikes Sharing Scheme in Cork by Gerry Murphy, Email from National Transport Authority (Appendix 1), and suggested figures based on CASP projections for Cork.

6.4 Lessons to be Learnt

Successful bike sharing schemes, such as those in London and Paris, albeit, these are much bigger cities, which have a much larger urban area, have stations placed approximately 300m apart. The placement of stations in Cork City are much closer, and some are less than 300m. The new suggestions for stations will see stations placed at minimum 300m apart, and further on long straight stretches of road such as Model Farm Road. This is based on best practice for bike sharing schemes and studies for such schemes. (ITDP Report: The Bike-Sharing Planning Guide, p. 12)

The expansion of the scheme in Dublin saw the number of stations and bikes increased, however this was also followed up by a increase in cost to €20 and a reduction in free usage time to 20minutes. While this is still under the £90 (€108) fee charged for yearly membership in London, one can make as many journeys in 24hours as long as they are less than 30minutes each time, this is the same for the daily pass which costs £2 (€>3). A similar option is available in Cork, however with the suggested expansion, it is likely that cost may have to be increased for use of the scheme, however it would be beneficial for usage time to remain or be increased.(https://tfl.gov.uk/modes/cycling/santander-cycles)

It was also found that the baskets on the bikes were unsuitable for the urban environment in Cork. They are elasticated and do no provide adequate protection for user belongings, and this increases the safety risk involved with bike usage. Since the implantation of the scheme, the baskets have deteriorated due to weather conditions and overstretched due to the size of items being placed in them.

Helmets were also seen as an issue for the Cork Scheme. While it must be advised that all cyclists use helmets while cycling, the scheme itself does not supply helmets for scheme users. Despite this, new legislation regarding public schemes and helmet usage among users is not advised. While awareness is needed, new legislation is not. This is based on issues surrounding the Australian scheme and laws regarding bike users and helmets. This required all bike users to wear helmets, meaning users of public bike sharing schemes would have to bring, or provide, their own helmet when using the scheme, this is not seen as a feasible solution to the issue.(ITDP Report: The Bike-Sharing

Planning Guide, p. 80)

It must also be noted that public policy in the area specifically relating to sustainable transportation has the opportunity to expand into other areas of city governance. This could be achieved by expanding the Cork Movement Strategy to incorporate the Public Bike Sharing Scheme and incorporating a specific health policy. This follows directly from the The City of Copenhagen's Bike Sharing Scheme, 2011-2025.

It is clear from the example of Copenhagen that a long standing bike share scheme can draw new advancements from users and the general public. While the scheme in Cork is equipped with reasonably good hardware and software, the overall technological abilities within the scheme are relatively basic. Going forward, it is imperative that the administrators within Cork's scheme, and those further afield, take advantage of local activism. This can be encouraged and brought about by publicly providing data related to the scheme, such as average journey times, most popular stations, etc. Along with this, data could be made available by the city council detailing traffic signal activities and cycle lanes. From here, independent app developers could replicate the navigation apps seen in Copenhagen. This also carries the potential for other, so far unforeseen, opportunities to create something beneficial for users of the scheme. Along with this, administrators of the scheme could quite easily encourage/create a social media presence for the scheme. In doing this, a platform can easily be created for users to both communicate with each other, and convey any issues/suggestions to the administrators. From here, it could be quite easy to create a 'hashtag' and emulate the crime and safety incentive seen in Copenhagen.

7. Conclusion: Technology for Design

The Cork Bike Share Scheme is a good example of 'technology for design'. It incorporates integrated project delivery, which the American Institute of Architecture defines as a project which 'integrates people, systems, business structures and practices'. It looks to 'reduce waste and optimise efficiency through all phases of design, fabrication and structure'. The Public Bike Sharing Scheme is an example of an integrated system which incorporates technology at its core. It incorporates urban and technological design, which aids sustainable development in these urban areas. The bikes reduce environmental impacts, help reduce traffic and congestion, as well as optimising efficiency due to the technological integration (Integrated Project Delivery: A Working Definition, p. 4).

The integration of 'design technology' into Public Bike Sharing Schemes is crucial to the management of the computation and non-computation areas of the technologies used in these schemes. Design technology works closely with information technology to aid the production of of necessary and appropriate infrastructure, suitable to local topographies. Public Bike Sharing Schemes, using Integrated Project Delivery', see a highly effective collaboration among the owner, the prime designer, and the prime constructor, commencing a the early design and continuing through project handover', while technology also enables project competence and use.

Technology for design, in this integrated fashion, is evident within the Public Bike Sharing Scheme. Technology is part of the central nervous system of these schemes, and is integral to the on street and off street use and maintenance of the scheme.

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Children's Tracks: Advancing children's rights to participate in land-use planning?

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1. Introduction

Children have a wide range of formal rights concerning participation in Norwegian planning (Ministry of the Environment 2012). Still, the voices of children can sometimes disappear in complex municipal planning processes where different interests are balanced against each other (Hansen 2006). In this article, we explore the potentials and challenges of Barnetråkk (Children's Tracks), a public participatory geographic information systems (PPGIS) tool. We examine how this tool is utilized to incorporate the interests and experiences of children in Norwegian land-use planning.

Children's Tracks is a digital, workshop- and map-based participative planning tool.It allows children and youth to map how they use and perceive places in their neighborhood, and to suggest physical measures and changes to the places. The tool was digitalized by the Norwegian Centre for Design and Architecture (DogA) and the Norwegian Mapping Authority in the 2000's, based on an analog participation tool developed in Vestfold county in Norway. In 2014 a new and improved version of Children's Tracks was released, and this version is currently undergoing evaluation that will lead to further improvement in the near future. Our study can be seen as an independent contribution to this evaluation. More importantly, the study will contribute to making the potentials and limitations of Children's Tracks known to European planners,

and further to inform discussions on methods and best practices of children's participation in land use planning.

2 Research questions and method

To explore the potentials and challenges of Children's Tracks, the following research questions are engaged with in this paper:

How do planners perceive the potential of Children's Tracks to strengthen the voice of children in land-use planning?

Which implications can Children's Tracks have for the development of children as "spatial citizens"?

To answer the research questions we use a case study design, were the use of Children's Tracks is studied in three case municipalities. The municipalities were chosen because of their differences in size and their different approaches to the development and use of Children's Tracks. The different cases will therefore highlight different aspects of the participatory process and provide a more general impression of the use of Children's Tracks in Norwegian land-use planning. In the first municipality the use of Children's Tracks has been part of a project in which new methods for including children and youth in physical planning have been explored. The second municipality is taking part in the evaluation of a new version of digital Children's Tracks, and has used Children's Tracks in the process of creating four new area zoning plans. In the third municipality, Children's Tracks has been used in the process of creating a new zoning plan.

The cases are studied using methods of semi-structured interviews and document analysis. The interviews are conducted with two planning actors working with Children's Tracks. One interview was conducted with a planner in one of the case municipalities. The informant has both instructed a school class in the use of the method, and worked on analysis of the data that were produced. Another interview was conducted with a representative from the Norwegian Centre for Architecture and Design (DogA) who has contributed to

developing the Children's Tracks-tool. Further, we have conducted a document analysis of policy documents and evaluation documents regarding the use of Children's Tracks in all three municipalities.

The paper continues with a presentation of the theoretical framework we will use to answer the research questions. Here, we take a closer look at how children's participation in land-use planning can be understood and legitimated, and we describe the benefits and challenges of PPGIS as a participatory tool. Further we describe the method of Children's Tracks. In order to contextualize our analysis, and make explicit in which way our conclusions are relevant in other contexts, we also explain some important traits of the Norwegian planning context. We then discuss and analyze Children's Tracks in relation to our research questions, before we present some concluding remarks for the potential of Children's Tracks in participatory planning processes.

3. Theoretical and contextual framework

3.1 Children's participation in land-use planning

From the early demand for children's participation in the advocacy movements in the1960s, children's participation has now become incorporated into mainstream approaches to land-use planning (Francis and Lorenzo 2002: 158). How children's participation is practiced depends on how participation is understood and legitimated as a part of the urban development (Thomas 2011), and also on the wider social position that is prescribed to children (Francis and Lorenzo 2002: 159). Turnhout, Von Bommel and Aarts (2010) view participation as a process where citizens are created, rather than as a neutral space where people can represent themselves. In this way participation-processes can place boundaries, restrictions and limitations on citizen involvement. Thus, the important question to ask about participation, according to Turnhout et al. (2010: 4) *"... is not whether participation is exclusive, selective, and restricted, but how it is. Which types of exclusion are achieved – not just in terms of who is in and who is out, but also in terms of the identities, perspectives, and views that can legitimately be included in participation."*

Hart's "ladder of young people's participation" (Hart 1998) is a much used theoretical tool for critical evaluation of the degree to which adults and institutions afford and enable children to participate (Hart 2008: 23). The three lowest rungs of Hart's ladder include different forms of non-participation, where children are manipulated or used to decorate a process where they have very little opportunity to shape both the process or its results. The top five rungs include forms of participation that differ in the degree "to which children are allowed, enabled and supported to initiate their own projects and make decisions in carrying them out with others" (Hart 2008: 24). On the top rung are placed participatory processes that are child-initiated and where children make shared decisions with adults. According to Hart (2008: 24) the ladder-metaphor should not be understood as normative, and the upper-rungs are not necessarily preferable in all situations. Rather, it can serve as a tool to understand how children's participation differ.
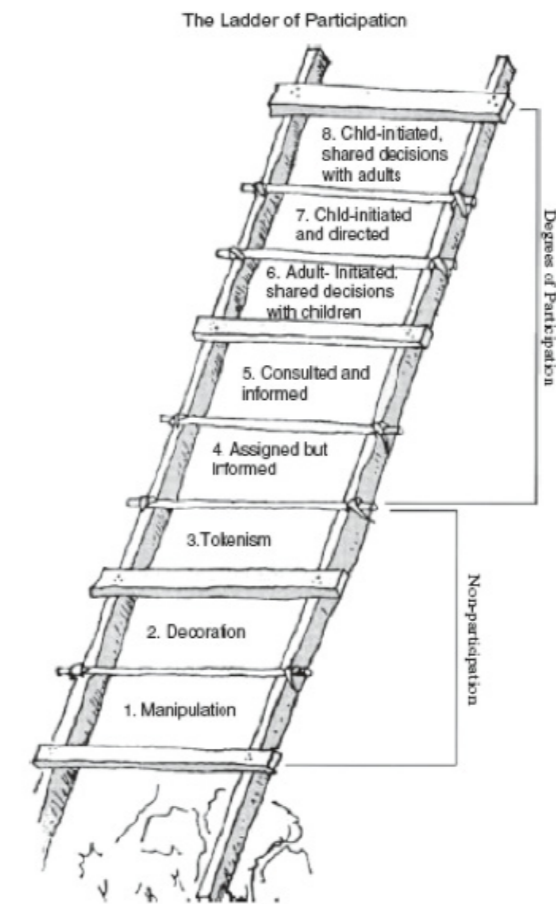

Fig. 1. *Hart's ladder of young people's participation (Source: Hart 2008)*

Children´s access to participation as urban citizens is to a large degree shaped by how their competences and knowledge are perceived by other children and adults (van der Burgt and Cele 2014: 31). If children's competences are understood only in comparison to adult perceptions and experiences in the city, the result is often a view on children as less competent and unable to participate as actors in the urban environment. A common justification for involving children in urban planning is that the competences and knowledge of children and youth about urban life is inherently different from those of adults, and children's knowledge can therefore provide important input to processes of land use development (Chawla 2002; Björklid and Nordstöm 2012). Children's views on resources and challenges in their environments, and what is experienced as an attractive urban environment, may also differ from those of adults (Moore 1986; Chawla 2002: 232), and children are therefore the best experts on their own life in urban environments. Therefore, a child-friendly city is not only a city that is good for children, but also a good city according to children (Riggio 2002).

In addition to the need to recognize children's competences as important input to urban planning, another justification for involving children in planning is that the child may develop its self-esteem and democratic skills through participation (Cele and van der Burgt 2015: 9). According to Chawla & Heft (2002: 207), the degree to which children develop competence in relation to their physical and social environment is dependent on how accepting the environment is to the child's contribution, and also to what degree the environment is responding to the child's actions. They find that the greatest influence on children's continuing engagement with the environment is immediate and continuous information that a particular self-produced action results in a discernible event.

3.2 Public Participation GIS (PPGIS)

There are many approaches to PPGIS, from storytelling and sketching on physical maps, to individual registration of subjective experiences with space in digital mapping tools (Cope and Elwood 2009). The latter is aided by technological progress and as technology moves, so does the possibilities for developing and understanding PPGIS. As a digital PPGIS-tool, Children's Tracks is subject to some particular challenges that stem from the use of ICT.

For one, PPGIS requires that the participant has some degree of fluency in the skills that are needed to fully participate in the production of the map (Cope and Elwood 2009). An ICT based PPGIS will automatically exclude those participants who are not comfortable with or sufficiently skilled in the use of ICT tools. Depending on whose voice the mapping project aims to visualize, or the level of information that is desired, this could be a serious challenge for the implementation of ICT based participatory GIS. Another important challenge of ICT based PPGIS is the power that lies in the presentation of information, both to the participant and later in the presentation of results. The design, structure and logic of the mapping tool and the final maps have impact on the participation process and how the maps are read by the observer. One of the risks of digital presentation is that unfinished or poor data can be perceived as unbiased fact.

PPGIS should also be seen in relation to its learning potential. According to Bednarz (2004), important rationales for the use of GIS in education are that GIS can be a supporting tool in the studies of local environments and contribute to the enhancement of the capacity of spatial thinking. In this way, the use of PPGIS can contribute to development of what Gryl, Jekel and Donert (2010) calls spatial citizenship: *"Spatial Citizenship is about 'learning how to navigate this world in respect to a) the physical world, b) the meanings attached to physical objects and environment c) the power relations involved in the production of meaning'."*

3.3 Children's Tracks - A PPGIS tool

Children's Tracks is a workshop based method that uses PPGIS to involve children in land-use planning, by letting them register their knowledge about their environment in digital maps. Important goals of Children's Tracks is to give children an opportunity to participate in planning processes that concern them (DogA 2010), strengthen the interests of children in spatial planning, and give planners knowledge about the spatial experiences of children. In addition, Children's Tracks is intended to have an educational function for the children involved; Participation may teach children about democracy in practice, prepare them to be decision-makers in the future, and give children an opportunity to develop their spatial understanding and GIS-skills.

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DogA (2010) recommends that the Children's Tracks process is lead by a local or municipal task force, consisting of municipal planners, teachers, and participants from technical and health sectors of the municipality. The task force holds responsibility to plan and implement the Children's Tracks registrations, and shall also ensure that the registrations are used in the following planning process. The Children's Tracks registrations are conducted in workshops that take place either at school or in the local community. The workshops are led by teachers, planners or preferably both (Aradi 2010). The recommended age group for participating in Children's Tracks is from fifth grade (11 years) and up. It is specifically recommended that children and youth in fifth/sixth grade and eighth/ninth grade participate, so that different age groups are represented (DogA 2014).

The workshop will typically start with an introduction to the process and the purpose of Children's Tracks. The aim of this introduction is that the children start thinking about what they like and dislike about their local environment. The municipal planner is recommended to hold this introduction to give the children a realistic picture of how their contributions will be used in the planning process, and also to put the Children's Tracks registrations into a wider context. After the introduction, the workshop will continue by a registration process. This process is recommended to be divided into an analog and a digital part (DogA 2014). In the analog part, the class is divided into small groups. The groups study a paper map together to make themselves familiar with how their local environment looks on the map. In the digital part of the workshop the children will firstly draw their school route onto the map. After this they are asked to register the places they like, the places they don't like, and the activities they do in those places. Teachers and planners will then be able to see the registrations on a separate web-page. The full registration process takes about three hours. To evaluate the process and inform relevant actors about the findings of the registrations, a short report should be written by the process leaders about the basis of the registrations. This report should summarizes which places are particularly liked or disliked by the class as a whole (DogA 2014).

3.4 The participation of Children and Youth in Land-use planning in Norway

In Norway, the system of land-use planning is hierarchically organized. The legal fundament for all Norwegian land use planning is the national Planning and Building act. Further, national guidelines specify how the act should be followed. On the regional/county level, the national guidelines are interpreted in regional plans, which indicate the direction of master plans on the municipal level. The municipalities enjoy a great extent of autonomy in regards to land-use planning. The overall municipal land-use plan is the main tool through which the municipalities regulate land-use. The municipalities use this plan to formulate the primary goals and principles for future land use, and implement land-use regulation through zoning (Falleth and Johansen 1996 in Hanssen 2013; Mäntysalo, Saglie and Cars 2011). The over-all plans can further be used as a foundation to develop more detailed area zoning plans that supplement or specify the municipal plan. While the plans are ordered hierarchically, the latest applied plan is always considered legally binding.

As Norwegian land-use planning is heavily influenced by the goals of communicative planning theory, public participation and promotion of equal opportunities for all sincere arguments from the involved parties are seen as important goals in planning practice (Sager 2009).These goals are reflected in the Planning and Building Act of 1985, where the participation of children and youth in land-use planning was formalized as a right. These principles were brought further in the act of 2008. § 5-1 states that:

"Anyone who presents a planning proposal shall facilitate public participation. The municipality shall make sure that this requirement is met in planning processes carried out by other public bodies or private bodies" (MLM 2008).

§ 5-1 further states that:

"The municipality has a special responsibility for ensuring the active participation of groups who require special facilitation, including children and youth. Groups and interests who are not capable of participating directly shall be ensured good opportunities to participate in another

way" (MLM 2008).

The municipality also has to "ensure that a special arrangement is established to safeguard the interests of children and youth in the planning process" (MLM 2008). In terms of participation, the relatively vague formulation of participation goals in the Planning and Building Act open for a great degree of local variation in how the law is practiced (Falleth, Hanssen and Saglie 2010).

Despite the relatively strong position of children and children's rights in many parts of society in the Scandinavian context, the rigidity and complexity of the planning process may lead to exclusion of children from formal physical planning processes (Cele and van der Burgt 2015:2).

Since the mid 1980's, the Norwegian land-use planning system has become increasingly market oriented (Hanssen 2013). It is common that private actors own and formulate new area- and detailed zoning plans, which are later handled by the municipal planning administration, before the final decision is made in local political processes (Bowith and Høegh 2005). The role of planners are then often reduced to that of a facilitator and coordinator (Hanssen 2013).

The new planning context brings forward some challenges to the participation of children and youth. Children's participation is in many cases part of publicly initiated master plans. However, public participation in privately initiated plans is often limited to the minimum requirement (Hanssen 2013). Increased privatization of municipal area planning may therefore pose a threat to children's participation (Johansen Aune 2015:111).

4. Analysis and discussion

The broadly formulated law regarding public participation in the Planning and Building Act leaves a lot of responsibility to the planner on how to interpret the law and implement measures. One aim of this paper is to research how planners perceive the potential for Children's Tracks to strengthen children's interests in this planning context. In this section, we explore some themes that came up during interviews and in documents from the case municipalities.

4.1 A resource efficient participation tool

From the experience of the municipal planner, one advantage of Children's Tracks was that the method is a finished product which is easy to implement, compared to the alternative of creating a participation program from scratch. Children's Tracks has a defined methodology, and offers defined procedural steps. This is particularly important in the municipal sector, which often has few resources. Children's tracks gives busy planners the opportunity to carry out participation measures, and can thus lower the threshold for involving children and youth in municipal planning. Moreover, involving children is seen as a desirable option for planners seeking to extend their knowledge base. In the case municipalities, the use of Children's Tracks was seen to inspire planners and other municipal workers to focus on participation of children and youth, and to implement their voices in plans and programs. The municipal planner argued that working with Children's Tracks contributed to increased interest and enthusiasm for participation amongst planners. It was particularly noted that when leaders of planning projects took part in the Children's Tracks process and saw the value of this type of participation measure, this had a positive effect on the implementation of the data in final plans. By illustrating how such participative processes can be organized, and showing the potential usefulness of data from such processes, Children's Tracks can thus contribute to spreading information and excitement amongst professionals about the importance of participation.

4.2 The production of useful information

In Children's Tracks, children are asked to map the places they like and dislike, by selecting between different icons in the software. In addition, they are asked to draw their school routes onto the map. This framing of the participation process (Turnhout et al. 2010) impacts both data production and data interpretation. In one municipality, the evaluation documents mentions that the preparations before the registrations were of high importance for the data quality. It was crucial that the children were given adequate information

about the mapping process and the purpose of the data collection, and that they were made to reflect on the questions they would be asked. Based on experiences from several Children's Tracks processes, the representative from DogA argued that both a planner and a teacher should be part of the team that carried out the process. While the planner could put Children's Tracks into a wider context of planning, political process and the rights of children and youth in planning, the teacher was a person that the children trusted and that "understood what they said". The teacher could thus be an important link between the municipality and the children. The municipal planner also stated that such practice appeared to make the process a better learning opportunity for the participants. The importance of preparations can be exemplified by the fact that some of the data collected was reported to be difficult to use by planners. When the children used the pre-constructed categories in the registrations, they often gave little explanation of the activities actually taking place. This, in turn, made it unclear what the information could be used for. Through presentations given before the registrations, the planners could inform the children about what kind of information that would be of particular interest in the specific cases.

The character of Children's Tracks as a finished product with fixed categories, can also limit the potential information one is able to gather. Those in charge of a PPGIS-process hold a lot of power by controlling how the mapping process is framed and which issues are brought to the table for participants to comment on. Turnhout et al. (2010) points to how participation reinforces dominant frameworks, by restricting the possible choices through presentation of predefined problems and scenarios. In Children's Tracks, children are asked to register activities and preferences based on pre-constructed categories, such as "nice view", "angry dog", "traffic" or activities like playing and swimming. These categories can indicate to the children that some activities are more legitimate than others, and create a desire among the children to fill in these activities on the map. From the perspective of the planner, the knowledge that is gathered has to be useful in the work with area plans. It will therefore be in the planner's interest to lead the children toward specific problem definitions and possible answers. Planners, teachers and software designers thus have a crucial role in the construction of knowledge through Children's Tracks. The interviewed planner also admitted that the data from Children's Tracks could possibly be used to legitimate "any purpose", by focusing on certain aspects

and categories. As put forward by Turnhout et al. (2010), critical evaluation of the problem definitions in participation measures is of great importance to make sure that these questions don't represent external interests. To answer this challenge, a possible future development of Children's Tracks could leave more of the categorization to the participants. Such a model would probably demand more time spent on the introduction of the workshop, to give participants a sufficient idea of how to come up with their own categories.

4.3 The need for ICT skills and adequate equipment

The digital part of Children's Tracks demands that the participants possess the required ICT skills to use the equipment. Cope and Elwood (2009) argue that the use of ICT in PPGIS can exclude those without the necessary skills and comfort with using ICT equipment. As O'Neill (2001 in Turnhout et al. 2010) points out, the skills necessary to participate are always unevenly distributed. In the case of Children's Tracks, the tool is advised to be used by children and youth in 5th grade and up, and especially children and youth in 6th and 8th grade, which include children aged 10 to 14. These are the youngest groups that are expected, by DogA, to be able to understand the maps and the use of the ICT tools. Children's Tracks thereby excludes younger children from participating. This is not a problem if additional measures are taken to include younger children by other methods of participation. If, however, Children's Tracks is considered the "go-to" tool for children's participation because of its efficiency and predefined procedural steps, as put forward by the municipal planner, then the exclusion is more problematic. Children and youth are diverse groups, and problems arise if Children's Tracks data is taken to represent the views of all children and youth in the municipality.

Children's Tracks also demands suitable technological equipment and that the facilitators of the workshop possess the required ICT skills. In one municipality, schools reported that problems with slow computers made the participating children restless, which led to fewer registrations than what could have been achieved with better equipment. The representative from DogA stated that technical issues concerning the computer equipment, and issues regarding the digital competence of teachers, are among the most noticed challenges by the teachers that have used Children's Tracks.

4.4 Confirming and challenging planners ideas of children's interests

Data from Children's Tracks can make it easier to implement children's perspectives in formal planning processes. Both the municipal planner and the representative from DogA argued that a main use of Children's Tracks data in their planning practice, was that it could confirm what planners already suspected about children's use of their local area. In this way Children's Tracks data can be used to legitimize arguments on what is thought to be the interests of children. The municipal planner described how Children's Tracks is particularly useful for the children's representative in her municipality, a person selected to safeguard the interest of children and youth in the planning process. The children's representative could, with the knowledge from Children's Tracks, speak with greater authority about children's interests. Children's Tracks constituted a factual basis for how the children's representative conducted her work. In the experience of the representative from DogA, the data gathered in Children's Tracks could not only confirm, but also challenge adults ideas on what is considered to be best for children. Knowledge about how today's children perceive their neighbourhood is important for guiding measures to make cities and towns better places for children. Children's Tracks gives both knowledge and legitimacy to the interests of children, and to the institutions that serve as the voice of children in land-use planning. By producing digital maps that visualize children's interest Children's Tracks produce information that should be easy to implement into a planning context in which municipal general masterplans and area plans are important tools. By "speaking the language of the planners", Children's Tracks can contribute to strengthening the voice of children in these public plans.

In the experience of the municipal planner, the most useful data from Children's Tracks was related to mobility and the routes that children used to school and in their spare time. This data was easy to interpret and implement, as it gave clear information on the use of streets, paths and shortcuts. This information could be used to find and secure short cuts in the local transport network, and could easily be added to existing maps. The municipal planner remarked that this data showed routes that the municipality already knew were important, but also gave new information about troublesome intersections and routes which were not as safe as originally thought. As the independent mobility

of Norwegian children is often limited to their neighbourhoods (MLM 2013), knowledge about their travel routes and traffic safety in their local communities is of great importance to the development of child-friendly cities. In regard to mobility, Children's Tracks can therefore be a suitable tool to create child-friendly cities that are, as put forward by Riggio (2002) good according to children.

4.5 Children and youth as planning actors

Different approaches to the participation of children and youth in urban development frame children and youth as planning actors in different ways, and operate with different goals for their participation (Francis and Lorenzo 2002). As put forward by van der Burgt and Cele (2014), how adults perceive the competence and knowledge of children has consequences for the degree of access children are given to participation in urban development. One overall goal of using Children's Tracks is to involve children and youth actively in the urban- and municipal development (DogA 2010). In addition to involving children because of their specific knowledge and experiences, the initiators of Children's Tracks hope participation will give children an increased sense of ownership to their local community, which in turn may lead to a desire to continue living in the same neighbourhood or municipality in adult age. In the case municipalities, children's legal right to participate is a common justification for involving children through Children's Tracks. One municipality sites their "law given assignment" to secure children good environmental surroundings, and facilitate "active and meaningful participation" for children and youth. In all of the municipalities, Children's Tracks has been proposed as a tool for gathering knowledge about children's interests in the development of area zoning plans. This indicates that children's participation is understood both as a legal obligation and as a way of introducing children´s competence and knowledge into the planning process. In particular, it seems that the municipalities believe that bringing children's knowledge into the planning process may contribute to creating environments that are good for children.

In his "ladder of participation", Hart (2008: 24) asks to what degree the participatory practice allows, enables and supports children to initiate their own projects and make decisions in carrying them out with others. In all

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municipalities, the Children's Tracks-process is initiated by adults to make children contribute with knowledge to adult decisionmaking. According to DogA (2010), the ambitions of Children's Tracks lie somewhere around rung 5, where children are consulted and informed, and rung 6, where children share in adult-initiated decision-making processes. As in conventional land use planning in Norway, Children's Tracks does not delegate any power of decision making to children, and it is therefore left to the planners and municipal politicians to determine whether children's contributions will bring about any changes to the land use.

4.6 The development of "spatial citizens"

An important goal of children's participation in general (Cele and van der Burgt 2015), and Children's Tracks especially, is the potential for the child to develop democratic skills. As Bednarz (2004) argues, the use of GIS in education can potentially enhance the capacity for spatial thinking. In both policy papers and amongst relevant actors, Children's Tracks is considered a potentially good tool for making children and youth able to develop both democratic and spatial understanding. In interviews, the municipal planner and the representative from DogA commented that the children had a very positive view of Children's Tracks. According to feedback from facilitators, the workshops appeared to be a stimulating and exciting activity. The children had shown new interest in maps and a greater understanding of the relationship between their own spatial practices and the representations of their local areas on maps. The representative from DogA argued that Children's Tracks gave children a platform in which they could share their opinions about their local environments. She also pointed out that teachers had experienced Children's Tracks as a good tool to teach children about society and democracy "in practice". Children's Tracks let youth and children learn about their rights and how they should proceed to get their voices heard within a complicated and complex land-use planning system. In this way Children's Tracks could possibly give a better understanding of society and the political process, by connecting less tangible concepts with the children's local contexts and life-worlds. Children's Tracks can thus have a huge potential in building knowledge and capacity regarding spatial understanding and participation in democratic processes.

If children and youth are to develop their self esteem and democratic skills through participation, as is argued by Cele and van der Burgt (2015), the time and effort that is put into the mapping process should not be taken lightly by the initiator. According to Chawla & Heft (2002: 207) the most important incentive for children to continue their engagement with the environment, is the experience of immediate and continuous information that a particular self-produced action results in a discernible event. Considering this, it is crucial that children experience that participation results in actual changes in their environment. Thought should be given to how children's expectations are managed and met.

One challenge that was both stated in interviews and found in the document analysis, concerned how Children's Tracks processes created expectations amongst the participants that were difficult to meet. Considering how important children's experiences are in shaping their worldview (Chawla and Heft 2002), a negative experience with public participation can have a harmful impact on the participant's sense of democracy, and may prevent future motivation for involvement and participation. "Involvement commits", as the municipal planner said in interview. She stated that the long timeframe of municipal planning was difficult to communicate to the participants in Children's Tracks, and that the process needed to be connected to more tangible measures. The representative from DogA also emphasized the importance of finishing the process with physical measures that could symbolize the process and show participating children that their voices were taken seriously (more affordable and immediate alternatives could be temporary physical installations or non-physical measures). Still, it is important that the interests of children and youth get "incorporated in the municipal economical plans", as the representative from DogA said, and not only end up as temporary and low cost solutions.

5. Concluding remarks

In this paper, we have asked whether Children's Tracks is perceived by planners to strengthen the voice of children in municipal planning, and which implications Children's Tracks may have for the development of children as

"spatial citizens".

Children's Tracks is designed to give children an active part in shaping their local environments. Our analysis shows that the tool is perceived to be a good methodology for answering the legal obligation for children's participation in the municipalities. By presenting a ready-made model for creating map based data, Children's Tracks is considered to be a relatively easy and efficient way to involve children in land-use planning. Children's Tracks is used to give evidence-based legitimacy to already existing local knowledge, and to opinions that planners have about the interests of children. At the same time, there are examples of established "truths" that have been challenged. The data from the case municipalities show that Children's Tracks serves both to confirm and challenge established ideas of what children's perspectives are. As seen in the example on the physical mobility of children, Children's Tracks can be seen as an opening to a child-friendly urbanization that goes beyond making restricted areas "child-proof", and onto providing knowledge about how the neighbourhood as a whole can become more accessible to children. Children's Tracks' seems to have great potential as part of the municipalities' work on developing the legally binding area plans. It is also worth noticing that the involvement of leaders of planning projects can contribute to a greater understanding amongst planners of the importance of children and youths participation.

Some limitations to the method are also identified. In particular, it is unclear to what degree Children's Tracks enables and supports children to initiate their own projects and decisions on land use. In the municipalities, there is a recognition that adults necessarily have to shape the process of involving children in urban planning. Not all knowledge is considered constructive when the municipal planners' goal is to finish their area plans. The consequence is that the production of knowledge through Children's Tracks is heavily influenced by pre-constructed definitions of what children's activities are thought to be. This leaves a lot of responsibility on those conducting the registration processes and interpreting the data. One risk is that data that doesn't immediately seem useful is discarded or not discovered in the first place. Another issue is related to the demand for ICT skills in both participators and facilitators, and to the availability of proper ICT equipment. The registration sessions

are dependent on adequate equipment and knowledge of its use in order for the registration process to be a positive experience with good results. In this regard, the use of Children's Tracks can contribute to a disparity in differents groups' opportunity to participate, by excluding groups that don't possess the adequate ICT fluency, and institutions that can not afford the adequate equipment.

Children's Tracks can also contribute to the development of children as "spatial citizens". Planners and teachers perceive the methodology to be a good tool for teaching children and youth about political processes, by relating complex and abstract processes to their own interests and local environments. The use of Children's Tracks can also give children and youth a good introduction to creating and reading maps, and thus contribute to the development of both their geographical imaginations and their ability to interpret geographical information. For the development of spatial citizenship, it is however crucial that participation leads to actual results. Experiencing these results can strengthen children's engagement and trust in democratic processes and strengthen their connection to their local community. On the other hand, a lack of commitment can have the opposite effect, as children will learn that they won't be heard when stating their opinion in a democratic, political process. As a foundation for the Children's Tracks methodology is the view of children as competent actors and rightholders in urban development. To contribute to the development of children as "spatial citizens", engagement in Children's Tracks need to be part of a pedagogical arrangement where children and youth both are heard and taken seriously as planning actors - they must not become tokens, but included in processes that result in physical outcomes.

There is a need for additional studies on the physical outcomes of planning processes that have used Children's Tracks. Further research should look into how knowledge from Children's Tracks or similar PPGIS methodologies is interpreted and put to use by public and private planning actors. In a planning context where private actors are gaining more control over the urban development, there is a particular need for knowledge about how these actors interpret and implement data about children's interests.

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Conclusions

Final Conclusions

AUTHOR:
John Manns

Cities have existed longer than monotheistic religions and are a defining characteristic of human civilisation. From the beginning, we have sought to shape them, responding to the driving needs of our societies at certain points in time; from establishing agricultural economies and defensive outposts to global marketplaces and cultural centres. "A city", as Patrick Geddes once said, "is more than a place in space; it's a journey in time".

The present time is increasingly defined by technological advancements but the implication for our built and social landscape remains to be determined. What is clear, however, is that the global Technology Revolution has placed computing power and content into the hands of people across the world at relatively little financial cost. Today, technology is having a profound impact on how people live, work and interact. Massive amounts of data and information are being accumulated, social media is connecting a greater number of individuals to each other in new ways; our societies are in the process of being restructured and our cities now need to respond.

To this extent the question of how technology will be used relates as much to urban planners and citizens as any other stakeholders in business, government or civil society. This is not an entirely new position for planning professionals to be placed in. The twentieth-century, for example, began with modernists such as Le Corbusier asserting that cities needed to respond to technological

progress of the Machine Age by placing greater emphasis upon the improved accuracy and efficiency it heralded. Our experiments with these ideas and subsequent reactions against them have provided significant insights that inform planning practice today.

The ECTP-CEU's Young Planners Workshop 2015 sought to grapple with some of the opportunities and challenges which the contemporary Technology Revolution brings. Each paper was presented at the Biennial of European Towns and Town Planners in Dublin during October 2015. At that point the world had a population of 7.3 billion people with 3.2 billion active internet users, 2.2 billion active social media users and 3.7 billion unique mobile users (of which there were 1.9 billion unique smart-phone users). The international relevance of this context to the question of "making cities work" is particularly apparent in each paper.

What is equally important to note is the rate at which technology is advancing and new formats are being incorporated into people's lives in various situations. Of the 3.2 billon active internet users at the time of the Biennial, approximately 225 million had used the internet for the very first time in the preceding 12 months, equivalent to 600,000 new users every day. Likewise, of the 3.7 billion active mobile users, there is a significant trend towards the adoption of smartphones which, with 2 million devices sold every day, account for more than 40% of the world's active handsets. The unavoidable implications are nonetheless that technology has significant and increasing relevance and potential. It can make people more connected, open and engaged. It can also help cities and citizens predict, adapt and respond to changes in the urban environment.

The scale of the Technology Revolution is enormous but, whilst technology is increasingly used, there remains significant potential for it to be incorporated into the way that policy-makers, decision-takers and citizens relate to each other. It provides another means by which to communicate information between people, although this does not supersede what is already done as it is dependent upon stakeholders having access to the necessary technology. Consequently, there is also an opportunity to inform people about these new forms of communication and to encourage their adoption, which in itself brings

potential to communicate more quickly and effectively with large numbers of people. In doing so, it provides an immensely valuable public resource.

As with so many things, therefore, the key questions faced by the Workshop relate to the application and delivery of such technology. The present age is both one of austerity and an increasingly established neo-liberal tradition, which brings its own challenges. Mark Prisk, Chair of the UK´s All Party Parliamentary Group on Smart Cities, has suggested that "it´s not about changing operating systems but changing mindsets". This is true to an extent, but questions do remain. How, when data is collected by private enterprise, should it be shared? To what extent should the use and presentation of data be transparent? Does this create a further burden on planning professionals?

The Workshop collectively emphasised the need to emphasise "checks-and-balances" through the provision of open, unrefined and freely available data, with public engagement that's supported by an obligation to follow-up. Yet the extent to which this are entirely desirable and realistic objectives remain to be seen. The exploration of these topics is nevertheless important as new technologies appear set to play an increasing and inescapable role in the practice of urban planning because they play an ever-greater role in our lives than at any previous point in history. We are, in many respects, at the dawn of a relatively new age and have not entirely found our feet.

We must therefore ensure that legislation catches-up with the pace of technological advancement, that the curation and presentation of information is closely monitored, and that changes are not made without due consideration. It is fundamentally important to remember that technology is a tool to support the practice of urban planning and not an objective in itself. Irrespective of the pace of change, therefore, it is crucial that we identify the planning strategies first and only then seek to understand how technology can help us to achieve these objectives.