

FUPOL: an Integrated Approach to Participative Policies

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Abstract: The **Future Policy Modelling Project (FUPOL)** is a research project funded by the 7th framework program of the European Union. Its research focus are new technologies and methods for e-governance, e-participation and policy modelling. The FUPOL consortium consists of partners from European countries, China and Kenya. and comprises innovative multinational companies, leading research institutes, high-level political organizations as well as strong pilot partners. This paper describes the FUPOL new integrated approach to policy design and implementation including also specific examples from real life pilots in cities from different countries. FUPOL consists of an advanced policy lifecycle and an IT-solution with features supporting all phases of the proposed lifecycle. The FUPOL concept and functional modules as well as the technical architecture to achieve such a complete integration are described.

Keywords: Policy Modelling, Policy Simulation, E-Participation, E-Governance, Smart Governance,

1 Introduction

Smart Cities advocate for a new type of city that is a people centred city, one that is capable of integrating all aspects of prosperity, that provides productivity, infrastructures, services, economic development, quality of life, equity, social inclusion and environmental sustainability. Leaders of smart cities decide policy priorities in transparent mode and with the active participation of citizens. The objective of the FUPOL project (www.fupol.eu) is to introduce a new governance model to support the openness of the policy design and implementation lifecycle with the help of innovative IT solutions. It enhances the capabilities of the constituents and policy makers to take better decisions and to reduce uncertainties related to the potential impact of policy measures and to the reaction of the citizens.

The FUPOL governance model builds on new technologies as well as existing know-how and open government data. The approach being developed seeks the active involvement of all stakeholders including policy makers, civil servants, citizens local organisations and companies in the policy making process.

The transparency of the policy design process is enabled by multichannel social computing, policy topic sensing and extraction, multilingual semantic analysis, modelling with dynamic agent based simulation, cloud computing, Idea Management System and GIS presentation technologies. Those elements from FUPOL are integrated with classic e-participation systems to facilitate e-governance.

2 The integrated FUPOL approach

FUPOL aims at a completely new approach to traditional politics using advanced technologies. It provides an integrated model, linking an advanced policy lifecycle with ICT. The major steps of the policy lifecycle are:

1. Agenda setting: establishing the need for a policy or a change in policy and defining what the problem to be addressed is.
2. Analysis: defining the challenges and opportunities associated with an agenda item more clearly in order to produce a draft policy document.
3. Creating the policy: ensuring a good workable policy document. This involves a variety of mechanisms which can include: formal consultation, risk analysis, undertaking pilot studies, and designing the implementation plan.
4. Policy decision making.
5. Implementing the policy: this involves the development of legislation, regulation, guidance, and a delivery plan.
6. Monitoring the policy: this encompasses evaluation and review of the policy in action, research evidence and views of users. Afterwards there is the possibility to loop back to stage one

3 The ICT features

This section describes the technology features that are assigned to the policy modelling lifecycle.

Full Data Integration and Storage: A central repository is indispensable to integrate data from multiple source systems. It ensures data consistency across all steps of the policy lifecycle and it provides a single common data model for all data of interest regardless of the data's source. Technically it is implemented using a Service Oriented Architecture (SOA) architecture and an Enterprise Service Bus (ESB).

Full GUI Integration: Applications have the same "Look and Feel" from a user's point of view. A single "sign on" to all applications simplifies the use of the system and improves security through a centralized authentication.

Policy Indicator Dashboard: The policy indicator dashboard visualizes various indicators and flags them if they are below / above thresholds or certain conditions are fulfilled. It is an efficient tool to monitor policies on the management level.

Social network aggregation and Single Window Display: This is the process of collecting content from multiple services such as Facebook, Twitter, BlogSpot or the FUPOL opinion map and pulling them together into a single location. The postings are displayed “single window”, which means postings from various sources are displayed on the same screen. The feature saves a lot of time, which is typically required to log into all the different sources and read the postings.

Hot Topic Sensing and Summarization: Hot Topic Sensing is a web and social network analytics tool that analyses data from social networks, newspapers, forums, blogs, etc. and identify relevant topics. Also a summary of postings is created, which reflects the opinions of the postings in brief.

Community Feedback Platform (CFP): The CFP is inspired by crowd-sourcing platforms and is designed to enhance cognitive processes in a similar way as traditional Idea Management Systems. The purpose of the system is to facilitate the idea analysis and selection processes. The CFP enhances the capabilities of Social Network, namely aggregation and Single Window Display with additional features such as commenting/voting and an analytics toolkit (i.e. computing: trends, topics, sentiments)

Visualization of Statistical Data: In the described process of policy modelling, the aspect of problem identification plays a key-role for the whole policy design process. The need for getting valid information about certain topics and policy indicators is essential for setting the agenda for a new possible policy. Visualizing these valid and proved data provides a more useful instrument to gather information by comparing, associating, correlating and identifying various data, data-attributes or indicators. The standard which is used to visualise statistical data on a map are Chloropleth maps. The specific architecture of FUPOL allows to combine statistical data, GIS and data derived from text such as “Hot Topics”.

Visual Social Data Analysis: Besides valid and objective data, the investigation of “subjective values” is important for identifying problems and gathering information about the “social impact”. The method of choice to analyse based on ICT-tools the social impact is Social Network Analysis (SNA). SNA enables analysing social networks and identifying opinion leaders by measuring and mapping the relationships and flows between people, groups, organizations and other connected information or knowledge entities.

Knowledge Database and Visualization: This refers to a multiple interlinked databases with policy related information. The visual knowledge database provides a visual search ability for proving the given information and compare to the web-knowledge.

Outgoing Multichannel Social Media Single Window Messaging: The capability of posting messages to various channels (social media targets) at the same time without the need to manually post to each site separately.

Opinion Maps: Opinion maps are interactive electronic maps that can be integrated into almost any internal or external web site and allow the posting of comments on a GIS based map.

Simulation and Impact Visualization: Policy simulation enables a virtual evaluation of policies. Therefore the statistical history of indicators is used to generate forecast based on mathematical models, in dependency of identified influencing indicators which can be addressed with a policy. To provide a better comprehension and transparency, some outcomes of the calculated simulation are visualized. This includes statistical visualization to analyse the impact based on the quantitative data, GIS (map based) visualization to illustrate the impact on a map, the “Policy Indicator Dashboard” to provide a simplified impact overview of the key indicators.

Visual Fuzzy Cognitive Map: Modern systems are complex and they are usually comprised of a large number of interacting and coupling entities that are called subsystems and/or components. A fuzzy cognitive map represents a system as a network showing the directed causal relations between its elements through arrows. The relations between the elements can be used to compute the "strength of impact" of these elements.

4 FUPOL implementation and pilots

The FUPOL project is now in the third year of development and is progressing as planned. The implementation activities have started with the identification of priorities in policy domains in all pilot sites. The priorities have been evaluated by considering exemplar scenarios which have lead to the identification of tangible needs by many actors involved at pilot sites. The features of the FUPOL integrated platform have been identified and already developed.

The methodology that has been used to collect “users’ needs” is based on agile analysis and programming techniques. The development of the FUPOL platform has not started from scratch. Contacts and cooperation agreements have been established with other research groups working on the same problem areas for example the UN Habitat project (www.unhabitat.org). The first FUPOL platform version and the first basic components of the platform have been released and are being utilised at the pilot sites. The pilot cities have identified the topics selected as local priorities in policy making and have already started real life pilots.

These are some of the pilot sites that have already started real life experimentations:

- Zagreb - Croatia, pilot about Land Use and Improvement of the Social Infrastructure
- Skopje - Macedonia, pilot about providing a healthy environment for citizens
- Pegeia,- Cyprus, pilot about sustainable tourism
- Yantai, China, pilot about economic development and urban administration
- Barnsley, U.K, pilot about the provision of land for employment creation
- Mtwapa, Kenya, pilot of the UN Habitat “Participatory Slum Upgrading Program”

Each pilot is described below with its domain application areas, the status and the development plans

4.1 The Zagreb pilot

The City of Zagreb is the capital city of Croatia. It is included in the FUPOL project with two pilots in the domain of Land Use & Improvement of Social Infrastructure. The first one includes two tests, one for setting the policy in the area of social infrastructure, and the other one for getting opinions regarding the Centre for autism. The second pilot includes two tests, one for setting the policy in the area of social infrastructure, and the other one for getting opinions regarding the children's playground in Remete. This chapter presents only the first pilot, that has already started and provided some results.

For the purpose of defining the new policy of improvement of the social infrastructure and building the Centre for Autism with the sensory park, a dialogue with the public should be held pursuant to Croatia's regulations. The main issue that the City of Zagreb should cope with is how to provide larger involvement of citizens and how to provide mechanism for collecting opinions from different groups of stakeholders.

The FUPOL policy lifecycle and the FUPOL platform are piloted as the solution to requirement of involvement of citizens. The actual topics have been opened for discussion on the websites of the City of Zagreb, on the social network pages of the City of Zagreb and blog (<http://zagreb-fupol.blogspot.com/>). For this purpose the FUPOL platform has been used, which allows the involved actors to make an investigation on the most used social networks to collect people's opinions on this topic. Such opinions can also be geo-referenced through a specific opinion map.

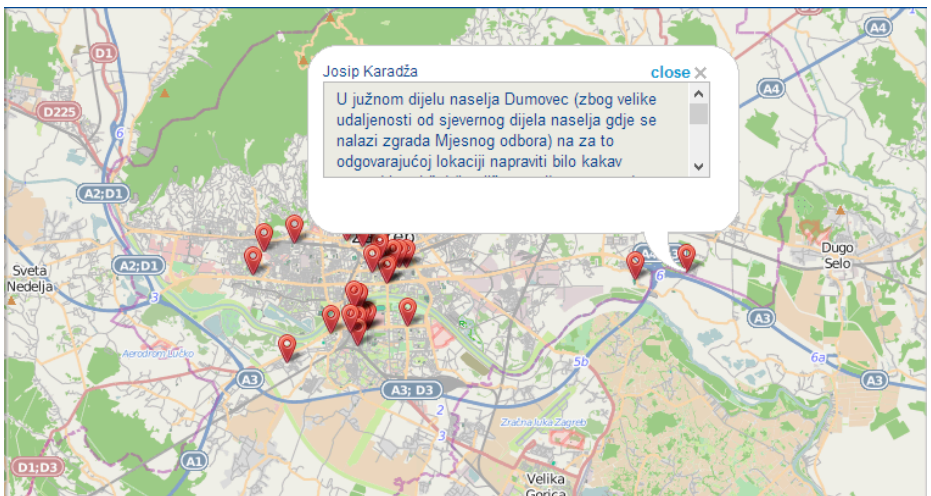


Fig. 1. Opinion map for Zagreb sports facilities

The City of Zagreb created four opinion maps, for schools, kindergartens, sports facilities and the Centre for autism with sensory park, figure 1. The media has been informed about the new campaign through the Press Conference, the website of the City of Zagreb and Twitter and Facebook of the City of Zagreb. The FUPOL leaflet has been designed, printed and distributed at 32 locations in the City. The articles

about the beginning of the campaign regarding social infrastructure and the Centre for autism have been published on the different portals.

Through the blogs the facilitators lead a discussion on how to provide the most suitable ideas for the observed facilities, such as the Centre for Autism and the public park in the area “Oporovec-south”. For the purpose of defining the most optimal content and equipment disposition in this park the FUPOL feature for simulation and impact visualization has been used. The simulation model and software have been developed. The City of Zagreb has started with using all FUPOL features and the expected finalization of the first pilot is at the end of March in 2014.

Based on the results of the first pilot the City of Zagreb will implement the full FUPOL policy lifecycle and platform in the second pilot during the next two years.

4.2 The Skopje pilot

The urban agglomeration of Skopje is a complex, dynamic system with an extremely high concentration of functions and population within the Republic of Macedonia and in the wider surroundings. The intensity of the spatial, functional and demographic development registered over the past period includes Skopje among agglomerations with an above-average developmental dynamics in Macedonia. There is an urgent need to undertake measures and activities in order to provide a healthy environment for the citizens of Skopje. One such measure is fostering inter-modality in the daily transportation of people and goods, more specifically, the use of bicycles (Topham 2013)

This topic is one focus of the pilot in the FUPOL project. Governmental decisions for modernization of current transport can be made based on several simulation tools as well as mechanism for collecting citizens’ opinions. Sophisticated tools for survey analysis and social networks can be efficiently used as input in the developed model. The optimization model will calculate optimal values of several functions, including environment and human protection functions, increasing the number of bike users. The expected output will not support only the governmental decisions; it will also provide more precise data on planning sufficient infrastructure, like parking lots, bike paths, resolving the conflicts and overcoming the constraints.

The optimization model is aimed to explore the barriers and facilitators in using bicycles as a transport mean in Skopje, considering bicycle riding for transport on private bicycles and different share schemes. The model will consider different citizens categories: Infrequent and non-cyclists, Regular bicycle riders and Cycle Associations members, altogether with the placement of bicycle docking stations and other bicycle path infrastructures. The output would provide the usage rates (i.e. trips per bike per day) considering different aspects of: Amount of docking stations, capacity of the docking stations and the location of the docking stations (close to residential and work areas) paying special attention to fostering inter-modality.

To make proper policy decisions about the projects’ priority one might use the simulation model and software as well as the visualization methods, developed within the FUPOL project. Driven by the citizen’s demands, our research will lead to better policy decisions, more efficient implementation of government policies as well as better identification of consequences for citizens and businesses. With the help of

multichannel social computing, policy topic sensing and extraction, advanced visualization including integration with GIS, multilingual semantic analysis, advanced policy modelling and model repository, dynamic agent based simulation, cloud computing and IMS supported crowd sourcing, we aim to address the bicycle inter-modality problem, to improve the bike infrastructure and to increase the bike usage as transport means in Skopje.

Beside the mentioned bicycle inter-modality problem, Skopje will evaluate two more tests till the end of March in 2014. One of them is devoted to the design of recreation activities and facilities in the Mount Vodna area (figure 2), and the other one addresses the shaping of open spaces and buildings based on the needs of its citizens.

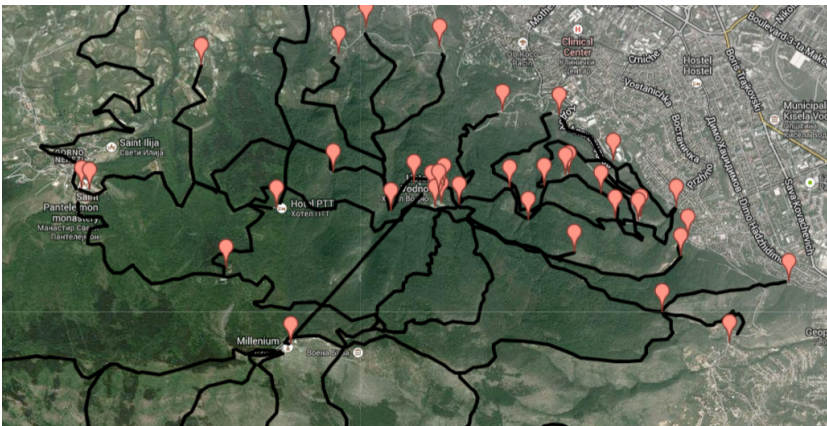


Fig. 2. Opinion map for Vodno mountain hiking trails

4.3 The Pegeia pilot

The tourism industry in Cyprus is a vital sector for the survival of the country's economy. Tourism accounts for many positive developments in Cyprus, such as the creation of infrastructure and amenities, employment, growth and entrepreneurship. In the last decades, Cyprus has tried to differentiate its tourism product with the addition of activities such as Agro tourism, Eco Tourism, Sports Tourism, Religious Tourism, and more (Jones 2012).

It is the reason for choosing to pilot the FUPOL approach in the domain of sustainable tourism. It includes two scenarios, one gathering tourists' opinions in order to improve the current infrastructure of the Coral Bay area and the second one to provide the optimal solution of promoting Yeronisos as an archaeological attraction.

The Pafos District (where the Municipality of Pegeia is located) is selected to be the European Capital of Culture for 2017. The Municipal Council of Pegeia has discussed and identified the problem of tourist seasonality as the major issue requiring immediate action to be taken as a top priority, and sustainable tourism initiatives as a possible solution to the problem. An increased number of tourists are expected to visit the district by then so the Municipal Council wants to improve the facilities of the Coral Bay area which is considered to be the best beach in the Pafos district for both

tourists and locals. Before taking such measures they need first to understand the needs of tourists when visiting Coral Bay - their opinion on the current facilities and what else they would like to find there.

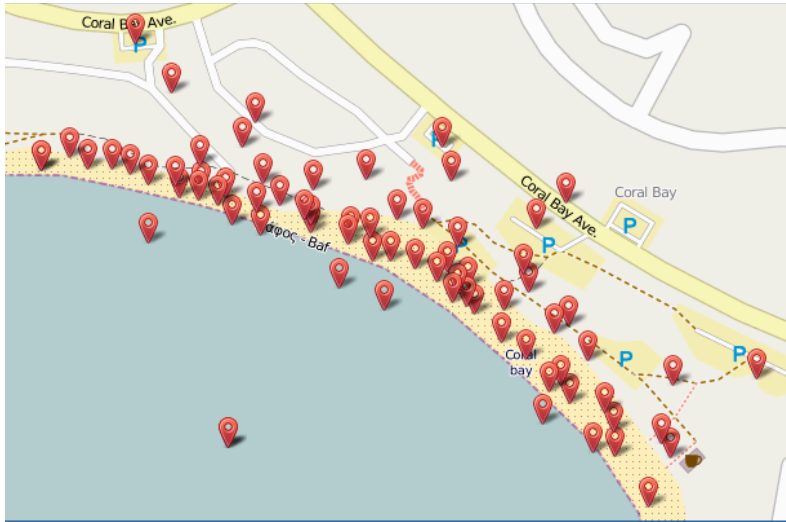


Fig. 3. Opinion map for Coral Bay beach area

For that purpose Pegeia has launched the campaign on the proposed issues, using the FUPOL platform. It allows conducting an investigation on the most used social networks, web forums and tourist websites to collect people's opinions on the topic "experiences tourists have on their visit to Coral Bay and improvement propositions". Such opinions can also be geo-referenced through a specific opinion map and topics can be generated to connect general observations to specific geographical areas, figure 3. The most debated issues are extracted and presented in a graphical way to the municipal council meeting. The results are used as the new basis for sustainable tourism policy that will lead into reducing Tourist seasonality, increasing their satisfaction, better match their needs and increase the number of the Coral Bay visitors.

In a similar way the campaign for Yeronisos island has been started. The campaign should include a crowdsourcing phase to get comments and ideas from the social media but also a more focused discussion on proposed solutions through the Feedback Community Platform. Finally a formal agreement with archaeologists and the Cyprus Sustainable Tourism Initiative will take place to review the various proposals.

The results of both campaign and the evaluation of using the FUPOL platform should be finalized at the end of March in 2014. In the second phase of the project Pegeia will initiate pilots that are follow-ups of the pilots of the first phase.

4.4 The Yantai pilot

Named after the local mountain, the city of Yantai straddles the Shandong Peninsula with a total coastline of 702.5 kilometres from north to south occupying a geographical area of 13,746 square kilometres. Together with the northeast city of Dalian, Yantai is strategically positioned to control the maritime gateway to the metropolitan areas of Beijing and Tianjin. The total population of Yantai at the end of 2007 was 6.51 million with a total of registered households at 2.29 million.

Yantai is poised to become one of the leading cities in the process of merging industrialization with informatisation as a new strategy for economic growth and development in China. New initiatives, such as the recently launched citizen card project, have helped Yantai to be well featured in the local and provincial headline news. Adding to the list of informatisation projects, Yantai's participation in the EU-China project seems to have added a new dimension of development to the city's informatisation strategy.

Yantai has conducted a discussion regarding the choice of the most important domains for implementation within the FUPOL project and based on the above mentioned facts it has chosen the economic domain and urban administration domain. (Jones 2013). Within these domains Yantai is going to implement two test cases.

The first one is related to reviewing the status of economic development, and making the strategic decisions of upgrading the existing industry, meeting the needs of local social and economic development. The decision makers of the city want to know about the development situation of the city's economy. They also want to base their decision on the existed data, for instance the consumption of the electricity, the emission of pollution etc., in order to implement a better policy towards next year's economic development. For that purpose Yantai wants to investigate citizens' and stakeholders' current opinions and suggestions towards current economic situations and to collect opinions about actual policy making standards, using the FUPOL platform. Also, for finding the best solution FUPOL team has started with preparing the simulation model and simulator for identifying the optimized industrial structure of Yantai.

The second test is in the field of parking area for the increasing number of cars (Jones 2013). According to the relevant data from municipal government departments, by the end of 2013, in Yantai for every 100 cities and township households there will be 37 cars. With the increase of quantity of private cars, the parking problem is getting increasingly serious. Therefore the relevant municipal government departments have to plan more parking area for citizens. For that purpose it has launched FUPOL campaign, figure 4.

Status	Title	Start Date	End Date	Initiator	Facilitator	Actions
🔒	Yantai Citizen Card service development	9/1/13	9/30/13	Wang Shaoyu	Wang Shaoyu	
🔒	Carparking Campaign	9/1/13	9/30/13	Wang Shaoyu	Wang Shaoyu	
🔒	Drinking Fountains Golden Beach 2013	1/21/13	2/28/13	Wang Boyong	Wang Boyong	edit
🔒	Chinese news watch	7/18/13	7/30/13	Wang Boyong	Wang Boyong	edit
🔒	Lailshan Airport PAX Experience Observation	1/8/13	1/31/13	Wang Boyong	Wang Boyong	edit
🔒	Media Watch	6/26/13		Wang Boyong	Peter Sonntagbauer	
🔒	Yantai Social Media Analysis	10/3/13	11/30/13	Wang Boyong	Peter Sonntagbauer	

Fig. 4. FUPOL platform with a campaign list

The first results of both campaigns should be expected in the mid of 2014. They will be analysed and used for improvement and conducting the second phase of the project.

4.5 The Barnsley pilot

Barnsley lies at the mid-point between the region's two main cities of Leeds to the north and Sheffield to the south. It covers an area of 320 square kilometres and is home to around 222,000 people. Historically, Barnsley was centred around coal mining, resulting in the borough's dispersed pattern of small towns and villages. Because people lived where they worked and coal was moved by rail, road links between towns and villages were poor and communities were self contained.

Barnsley is involved in the FUPOL project with the demonstrator domain of "Provision of Land for Employment Creation" (Jones 2012). Barnsley Council wants to increase the availability of quality land for economic development initiatives. This is to encourage businesses to locate or relocate, or remain and expand in Barnsley and the South Yorkshire region.

It wishes to do this in the most inclusive way. Not just for the benefit of the businesses, but also for the employees of these businesses, their families and the residents of Barnsley and South Yorkshire generally. Using FUPOL platform it will do this by investigating and appreciating the current consensus of the people about the areas already allocated for development in Barnsley and the South Yorkshire region, sourcing suggestions and ideas regarding possible improvements and constantly collating feedback on the issues which are thought to be the most important, an iterative process which will inform policy decisions and policy definitions.

Barnsley has launched a specific planning development campaign using the FUPOL platform to enhance and verify the eventual decision (Topham 2013). It has been done by using established and also 'local' social networks (those supported and often raised

in the actual area in question) to directly and indirectly collect people's opinions on the topic of "Allocation of land for industrial purposes and for sustainable economic development". Such opinions can also be geo-referenced through a specific opinion map. Normal communication channels will be used to ensure sufficient interest is raised and that a meaningful dialogue ensues.

Within the mentioned domain Barnsley is implementing three test cases. The first one is related to investigating citizens' current thoughts and feelings concerning the Provision of Land for Employment Creation. The second one is going to be used for identifying new ways for the provision of transport, particularly linked to travelling to work. And the last one is allocation of land for economic development. The facilitator from the City Administration has created a campaign for starting discussions regarding this topic. He has started social network aggregation and collecting inputs from the different sources regarding the policy under scrutiny, making a first analysis using the FUPOL platform, figure 5. The final analysis and making decisions about validity and importance of the collected feedback is planned for the mid of 2014.

Collected social media data

Trigger	started	Summary																																				
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Fig. 5. FUPOL platform for collecting social media data

4.6 The Mtwapa - UN Habitat pilot

Mtwapa is located in Kenya's Kilifi County. The town is situated approximately 16 kilometres (9.9 mi) north-east of Mombasa on the Mombasa-Malindi road. Its population was calculated in almost 50,000 people in the 2009 Kenya national census, and half of them live in slums. The Mtwapa Participatory Slum Upgrading Programme (PSUP) aims at improving living standards of slum dwellers in Mtwapa by addressing the five deprivations of slums namely the lack of access to safe drinking water, access to improved sanitation, overcrowding, permanency of living structures, and security of tenure. In Mtwapa, the project concept notes prepared under the Phase 2 of the project identified, security of tenure, water and sanitation as

the key priorities that need to be addressed. The Mtwapa Participatory Slum Upgrading Programme (PSUP) is financed by EUROPEAID. It is part of the of the UN-Habitat's Participatory Slum Upgrading Programme (PSUP) which aims at improving the living conditions in towns and cities of at least 100 million slum dwellers by the year 2020.



Fig. 6. Mtwapa E-Participation platform

UN-HABITAT PSUP project in Mtwapa is taken as a first pilot in the FUPOL project for fine tuning to the requirements in difficult environments with excluded citizens (Sonntagbauer 2013). It complements the research and development to arrive at a solution applicable to the full spectrum of citizens. This is considered a key element in policy modelling in general to avoid the digital divide. In order to enable future support of UN-HABITAT's PSUP projects tools and methods are adopted in such a way that they allow replication beyond the initial pilot. Potentially the tuned toolset could be a standard component of UN-HABITAT slum upgrading projects and in other projects deployed in difficult environments.

The Mtwapa e-participation project is led by the E-participation Coordinator with the guidance of the PSUP project leader and the UN-Habitat FUPOL project leader. The team includes the Mtwapa community mobilizer, the Content Manager and the Communicator/community mobilization officer, besides the focal points from FUPOL partners and the Kenyan counterparts.

Mtwapa has already launched a blog <http://www.mtwapapsup.blogspot.co.at/> for collecting opinions through FUPOL platform, figure 6. The country team has defined processes how to process incoming posts and how to reply to them. Also, it has identified the feedback mechanism for providing feedback to stakeholder, how their input has been taken into account.

The first results of using FUPOL approach and platform should be visible at the end of March in 2014 through identification of the priorities and issues regarding the started campaign. Final evaluation of this pilot is expected for September of 2014.

5 Conclusion

The FUPOL integrated approach to policy design and implementation has been outlined.

It represents a significant step forward towards the implementation of an enhanced integrated policy lifecycle. It provides a vast variety of functions and tools to support the decisions of the policy makers. Data and information from different sources, particularly the Social Networks are integrated. The simulation models and tools represent a way to explore many different options in order to take effective and fact based decisions. The graphical visual representation of the data and information is the key enabler to easily understand the options and the situation and take the right decisions.

The flexible conceptual approach and the open architecture allows future expansion with additional applications supporting the policy lifecycle.

The pilots are experimenting a wide set of different city environments, from very large (Yantai) to very small (Pegeia) and application different domain areas.

The project is on schedule and will lead to a final solution usable and extendable also in other different environments to support the policy making.

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