Deliverable D4.1
Draft Final Report

"Researching and Drafting of Four Case Studies on Applications of ICT solutions for governance and policy modelling"
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# 1 Introduction

The CROSSOVER project – Bridging Communities for Next Generation Policy-Making (http://www.crossover-project.eu) is a Coordination and Support Action (CSA) funded by the European Commission's Seventh Framework Programme (ICT Work programme 2011-2012 (ICT FP7)) (Grant Agreement No: 288828). The project is implemented by a consortium composed of the following core partners: Athens Technology Center SA (Greece); Tech4i2 Ltd (UK); W3C/GEIE-ERCIM (USA/France); University of Rome La Sapienza CATTID (Italy); Millennium Institute (USA) and the European Commission’s Joint Research Centre, Institute for Prospective Technological Studies (JRC-IPTS).

Among its objectives, CROSSOVER is developing a Roadmap on Policy Making 2.01 (http://www.crossover-project.eu/ResearchRoadmap.aspx) which is based on the following novelties with respect to its predecessor CROSSROAD:

- A demand-driven approach: rather than focussing on the technology, the present roadmap starts from the needs and the activities of policy-making and then links the research challenges to them;
- A clearer thematic focus on ICT for Governance and Policy-Modelling;
- A global coverage: while CROSSROAD focussed on Europe, CROSSOVER includes cases and experiences from all over the world;
- A living roadmap: the roadmap is accompanied by an online repository of tools, experts and applications;
- An additional emphasis on cases and applications: for each research challenge, relevant cases and practical solutions are indicated.

In particular, four in-depth cases studies have been selected so to contribute to enhance and deepen the Roadmap on Policy Making 2.0 being developed by the CROSSOVER’s Consortium’s partners, and are aimed at evaluating the lesson learned and impacts from implementation of ICT solutions for governance and policy modelling at both European and global level. The aim of this activity is to identify and analyse case studies focusing on real user needs and highlighting the concrete problems solved and the impact of ICT solutions for Governance and Policy Modelling.

The JRC-IPTS is responsible for coordinating this activity and in particular the conduction, drafting and editing of the case studies and the cross-case assessment that will be then integrated into the final version of the CROSSOVER Roadmap on Policy Making 2.0. For this purpose, the JRC-IPTS sub-contracted part of the activities to the National Technical University of Athens (NTUA) to support in mapping and identifying promising cases of applications of ICT

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1 Policy-making 2.0 refers to a set of methodologies and technological solutions aimed at innovating policy-making. It is a new term coined by CROSSOVER to express in more understandable terms the somehow technical notion of "ICT for governance and policy modelling". Its usage in the course of the project proved more effective when discussing with stakeholders.
solutions for governance and policy modelling and to select and analyse in depth four good practice cases.

Deliverable “D4 – Draft Final Report” is the fourth deliverable of the study entitled “Researching and Drafting of Four Case Studies on Applications of ICT solutions for governance and policy modelling” and includes a presentation of the integrated methodology followed for the whole study, a presentation of the four (4) selected cases (described in detail in previous deliverables) including the main points of each case accompanied by highlights and critical opinions, the lessons learned and the practical recommendations (deriving from the integrated analysis) towards the CROSSOVER Roadmap.

Figure 1-1: Progress of the Study

The implementation of this deliverable was performed through the combination of the input received from various sources in the course of the study, including: desk research, CROSSOVER consortium members, CROSSOVER animators and reviewers of the CROSSOVER draft/intermediate deliverables, people involved in each one of the four proposed cases (mostly people from the project teams and some end-users) etc. Useful information regarding the aforementioned can also be found in the Annexes of the document at hand.
2 Study’s Methodological Approach

The deliverable at hand constitutes the final deliverable of the CROSSOVER Study aiming at incorporating and presenting the overall findings regarding the four cases in terms of similarities, differences, lessons learned, policy implications and practical recommendations for the CROSSOVER Research Challenges and the project’s envisioned Roadmap.

In order to reach the valuable results and implications that are presented in the following sections, a straightforward and coherent methodology had to be designed/formulated and applied, in order to achieve the envisioned results in a transparent, open and documented manner. The methodology that was followed consisted of nine discrete steps:

I. Identification of a large number of sources for relevant cases/initiatives, through an extensive desk research and peer-to-peer brainstorming (e.g. ePractice2, JoinUp3, Scopus4, ISI Web of Knowledge5 portals)

II. Formulation and enrichment of an initial extensive, yet not exhaustive, list of candidate cases (more than 300 entries, deriving from almost every continent and applied in various policy domains)

III. Design and implementation of a suitable Cases’ Description Template, in order to capture all the necessary information regarding each case in an effective and efficient manner

IV. Definition and application (based on collected information through the aforementioned template) of a set of “1st Round Criteria” in order to filter the initial set of candidate cases and limit their number to 25

V. Description of the 25 selected cases, and, through a second set of selection and prioritization criteria, selection of a limited set of the 10 most relevant cases (Deliverable D1: Descriptive database of cases with at least 20 relevant entries)

VI. Further elaboration on and enrichment of the collected data regarding the 10 selected cases

VII. Definition and application of a 3rd set of selection and prioritization criteria, in order to identify the four (4) most suitable and promising cases to be proposed for the needs of the CROSSOVER Roadmap (Deliverable D2: Brief analysis of cases available in the database and shortlist of most promising cases with analysis to support selection)

VIII. Validation of the four (4) proposed cases in the frames of the whole CROSSOVER consortium and community

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2http://www.epractice.eu/
3http://joinup.ec.europa.eu/
4http://www.scopus.com/home.url
5http://wokinfo.com/
IX. Extensive description of and elaboration on the four selected cases (through extensive desk research, interviews with members of each one of the four selected cases, interviews with actual users of the four selected cases etc. – Deliverable D3: Reports of Four Case Studies), in order to derive valuable feedback, policy implications and recommendations targeted towards the CROSSOVER Roadmap.

The main of the above described steps, being demanding and quite complicated themselves, were based on individual methodological approaches. This approached are described in detail in the following sections.

2.1 Identifying and Analysing 25 Cases studies out of a Pool of 335 Candidates

The research team conducting the study gathered basic data and documentation from a number of resources regarding large set of cases and examined their relevance to the specific needs and requirements of ICT for Governance and Policy Modelling. This exercise resulted initially at a set of 335 Policy making 2.0 cases out of which twenty five (25) practices prevailed as being of high relevance to the scope of the study.

For each of these practices, various data have been documented, such as the context of each case, the objectives, the performed activities, the main results and other relevant and useful material that could contribute or be aligned to the various research challenges defined in the CROSSOVER draft Research Roadmap.

In more detail, during this task, the following steps have been implemented:

I. Identification and prioritization of potential sources of information ranging from targeted information gathering portals (i.e. ePractice or JoinUp in the European Union) to traditional search engines (Google, Bing, etc.), academic literature databases (Scopus, ISI Web of Knowledge, etc.) and social media (such as blogs, Twitter hashtags and delicious bookmarks tags). The outcome of conferences which are thematically near to the overall research domain of ICT for Governance and Policy Modelling, i.e. EGOV, HICCS eGovernment Track, ePART, dg.o, AMCIS eGovernment Track, ICEGOV and Government 2.0 Summit / Conference, as well as the nominees in eGovernment awards and competitions, were also investigated although they focus primarily on research approaches and not on real-life cases. Both state of the art reports of projects funded under the “ICT for Governance and Policy Modelling” objective and policy documents eventually contributed to the recognition of best practice cases.

II. Open invitation for proposal of cases through the personal twitter accounts of the study’s researchers through blog posts, Facebook posts and also through LinkedIn groups (i.e. Policy Making 2.0, CROSSROAD-EU, Government 2.0, W3C eGovernment Interest Group, EGOV researcher community, NET-EUCEN, COCKPIT, e-government/ e-citizen, eDemocracy
professionals group, eGov Community, EGOV researcher community, PADGETS, OurSpace).

III. Design of a template for documenting the practices to be selected. The template (depicted below) includes some predefined entries that have been used for easily comparing the various cases.

IV. Definition of the 1st-round criteria for selecting at the initial set of practices.

V. Information-oriented selection of the corresponding case studies on applications of ICT solutions for Governance and Policy Modelling. Each case study was described using the template at high-level based on the material gathered from a web-based research.

<table>
<thead>
<tr>
<th>GENERAL INFORMATION</th>
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</thead>
<tbody>
<tr>
<td>Acronym</td>
</tr>
<tr>
<td>Title</td>
</tr>
<tr>
<td>Link</td>
</tr>
<tr>
<td>Country/Region/City</td>
</tr>
<tr>
<td>Contact Point</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CASE DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Case</td>
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<tr>
<td>Topic</td>
</tr>
<tr>
<td>Sector</td>
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<tr>
<td>Reach</td>
</tr>
<tr>
<td>Start Date</td>
</tr>
<tr>
<td>End Date</td>
</tr>
<tr>
<td>Description Abstract</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Languages Supported</td>
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<tr>
<td>Policy Making Cycle Stage</td>
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<tr>
<td>• Agenda Setting</td>
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<tr>
<td>• Design</td>
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<tr>
<td>• Implementation</td>
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<tr>
<td>• Monitor and Evaluation</td>
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<tr>
<td>CROSSOVER Roadmap Research Challenge Group</td>
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<tr>
<td>• CROSSOVER Roadmap Research Challenge Group</td>
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<td>• Research Challenge</td>
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<td>• Research Challenge</td>
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<tr>
<td>• Research Challenge</td>
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<tr>
<td>Innovative policy elements of the case</td>
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<tr>
<td>Innovative technological elements of the case</td>
</tr>
<tr>
<td>Motivator</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CASE IMPLEMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation Approach - Deployment</td>
</tr>
<tr>
<td>Description of the implementation of the case</td>
</tr>
<tr>
<td>Key Stakeholders and Involvement</td>
</tr>
<tr>
<td>Citizens-Vote/Decision Makers- Modelling/...</td>
</tr>
<tr>
<td>Supportive Technologies</td>
</tr>
</tbody>
</table>
2.2  Methodology for Selecting the 10 Most Appropriate Cases

In the course of this procedure, NTUA, in collaboration with JRC-IPTS and other partners of the CROSSOVER project, identified a shortlist of ten (10) possible cases out of the total number of cases that have been documented in D1, who served as the basis for selection of the four (4) case studies to be analysed in depth in the next steps. Towards this direction, the following steps have been implemented:

I. Definition of a 2nd-round of criteria for selecting the final candidate cases. Through these criteria the target was to shortlist a small, but representative number of cases that will be aligned with the current landscape in terms of the research themes explored in the CROSSOVER project.

II. Application of a multi-criteria method for ranking short-listing the case studies. This exercise has been performed through the application of the aforementioned set of criteria on the initial set of the twenty-five (25) cases that have been identified in D1 and resulted to a limited set of ten (10) cases which are considered as most promising and representative of the current landscape, based on the research challenges that have been identified in the CROSSOVER Roadmap.
In order to proceed to the selection of the candidate cases, a multi-criteria methodology has been used. The idea was to prioritise the cases on the basis on the specific criteria for judging which cases are more appropriate and mature in order to be used at the next steps of the study. The multi-criteria method selected and applied for prioritising the cases is based on the Analytic Network Process\(^6\) (ANP), a more general form of the well-known Analytic Hierarchy Process\(^8\) (AHP) used in multi-criteria decision analysis\(^9\). ANP is a multi-criteria theory of measurement used to derive relative priority scales of absolute numbers from individual judgments (or from actual measurements normalized to a relative form) that also belong to a fundamental scale of absolute numbers. These judgments represent the relative influence, of one of two elements over the other in a pair wise comparison process on a third element in the system, with respect to an underlying control criterion. The ANP is an essential tool for articulating our understanding of a decision problem.

The first step for implementing the method had to do with the construction of the model. The criteria have been applied to the model by categorising them in three clusters which have to do with the importance of the cases to policy makers and relevant stakeholders, the relevance of the case to the results of the CROSSOVER research project and the sophistication and availability of the case.

1. **CASE IMPORTANCE FOR POLICY MAKERS**
   1.1. Evidence of utilisation by stakeholders
   1.2. Commitment

2. **CASE RELEVANCE TO CROSSOVER**
   2.1. Number of Steps of the Policy Cycle Addressed
   2.2. Number of CROSSOVER Research Challenges touched
   2.3. Number of CROSSOVER sub-challenges touched per Research Challenge

3. **CASE AVAILABILITY AND SOPHISTICATION**
   3.1. Evidence of the case being active
   3.2. Maturity
   3.3. Sophistication of Tools Used

The model that has been constructed and was fed into an ANP decision support tool is shown in the next figure, where the relations of the different clusters are depicted.

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The above-mentioned criteria have been applied and evaluated on each different case and the output of the multi criteria decision support system that has been used to conduct the ranking is the following list.

<table>
<thead>
<tr>
<th>No.</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Opinion Space 3.0</td>
</tr>
<tr>
<td>2</td>
<td>2050 Pathways Analysis</td>
</tr>
<tr>
<td>3</td>
<td>C-ROADS</td>
</tr>
<tr>
<td>4</td>
<td>UrbanSIM</td>
</tr>
<tr>
<td>5</td>
<td>GAINS</td>
</tr>
<tr>
<td>6</td>
<td>GLEAM</td>
</tr>
<tr>
<td>7</td>
<td>MEL-C</td>
</tr>
<tr>
<td>8</td>
<td>Arbeitsmarktmonitor</td>
</tr>
<tr>
<td>9</td>
<td>Vibat London</td>
</tr>
<tr>
<td>10</td>
<td>€CONOMIA</td>
</tr>
<tr>
<td>11</td>
<td>Urgent Evoke</td>
</tr>
<tr>
<td>12</td>
<td>Madrid-p</td>
</tr>
<tr>
<td>13</td>
<td>Lisbon City Hall – Participatory Budgeting</td>
</tr>
<tr>
<td>14</td>
<td>ALERTS</td>
</tr>
<tr>
<td>15</td>
<td>OpenGov.gr</td>
</tr>
<tr>
<td>16</td>
<td>Enquete Beteiligung</td>
</tr>
<tr>
<td>17</td>
<td>The Icelandic Constitution Case</td>
</tr>
<tr>
<td>18</td>
<td>Inflation Island</td>
</tr>
<tr>
<td>19</td>
<td>Demos Plan – City of Hamburg</td>
</tr>
<tr>
<td>20</td>
<td>A Thousand Visions</td>
</tr>
<tr>
<td>21</td>
<td>Meieraha</td>
</tr>
<tr>
<td>22</td>
<td>LocalEyes</td>
</tr>
<tr>
<td>23</td>
<td>In the Air</td>
</tr>
<tr>
<td>24</td>
<td>Your Voice</td>
</tr>
<tr>
<td>25</td>
<td>Maryland Budget Map Game</td>
</tr>
</tbody>
</table>

Table 2-1: Ranking of the 25 Identified Cases in D1
III. The derived set of candidate cases was proposed to JRC-IPTS for deciding on the appropriateness of the cases and for finalising the shortlist. This step was conducted in order to verify the appropriateness of the cases identified in order to proceed to the detailed analysis of each different case. For this purpose, a special teleconference took place between JRC-IPTS and NTUA on October 12th, 2012, where each of the proposed case has been discussed to expose the interesting facts that characterize it as a “candidate case”.

IV. Study and further elaboration on the ten (10) case studies that have been selected by the multi-criteria method based on desk research. The work performed was based on the case reporting template used in deliverable D1, trying to gather more detailed information about each case, not only through available online resources, but also through direct communication with the responsible persons for each case, preparing in this way the ground for the interviews that will take place in T3.

V. Definition of a third set of criteria for selecting four (4) practices. Such criteria mainly focused on their appropriateness to the themes of the CROSSLER Roadmap and have been developed so that they can identify the four (4) cases that capture as many aspects as possible. The final proposal of the cases analysed in the previous section, is based on a third set of criteria which mostly aims to cover the interests of the CROSSLER project. Of course, those criteria are applied on the ranked list presented in Section 3, as it is important to start from a common ground which is the previous analysis and ranking of cases. As such, the criteria selected for proposing the final four cases are the following:

1. The 4 cases should altogether capture both Research Challenges
2. The 4 cases should altogether cover as many sub-challenges as possible
3. The 4 cases should altogether cover if possible the Local, Regional and International dimension.
4. Each one of the 4 cases should target a different application area than the others. (e.g. Environment, Finance, Labour, Youth, etc.)
5. There should be no more than 1 use case outside the EU.
6. The responsibles of the cases should be easy to reach. This has been tested through the exchange of emails with the various case responsibles, or through the CROSSLER partners that have declared they are in communication with people in these cases.

In applying these criteria, the following

- “Opinon Space 3.0” is the best candidate outside the EU (targeting Foreign Policy) and the case responsible has been contacted by NTUA. The second candidate for a case outside the EU is MEL-C (targeting Youth), which was also contacted.
- “2050 Pathways”, “C-ROADS” and “GAINS” are all targeting Environment, and almost the same CROSSLER Research
Challenges, while all are based in the EU and have Regional reach. The main proposal from these cases is "2050 Pathways".

- "URBANSIM", targeting Urban Planning is another candidate highly ranked with many applications in the EU and in the US, and a communication channel with them has been also established.
- "GLEAM", targeting health, is a case with international reach, and communication with the implementation team is feasible.
- The other cases not mentioned in the above bullets did not respond to our communication requests.

Based on the above-mentioned criteria, the final list of the four proposed cases is the following.

<table>
<thead>
<tr>
<th>Application Domain</th>
<th>Policy Cycle</th>
<th>CROSSOVER RC #1</th>
<th>CROSSOVER RC #2</th>
<th>Based</th>
<th>Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opinion Space 3.0</td>
<td>Foreign Policy</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2050 Pathways Analysis</td>
<td>Environment</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>UrbanSIM</td>
<td>Urban Planning/Transport</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLEAM</td>
<td>Health</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Candidates</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-ROADS</td>
</tr>
<tr>
<td>Arbeitsmarktmonitor</td>
</tr>
</tbody>
</table>

**Table 2-2: List of Top Cases to be further researched in T.1**

VI. Circulation of the interim version of D2 to the CROSSOVER consortium for deciding on the final set of four (4) cases. For facilitating this, a teleconference was held on the 15th of November 2012 where

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18 Instead of “2050 Pathways Analysis”
participants (of the CROSSOVER project) discussed the ten “candidate” cases and the proposal regarding the final four (4) cases.

VII. Finalisation of the set of the most appropriate four (4) cases for further analysis in the next steps of the study.

2.3 Reports of the Four (4) Case Studies

During Task T.3, NTUA, in collaboration with JRC-IPTS, dealt with the analysis of the winning four (4) selected cases mostly based on the input received through the interviews conducted with the people engaged in these studies (either as researchers or practitioners that worked for the implementation or as users of the tools). The interviews questions were based on the general directions provided by the analysis framework that was defined in the previous deliverables of the study in order to be able to capture important aspects that were not publicly available on the information sources of these cases. As a result, the analysis of these cases was performed not only through desk-based research but also (and more deeply) through the direct contact with selected members that have been involved in each case in order to verify the study’s results and to acquire more information (such as impact, usefulness, drawbacks, advantages, business opportunities, etc.) that could not be excavated only through the analysis of written reports.

In more detail, during this task, the following steps have been implemented:

I. Conduction of the proper desk research in order to analyse relevant data and documentation available. This has been based on the work conducted in the previous steps and the in-depth analysis has been performed in order to acquire a better understanding for each case in an attempt to prepare the team for the interview.

II. Identification of contact persons per case and communication establishment with the contact persons for scheduling interviews. During this step, the different persons in charge of these cases have been identified and contact was established, presenting them the background of the study and inviting them to an interview where they could present their case.

III. Design of an interview template, in collaboration with JRC-IPTS, that has been sent to the cases’ representatives prior to the interviews. The template has been carefully constructed in order to get all required information about each case, trying to capture the issues that will be of value for the next steps of the study. Moreover, the idea behind the creation of the template was to let people know about the upcoming questions to be better prepared to answer them and to guide the discussion to the themes that the study needed to touch.

IV. Conduction of qualitative in-depth interviews with representatives of the organisations involved in each selected case. The interviews with the cases have been carried out through teleconferencing infrastructure and have been recorded. During these interviews, which lasted around 90min in average and were attended also by JRC-IPTS and other CROSSOVER
partners, the experts of the different cases have been informed about the CROSSOVER developments and were invited to the various CROSSOVER events.

V. Identification of other stakeholders per case for further information retrieval, from the policy perspective. For the purpose of this step, the study’s team has asked the interviewed persons to identify policy makers and decision makers that could be interviewed at a later stage. After this step, an invitation to an interview was send to the identified persons, for conducting a short interview where they could express their views on the specific case.

VI. Conduction of further interviews with decision makers/policy makers utilising the tool. During this step, the study’s team arranged short telcos with decision makers to extract their thoughts on the usability of each case and to report on how it is being implemented by their organisation.

VII. Reporting on the interviews and validation of the final output with the interviewed persons.

VIII. Consultation of the acquired feedback with the CROSSOVER Animators for enhancing and improving the final results, based on their expertise.
3 Highlights and Opinions on the Four Case Studies Selected

As made apparent from the aforementioned analysis, the process towards identifying the four most appropriate and promising scenarios so as to be included in the CROSSOVER Roadmap was both targeted and detailed. Thus, it can be taken as granted that many and important highlights can be derived from each of the four cases. Nevertheless, remarks, propositions and opinions (deriving from various experts and/or stakeholders) were also received as additional and valuable feedback.

The purpose of the following sections is to offer a concentrated and “to-the-point” presentation of the highlights of each of the four finally selected cases, accompanied with relevant opinions coming from various sources.

3.1 2050 Pathways Analysis

3.1.1 General Information

The UK Department of Energy and Climate Change (DECC) built the 2050 Calculator to help the public engage in the debate, and for Government to ensure that its short- and medium-term planning was consistent with achieving the long-term aim.

The 2050 Pathways Analysis features four resources:

1. A web-based tool for the public to try their own ideas for reducing greenhouse gas emissions.
2. An in depth Excel-based tool and reporting system which includes the methodology/the models that are used for the analysis.
3. A web-based presentation for younger audiences about greenhouse gas emissions.
4. A toolkit for leading an energy debate in schools.

2050 pathways is a tool to help policy makers, the energy industry and the public understand these choices. For each sector of the economy, four alternative trajectories have been developed, ranging from little or no effort to reduce emissions or save energy (level 1) to extremely ambitious changes that push towards the physical or technical limits of what can be achieved (level 4).

The 2050 Calculator is targeted at citizens, policy makers, senior officials and politicians as well as technical experts through different interfaces.

The following table provides a quick overview of the most important information regarding the 2050 Pathways Case:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Status</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Sector</td>
<td>Environment, Climate Change</td>
</tr>
<tr>
<td>Policy Making Cycle Stage</td>
<td>• Design</td>
</tr>
</tbody>
</table>
| CROSSOVER Roadmap Research Challenge | • Policy Modelling
|                        |   • Collaborative Modelling                                      |
### Group/Research Challenges

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Options</th>
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<tbody>
<tr>
<td>Immersive Simulation</td>
<td></td>
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<tr>
<td>Output Analysis and Knowledge Synthesis</td>
<td></td>
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<tr>
<td>Data-powered Collaborative Governance</td>
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<tr>
<td></td>
<td>Open Government Data</td>
</tr>
<tr>
<td></td>
<td>Serious Gaming for Behavioural Change</td>
</tr>
<tr>
<td></td>
<td>Collaborative Governance</td>
</tr>
</tbody>
</table>

#### 3.1.2 2050 Pathways Highlights

2050 has proved to be a very successful initiative in terms of end-user engagement. In the first three months from the official project launch there were about 10,000 unique visitors in the platform. Regarding My2050, there are over 16,000 pathways up to the date, while about 200 stakeholders were involved in the initial (building) phase. After the launch, about 500 stakeholders were contacted. Moreover, a week-long online debate including 5-6 experts took place with lots of comments from open public.

The take-up of the initiative can also be considered successful: the UK “Carbon Plan 2011” government document (how will the UK look in 2050) included as one of the main pieces of evidence and visualisation the 2050 Pathways Calculator. In addition, there are there are education programs, both in and outside of the UK, that engage the 2050 Pathways models and tools in their courses.

The 2050 Pathways have been presented to and has found approval from a complex mixture of various audiences, including the EC, NGOs, conferences, open media (including the BBC website) etc.

One of the key components of the 2050 Pathways analysis is the available data. Thus, in parallel with the project team’s plan to apply the analysis to more and more countries (e.g. China, Indonesia, South Africa, Bangladesh), there is a constant effort towards improving and enriching the available data.

#### 3.1.3 Critical Opinions on the Case

Feedback deriving from end users and/ or experts related to the CROSSOVER project reported that the 2050 Pathways Analysis is in fact a totally interesting, useful and innovative initiative. Many workshops and surveys have been carried out, based either on the 2050 Calculator or in the My2050 visualisation tool.

However, it was noted that, unlike the My2050 web-based visualisation, the 2050 Calculator is quite complex and cannot be understood and utilized easily by the ordinary end user (e.g. an everyday citizen). In addition, it was proposed to replace the excel-based tool (that the analysis is based on) with something more sophisticated. Regarding dissemination, there was a high criticism on not utilizing social media; the 2050 Pathways Analysis team should consider the integration of social channels in their dissemination strategy. Last but not least, it would be interesting to see a comparison of the actual results to those calculated.
be the 2050 model; in case of course the propositions made through the 2050 Calculator are adopted and implemented.

3.2 GLEAM

The global epidemic and mobility model, GLEAM\(^{11}\), is a discrete stochastic epidemic computational model based on a meta-population approach in which the world is defined in geographical census areas connected in a network of interactions by human travel fluxes corresponding to transportation infrastructures and mobility patterns. The GLEAM 2.0 simulation engine includes a multi-scale mobility model\(^{12}\) integrating different layers of transportation networks ranging from the long range airline connections to the short range daily commuting pattern\(^{13}\).

Elaborate stochastic infectious disease models to support a wide range of epidemiological studies are used, covering different types of infections and intervention scenarios in order to respond to the spread of a pandemic crisis in very short times.

Real-world data on population and mobility networks are used and integrate those in structured spatial epidemic models to generate data driven simulations of the worldwide spread of infectious diseases.

The following table provides a quick overview of the most important information regarding the GLEAM Case:

<table>
<thead>
<tr>
<th>URL</th>
<th><a href="http://www.gleamviz.org">http://www.gleamviz.org</a></th>
</tr>
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<tbody>
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<td>Health - Epidemiology</td>
</tr>
<tr>
<td>Policy Making Cycle Stage</td>
<td>• Design</td>
</tr>
</tbody>
</table>

**CROSSOVER Roadmap Research Challenge Group/Research Challenges**

- Policy Modelling
  - Collaborative Modelling
  - Model Validation
  - Immersive Simulation
  - Output Analysis and Knowledge Synthesis
- Data-powered Collaborative Governance
  - Visual Analytics
  - Open Governmental Data
  - Big Data

\(^{11}\) http://www.gleamviz.org/
\(^{12}\) http://www.gleamviz.org/model/
\(^{13}\) GLEAM in Detail. Available at: www.GLEAMviz.org/GLEAM-in-detail/
3.2.1 GLEAM Highlights

The first highlight regarding GLEAM is the amount, complexity and diversity of data it has managed to collect and organise (e.g. detailed airline transportation model). Data from census agencies, data regarding population at very high resolutions, data from a world map implemented by NASA with the world population divided to 5x5 miles area boxes, the entire database of airlines, about 40 databases from different countries for local mobility, transfer etc. are utilized.

In addition, it has to be mentioned that GLEAM moved beyond research in the H1N1 epidemic case; the forecast derived from the application of GLEAM was considered particularly accurate and successful, compared to any previous effort.

GLEAM is nowadays utilized both in research initiatives (e.g. EPIWORK IP project\textsuperscript{14}, EPIFOR project\textsuperscript{15}) and in formal policy making agencies (e.g. US Defense Agency). Moreover, GLEAM can also be met in educational courses; both in a high school and in a university level.

3.2.2 Critical Opinions on the Case

First of all, it has been reported that, due to the GLEAM’s highly sophisticated and complex model, the end user has to devote some time in getting familiar with the model and workflow, before being able to utilize it; even when talking about policy makers and not everyday users. Complementary to the aforementioned comment, GLEAM asks for a huge amount of data; it is quite difficult (especially when not engaging large and active public agencies) to find and retrieve all the necessary data in order to achieve the desirable result. Thus, the creation of and open call for contribution to a platform aiming to collect and organise large amounts of relevant data is advisable.

In addition, while the model is indisputably the best solution in diseases spread through transportation (and specifically airlines), it might be too sophisticated when dealing with more restricted areas of application.

Last but not least, if not already done so, the GLEAM project team should search for collaborations with public administrations and/ or NGOs, in order to achieve great results in terms of public health and relative application.

\textsuperscript{14} EpiWork - Developing the framework for an epidemic forecast infrastructure. Available at: http://www.epiwork.eu

\textsuperscript{15} EpiFor - Complexity and predictability of epidemics: toward a computational infrastructure for epidemic forecasts. Available at: http://www.epifor.eu
3.3 Opinion Space 3.0

Launched by the U.S. Department of State\(^\text{16}\), Opinion Space bridges the worlds of politics and social media in an interactive visualization forum, where users can engage in open dialog on foreign affairs and global policies. It invites users to share their perspectives and ideas in an innovative visual "opinion map" that will illustrate which ideas result in the most discussions and which ideas are judged most insightful by the community of participants.

Using an experimental gaming model, Opinion Space incorporates techniques from deliberative polling, collaborative filtering, and multidimensional visualization. The result is a self-organizing system that uses an intuitive graphical "map" that displays patterns, trends, and insights as they emerge and employs the wisdom of crowds to identify and highlight the most insightful ideas.

In summary, Opinion Space helps policy makers:

- Understand the diversity of their communities
- Solicit feedback and creative suggestions on specific topics
- Rapidly identify the most insightful ideas and suggestions
- Increase satisfaction and engagement with their communities

Opinion Space also helps citizens:

- Visualize their relationships to other people
- Express thoughtful ideas and suggestions about emerging issues
- Engage in friendly competition with other people
- Learn and gain insights from other people

The following table provides a quick overview of the most important information regarding the Opinion Space Case:

| URL                          | http://www.state.gov/opinionspace/  
|------------------------------|-----------------------------------------  
|                              | http://opinion.berkeley.edu             |
| Status                       | Ongoing                                 |
| Sector                       | Foreign affairs, Global policies        |
| Policy Making Cycle Stage    | • Agenda Setting                        |
|                              | • Monitor and Evaluation                |
| CROSSOVER Roadmap Research Challenge Group/Research Challenges | • Policy Modelling  
|                              |   o Collaborative Modelling             |
|                              |   o Easy Access to Information and Knowledge Creation  
|                              |   o Output Analysis and Knowledge Synthesis  
|                              | • Data-powered Collaborative Governance |
|                              |   o Opinion Mining and Sentiment Analysis  
|                              |   o Visual Analytics                    |
|                              |   o Open Governmental Data              |

\(^\text{16}\) U.S. Department of State. Available at: http://State.gov
3.3.1 Opinion Space Highlights

Opinion Space, in the few years of its life (active from 2009), has achieved to be part of the formal procedures of both public (e.g. US State Department\(^\text{17}\)) and private (e.g. Fujitsu\(^\text{18}\), UniLever\(^\text{19}\)) bodies.

As far as end user engagement is concerned, Opinion Space has engaged a large number of stakeholders, both from open public and from targeted organisations (private companies, public administrations etc.). It has to be noted that in some projects the visitors’ participation rate (how many users actually engage themselves with the platform, compared to the number that visited the platform in total) was close to 50% and in others around 10%. In the State Department instance of Opinion Space 3.0, more than 2000 different ideas were collected (about US foreign policy). In addition, more than 5000 individual responses were collected. Moreover, the project with a US automobile industry (targeted towards recognising ways of improving their image) resulted to about 1000 ideas and about 100.000 ratings evaluating these ideas (e.g. more specifically they talked about green vehicles).

One of the best endorsements regarding Opinion Space was Hillary Clinton’s reference to the initiative. Other endorsements include high level officers of collaborating companies as presented in the Opinion Space website.

3.3.2 Critical Opinions on the Case

Although the concept, way of implementation and visualisation of the Opinion Space case is highly innovative, the project team could consider thinking about and designing the social interaction part of Opinion Space 3.0. In addition, it has been proposed that the Opinion Space team should argue that the net effect of the two opposite psychological biases of the tool (premier polarization in input, return a depolarized representation of individual positions as output) is a depolarizing one.

Last but not least, although the up-to-date participation in the various projects engaging Opinion Space can be considered satisfactory, the project team should build on dissemination activities in order to increase even more the participation of open public.

\(^\text{17}\) http://www.state.gov/
\(^\text{18}\) http://www.fujitsu.com/global/
\(^\text{19}\) http://www.unilever.com/
3.4 UrbanSim

UrbanSim\(^{20}\) is a software-based demographic and development modelling tool for integrated planning and analysis of urban development, incorporating the interactions between land use, transportation, environment, economy and public policy with demographic information. It simulates in a 3D environment the choices of individual households, businesses, and parcel landowners and developers, interacting in urban real estate markets and connected by a multi-modal transportation system. The 3D output of the aforementioned process is presented using indicators, which are variables that convey information on significant aspects of the simulation results. This approach works with individual agents as done in agent-based modelling, and with very small cells as in the cellular automata\(^{21}\) approach, or even at building and parcel levels. UrbanSim differs from these approaches by drawing together choice theory\(^{22}\), a simulation of real estate markets, and statistical methods in order to achieve accurate estimation of the necessary model parameters (such as land policies, infrastructure choices, etc.) in order to calibrate uncertainty in its system. As an example of its use, one could refer to the project on Modelling Land Use Change in Chittenden County\(^{23}\), where the model parameters based on statistical analysis of historical data, the model then integrated market behaviour, land policies, infrastructure choices in order to produce simulations on household, employment and real estate development decisions (where the first two were based on an agent-based approach while the latter on a grid-based approach).

The following table provides a quick overview of the most important information regarding the UrbanSim Case:

<table>
<thead>
<tr>
<th>URL</th>
<th><a href="http://www.urbasim.org">http://www.urbasim.org</a></th>
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<td>Sector</td>
<td>Transport</td>
</tr>
<tr>
<td>Policy Making Cycle Stage</td>
<td>• Design</td>
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</tbody>
</table>
| CROSSOVER Roadmap Research Challenge Group/Research Challenges | • Policy Modelling  
  o Systems of Atomized Models  
  o Immersive Simulation  
  • Data-powered Collaborative Governance  
  o Big Data  
  o Visual Analytics |

3.4.1 UrbanSim Highlights

UrbanSim has proved its acceptance by the targeted end users as it has been already applied in many cases (mostly in the US), including Eugene-Springfield -

\(^{20}\) http://www.urbasim.org  
\(^{21}\) http://en.wikipedia.org/wiki/Cellular_automaton  
\(^{22}\) http://en.wikipedia.org/wiki/Choice_theory  
\(^{23}\) http://www.uvm.edu/rsenr/countymodel/Workshop08bv3.ppt
Oregon, Detroit - Michigan, Salt Lake City - Utah, San Francisco – California and Seattle – Washington. In Europe, applications of the UrbanSim system include Paris, Brussels, Belgium and Zurich. Nevertheless, UrbanSim, as still being a research initiative, is also active in the field of research (SustainCity FP7 project\(^{24}\)).

In the San Francisco case, the 3D UrbanSim visualization system was created, in order to achieve higher visibility amongst citizens than the plain UrbanSim tool. Each of these meetings conducted in this case engaged from 15 up to 200 participants. The point of these meetings was to communicate the different scenarios to the public and to receive feedback on the preferences of the citizens.

UrbanSim is now exploring transportation and land use domains, as well as urban design. Environmental issues (e.g. greenhouse gas emissions) were motivation to some projects (such as UrbanSim for Canada\(^{25}\)); so environmental planning is also quite relevant. Energy consumption and/ or water consumption constitutes issues of interest too. Modelling the impact of climate change (e.g. on weather) is also a topic of interest. Finally, as also mentioned earlier, economic development/ policies are also under consideration.

3.4.2 Critical Opinions on the Case

The UrbanSim models urge for large amounts of data; thus, it is a great challenge to locate, collect and transform in a useful form the necessary (statistic, demographic etc.) data. In addition, real estate markets, but also transportation systems, are rather different from place to place. Thus, another challenge is to ascertain that the UrbanSim models are flexible enough in order to fit the various needs.

In addition, given that the UrbanSim aims to further strengthen and enrich its underlying packages and models, they should be careful in dealing with interdependencies amongst different policies (e.g. through complex systems science). In case of such an implementation, the visualisation of the various interdependencies would constitute a very interesting research initiative.

Moreover, UrbanSim could constitute a catalyst towards collecting, organizing and (probably most important) enriching the globally available open/ public data. Last but not least, the UrbanSim team should explore strengthening the initiative’s relation with social media; both as a way of identifying and collecting data and as a way of disseminating the project to citizens and stakeholders.

\(^{24}\) http://www.sustaincity.org/

\(^{25}\) http://res.ca/UrbanSim/UrbanSimIntro.htm
4 Cross-Analysis of the Four Cases

In this section, the four cases that have been investigated in depth (i.e. 2050 Pathways Analysis, GLEAM, Opinion Space 3.0, UrbanSim) are cross-analysed to compare findings and distil key recommendations towards policy makers who embark on a “Policy Making 2.0” case.

4.1 Cases Similarities and Differences

2050 Pathways Analysis, GLEAM, Opinion Space 3.0, and UrbanSim demonstrate a well-balanced coverage of diverse policy domains, from Environment and Foreign Policy to Urban Planning while altogether capturing as many research challenges under Policy Modelling and Data-powered Collaborative Governance as possible.

Emerging from the need to solve real problems, all cases have been initiated either by governments or as a result of collaboration between researchers and governments, in a top-down approach. In particular, GLEAM and Opinion Space 3.0 were initially introduced as research initiatives that gathered significant attention and subsequent funding from public authorities. In fact, all cases build on a wide range of research techniques and exemplify how research can be applied in real-life settings.

Multi-disciplinarity in the teams behind all cases has brought together different perspectives and ensured appropriate modelling of policy options and interpretation of outcomes. Building a dynamic dialogue with the policy makers and all external stakeholders (from NGOs, academia, industry, experts) has provided significant insights and feedback to all cases. The real support by public officials has been though instrumental in the success of all cases.

To address the targeted needs of policy makers and citizens and to allow them contribute in a more efficient and productive way to the policy issue at stake, dedicated tools have been developed. Simple interfaces (like gaming environments in the 2050 Pathways Analysis, or interactive visualizations in GLEAM, Opinion Space 3.0, and UrbanSim) have proved effective in engaging and keeping the interest of citizens and have been strongly endorsed in all cases. Through the visual interfaces, users are in a position to create their own models and investigate specific issues that they are interested in. Naturally, in each case, the required learning curve to understand and use a policy model significantly varies (and is depending on the complexity of the policy model(s) running in the background for policy makers).

In all cases, the power of high-quality data at an appropriate level and format to be incorporated into policy models is indisputable. Open data have been exploited to an extent in the case of 2050 Pathways Analysis and GLEAM. In Opinion Space 3.0, the necessary data are in effect provided by the users and
policy makers. UrbanSim on its behalf and GLEAM up to a degree take stock of proprietary data that had acquisition cost and limits on distribution.

Despite recognizing the network effect of social media and Web2.0 technologies, the four cases confirm that their use for the policy-making domain is often accompanied by some scepticism or too much enthusiasm. Interaction with social media is limited to publishing relevant stories in the user's social media accounts while a more efficient exploitation of social data is envisaged as a future research challenge in most cases studied.

Funding has also been a non-negligible factor for keeping the cases live as various additional functionalities and components have been gradually introduced in the course of each case's life span.

All cases have succeeded in informing policy makers in a documented manner. The use of policy models seems rather diverse, focusing at different abstraction levels and ranging from elaborate stochastic models (in GLEAM and UrbanSim) to more lightweight models (that can be depicted in excel spreadsheets like in 2050 Pathways Analysis). As anticipated, behind each model, there are assumptions, modelling compromises, incomplete/missing data, etc. so looking at solely the numbers is not sufficient. The role of policy makers indeed remains crucial across the policy making procedure.

To measure impact, typically, no specific KPIs were set from the inception of the cases. However, the numbers of visitors and of interactions have demonstrated their success and impact which has been reinforced with the help of appropriate stakeholders' engagement strategies that have been put in place. It needs to be noted that in some cases (GLEAM) users resorted to the corresponding platform as a result of a natural phenomenon (i.e. H1N1 pandemic) whereas in others (Opinion Space 3.0 and 2050 Pathways Analysis), it was the outcome of large press coverage.

By studying cases that had strong internalization aspects (i.e. transferring experience from national to international level in 2050 Pathways Analysis, from US to EU in UrbanSim), the different culture dimension emerges and should not be neglected as it may decide the success of a case in different geographic settings.

4.2 Policy Implications as derived from the Case Studies
On the basis of the experience of the four cases as studied and elaborated by the project team and as reflected in the interaction with their stakeholders, a set of policy implications has been derived. Such implications have been formulated into the following concrete recommendations (“the decalogue of Policy Making 2.0”) that should be taken into account by policy makers and stakeholders when initiating similar endeavours.

Capitalizing on the experiences gained in the Web 2.0 era, cases in Policy Making 2.0 should follow the agile pattern implementing light-applications with constant, iterative cycles of design, development and testing. Since building a generic model to cover all aspects is impossible and specialization in certain domains and application of already established knowledge is the most recommended way to go, platforms / apps and their accompanying policy models should be gradually developed incorporating feedback received in each major and minor release.

Relevant Policy Implications from: Opinion Space 3.0, UrbanSim

Policy Recommendation 2. Continuously embed high-quality (open) data into your policy models.

No matter how well-defined or detailed a policy model is, high-quality data represent the holy grail of policy making. Particular attention thus needs to be given to collect, filter, curate and intelligently tap bottom-up data, available from multiple sources, i.e. through open data initiatives, social media and participatory sensing tools. As current policy making cases typically struggle to cope with too much or too little data, reliable data sources need to be foreseen from the very beginning and incorporated in policy models in a real-time manner to allow for pragmatically informed decisions.

Relevant Policy Implications from: 2050 Pathways Analysis, GLEAM, UrbanSim

Policy Recommendation 3. Tap the power of visualization and social networks to effectively communicate policy outcomes.

Policy models typically hinder such a high level of complexity that tends to discourage stakeholders from trying to understand the policy issue at stake. In essence, visualization holds the promise of providing valuable insights to non-specialists while social networks provide an unprecedented opportunity for spreading knowledge. By taking the best of breed out of both research streams, a case is by-design more tuned to solicit concrete inputs from its stakeholders.

Relevant Policy Implications from: 2050 Pathways Analysis, UrbanSim


In a rapidly moving world, the importance of real-time data and simulation for quick decisions gains more and more momentum. To this end, it is necessary for
a case not only to gather real-time data, but to allow for the direct experimentation with the policy models to anticipate the outcomes of various policy alternatives. Only through advanced simulation capabilities, different models can be calibrated at a satisfactory degree and eventually converge to best policy options.

Relevant Policy Implications from: GLEAM

**Policy Recommendation 5. Create intuitive, yet diverse interfaces depending on the profile of the stakeholders.**

Policy models by their nature depict part of the reality as conceived by policy makers and interpreted by policy modellers. In order to bridge the gap of modeling literacy, though, all stakeholders irrespectively of their background need to understand the effect of their own actions on the models. Finding the balance between complexity which is required for the policy making purposes and simplicity to ensure high engagement is always a challenging task. To this direction, intuitive interfaces (which are also accessible from multiple devices and platforms) in order to engage a wide range of stakeholders (policy modellers, policy makers and citizens) seem a crucial success factor.

Relevant Policy Implications from: 2050 Pathways Analysis, GLEAM, Opinion Space 3.0, UrbanSim


The need for multi-disciplinary approaches in policy making has been long debated during the last years. With policy challenges that are both global in nature and local in required action, it is more necessary that ever to bring in a wide range of expertise that will not only construct a solid and close to reality model, but also interpret the results correctly and catch the realm of citizens.

It needs to be noted that such expertise should emerge from research, practitioners, policy makers, NGOs and other stakeholders who are motivated to be heavily involved. Significant added value is attached to a case in Policy Making 2.0 by establishing a balance between research activities and real-life applications to constantly improve the actual impact of the ICT tools.

Relevant Policy Implications from: 2050 Pathways Analysis

**Policy Recommendation 7. Engage stakeholders from the very beginning.**

In order to consider a case in Policy Making 2.0 as successful, a wide range of innumerable stakeholders needs to be involved at various engagement levels:
from active, everyday participation to merely briefing. Opening up dialogue with all stakeholders is a time consuming task that should not be underestimated. To this end, an engagement strategy with targeted activities for each stakeholder group needs to be outlined and put into effect from the very beginning. Successful cases get known one way or another via word of mouth/Web2.0 and satisfied users are the best ambassadors of a case.

Relevant Policy Implications from: 2050 Pathways Analysis, Opinion Space 3.0, UrbanSim

Policy Recommendation 8. Incubate your case into the interested public organization.

Typically, research is conducted in more “sterilized” laboratory environments with little interaction with the end-users. In the case of Policy Making 2.0, research needs to go hand-in-hand with practice in order to allow for quick implementation of ideas in real-life settings. Along these lines, research teams should incubate in public organizations with a policy agenda in order to ensure smooth communication and seamless advancement of research through its direct application.

Such an approach will also help to research teams to validate their assumptions based on real-life data and policy makers will be able to propose requirements, as captured during operation, that will help to further optimise the offered solutions. Public organisations should thus build specialised teams within their structure that will consist of not only policy experts but also from researchers that have developed the offered solutions in order to exploiting the full potential of the offered tools and for connecting practice with research.

Relevant Policy Implications from: 2050 Pathways Analysis, GLEAM, UrbanSim

Policy Recommendation 9. Treat your case as a product/service to ensure sustainability and further development.

Following the paradigm of enterprise software (i.e. ERP or CRM) and services, cases in Policy Making 2.0 should be viewed under a long-term perspective for their target audience and potential clients that are no others than policy makers. They should not represent an one-off effort that may become obsolete and deprecated, but rather represent the commitment of the corresponding public organization to keep the initiative live through periodic funding injections.

By treating a case as a service/product, the interest of the research and stakeholder community can be more effectively maintained, the underlying models can be further elaborated and optimised and the sustainability of the offered solution can be maintained in a more proper and effective manner.
course, alternative sources of funding may be also discovered and utilised. At the bottom line, policy makers should realise that Policy Making 2.0 cases, in other ICT domain (such as Social Media), possess a ROI that cannot be measured and witnessed directly, however benefits do exist and they can only be sustained by the proper funding instruments.

*Relevant Policy Implications from: 2050 Pathways Analysis, GLEAM, Opinion Space 3.0, UrbanSim*

**Policy Recommendation 10. Think out-of-the box for the deployment of your case in other settings and contexts.**

The team responsible for a case in Policy Making 2.0 should keep its horizons open and ensure its maximum outreach both within and beyond the organization for which it was originally developed. Interaction with stakeholders from different domains may pave new directions for the application of a case and cover diverse needs of policy makers that had not been originally foreseen. As such it is important to spread the knowledge and the overall experience of a case with as many stakeholders as possible in order to trigger their eagerness and explore new horizons that may lie ahead.

*Relevant Policy Implications from: 2050 Pathways Analysis, GLEAM, Opinion Space 3.0, UrbanSim*
5 Towards the CROSSOVER Research Roadmap

5.1 Reflection of the Case Studies to the CROSSOVER roadmap

For the very beginning of this study the research team has tried to select a set of cases which was able to cover as many of the steps of the policy making cycle (Agenda Analysis, Design, Implementation, Monitor and Evaluation) as possible and this fact has been also reflected in the criteria for the analysis and the selection of these cases.

The following table presents the coverage of the policy making cycle by the investigated cases of the study, as indicated by the people engaged in the creation of these cases.

<table>
<thead>
<tr>
<th>Policy Cycle Steps</th>
<th>Final Cases</th>
<th>2050 Pathways</th>
<th>GLEAM</th>
<th>Opinion Space 3.0</th>
<th>UrbanSim</th>
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<tr>
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Table 5-1: Cases Coverage of the Policy Making Cycle

As it becomes obvious from the table above, most of the cases selected target the “Design” of policies, while there is a limited coverage of the “Agenda Analysis” and the “Implementation” phases. Moreover, based on the cases investigated we see no coverage of the “Monitor and Evaluation” phase.

However, it has to be noted that some of these cases could potentially also cover the last step of the policy making cycle, but they are currently not used for that purposes. However, some of their characteristics (such as the “real-time data input” of the GLEAM model) could be used to actively monitor and evaluate the success rate and other factors of different policies that are already put in place. Those are marked with an “@” in the table above, and as mentioned in Section 4 it is highly possible that the existing set of operating methodologies and tools can be applied to other fields or with other purposes and still deliver useful results that could assist policy makers.

This is also a natural consequence of the set of key challenges that policy makers are facing today which are:

- The need to detect and understand problems before they become unsolvable.
- The generation of the necessary preconditions for high involvement of all stakeholders and especially citizens in policy making.

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26 Taken from CROSSOVER Deliverable D2.1.1 - International Research Roadmap on ICT Tools for Governance and Policy Modelling - Interim Version
27 X’s marks the answers retrieved directly for the cases responsibles, while @’s mark potential usage as envisaged by the study’s researchers
• The identification of “good ideas” and innovative solutions to long-standing problems (by bringing the wisdom of the crowd).
• The reduction of uncertainty on the possible impacts of policies.

The above mentioned key challenges reveal the emphasis that policy makers put on proactive activities that could benefit policy making as they are considered of delivering high quality, evidence-based and impact oriented policies and not conduct trials on real conditions. As such, the “Design” phase seems to prevail over the others when it comes to tools that are mostly desired by policy makers, as this is the point where they can easily and without harm experiment with the various options they have for policies. In other words, the “Design” phase is the actual “trial&fail” or “trial&succeed” testbed where policy makers are able to both explore their options and seek for the a-priori assessment of the policies under consideration from the citizen’s perspectives.

Departing from this step means that most decisions have been taken and then the emphasis is laid on the implementation of the policies (which is mostly a question of increasing the acceptance, the understanding and the collaboration between the decision makers and the citizens based on already deployed terms) and of course on the monitoring and evaluation of those. The former is mostly handled by tools and methods that focus on the communication and conveyance of messages which will help the smooth implementation of a policy, an area that mostly deals with communication strategies and which does not belong to the “core” policy making 2.0 methods and tools, but has close relations with them.

Moreover, just a few tools and modern methods are available also for the last step namely the “Monitor and Evaluation”, where decision makers get informed about the impact of the already deployed. Of course there are many discussion tools, like forums and blogs that have been used since long for monitoring the citizen’s reactions to already implemented policies and practices, however for the purpose of the current study these have been considered as deprecated tools that have been already exploited to the maximum by policy makers.

The same applies also for the “Agenda Setting” step, as there is an absence of new ways to massively engage citizens to the early procedures that lie before the actual design phase. The tools used are mostly the ones that have been used during the last decade, in some cases with some new tweaks and upgraded features that try to infuse Web2.0 and other modern characteristics.

Getting into the discussion about the different tools and methods that are being used in the different policy making cycle steps, it needs to be mentioned that the four cases selected for the analysis, as emerging from the study’s methodology, capture a broad spectrum of the research challenges of the CROSSOVER roadmap on ICT tools for Governance and Policy Modelling. The relation of the cases to the research challenges (as extracted from CROSSOVER deliverable D2.2.1 - International Research Roadmap on ICT Tools for Governance and Policy Modelling - Interim Version) is presented in the following table.
Based on the previous table, the four cases investigated are not concentrating in one, unique research challenge. This fact is also obvious in all other cases reviewed during the study and this happens as an orientation towards just one research challenge would turn each case to a very specific tool that would be usable only by a very small group of stakeholders, who would need to possess specific expertise in such fields. Such an approach would also result into acquiring important data but that would then be in the need of further specialised tools to be processed, interpreted and carried on forward towards transforming it to highly usable information for policy making.

As a result – and this is in most cases the “winning argument” of these cases – they are not focused on solving isolated issues but try to cover a wider spectrum of issues, employing a large set of tools and methods available. This need is a natural outcome of the high complexity of the problems that policy makers have to tackle, and as these call for multi-disciplinarity in research and development, it is more than obvious that this can only be tackled by combining different tools and practices. At this point it has to be mentioned that the final fours cases selected had no evidence of technologies or methodologies that fall under the “Participatory Sensing” and “Identity Management” research challenges. The main reasons behind this fact are multiple and some insights are presented in the following sections.

Also based on the case studies analysis it became possible to understand which research areas are met in each step of the policy making cycle. The result of this exercise is presented in the following table, which combines Tables 5.1 and 5.2 in order to shed light to this important view. Again, this table is derived out of the
results of the study, and thus should not be viewed as a generic perception of the overall domain, but rather reveals the information extracted from the cases under investigation. However it could serve as a starting point for further research and generalisation in order to effectively link the different research challenges with the policy making cycle.

<table>
<thead>
<tr>
<th>Research Cycle Steps</th>
<th>Agenda Analysis</th>
<th>Design</th>
<th>Implement</th>
<th>Monitor and Evaluation</th>
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<tbody>
<tr>
<td>Policy Modelling</td>
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<tr>
<td>Systems of Atomised Models</td>
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<tr>
<td>Collaborative Modelling</td>
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<tr>
<td>Easy Access to Information and Knowledge Creation</td>
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<td>Model Validation</td>
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<td></td>
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<tr>
<td>Immersive Simulation</td>
<td>@</td>
<td>XXX</td>
<td></td>
<td>@</td>
</tr>
<tr>
<td>Output Analysis and Knowledge Synthesis</td>
<td>X@</td>
<td>XX</td>
<td>X@</td>
<td>@</td>
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<tr>
<td>Data-powered Collaborative Governance</td>
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<tr>
<td>Big Data</td>
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<td>@</td>
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<td></td>
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<tr>
<td>Opinion Mining and Sentiment Analysis</td>
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<tr>
<td>Visual Analytics</td>
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<tr>
<td>Serious Gaming for behavioural Change</td>
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<td>@</td>
</tr>
<tr>
<td>Open Government Data</td>
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<tr>
<td>Collaborative Governance</td>
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<tr>
<td>Participatory Sensing</td>
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<td>@</td>
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<tr>
<td>Identity Management</td>
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</table>

Table 5-3: Mapping the Policy Cycle steps to the CROSSOVER Research Challenges on the basis of the four Cases investigated (X mark direct links as seen by the cases responsibles and @ mark further links as seen by the study’s research team)

5.2 Practical Recommendations for the Roadmap Research Challenges

Based on the analyses performed during the present study, the research team has come up with a short list of high-level recommendations that could be used to further develop the CROSSOVER research roadmap in its final version.

Roadmap Recommendation 1. Handle the Roadmap’s Elements as Nodes in a Connected Graph

Highly complex environment have a unique characteristic: the elements they include are related and linked to each other based on various types of relationships. The analysis presented in Table 5-2 has led to the creation of a graph revealing the relations between the different research challenges as listed in the Research Roadmap (Figure 5-1). The graph contains in blue all the
Research Challenges from the 1st Grand Challenge “Policy Modelling”, while the orange ones come from the 2nd Grand Challenges “Data-powered Collaborative Government”. The edges between the different nodes represent the relations between the different research challenges, as documented in the four cases under investigation.

Moreover, the green dotted edges reveal relations between the research challenges of the two grand challenges, as witnessed in the four cases.

![The Graph of Research Challenges](image)

**Figure 5-1: The Graph of Research Challenges**

As the above-placed figure reveals, there are many relations between the different research areas of Policy Making 2.0, even when looking at a very small (but with a wide span) specimen, which was this of the 4 cases investigated in the study.

In fact, as it is already evident in the previous sections, research and development during in each case focused in more than one research challenge, and this is natural as Policy Making 2.0 is a domain that contains diverse research fields that should however be combined and tackled together in order to deliver a working and usable environment. This is also a need that derives directly from the fact that such application targets many different stakeholder groups, with diverse backgrounds and thus it is necessary to combine different parts of the identified research challenges in order to achieve that.

Looking at the graph, only the research challenges “Participatory Sensing” and
“Identity Management” have not been identified in the four cases and therefore they are not connected to the graph in the same manner as all other research challenges. The authors of the study have linked “Participatory Sensing” to “Big Data” as it obviously sits on top of it and has very close relations, and this edge is coloured black in order to show the difference. On the other hand “Identity Management” remains disconnected (see Roadmap Recommendation #2.)

**Roadmap Recommendation 2. Build Clusters of Research Challenges and Define Policy Making 2.0 "Enablers"**

The graph presented in Figure 5-1 also tries to reveal which specific areas have stronger bonds between each other by observing the thickness of the edges that represent how many times the relation between two nodes has been witnessed in the different four cases. For example, the link between “Big Data” and “Visual Analytics” has been witnessed three times, while “Systems of Automized Models” has been only once present in a case which also included “Immersive Simulation”.

Based on the findings of the four case studies, it seems that research challenges “Collaborative Modelling”, “Immersive Simulation”, Output Analysis and Knowledge Synthesis”, “Open Government Data”, “Big Data” and “Visual Analytics” are met more times than the rest. This could lead to the creation of different clusters around them, as they seem to be quite dominant and present in most cases.

Moreover, as also mentioned before, there exist numerous links between the various research challenges of the two Grand Challenges (and they seem stronger between the research challenges “Immersive Simulation”-“Big Data” and “Collaborative Modelling”-“Visual Analytics”-“Open Government Data”. This reality should be considered alongside Roadmap Recommendation #1 in order to construct clusters of research challenges that could lead to more applied research in order to move more quickly from research to development. In such a context, the roadmap could point out clusters that not only include elements from one Grand Challenge, but also combine multidisciplinary elements that are required towards developing successful policy making applications and cases.

Lastly, based on the study’s results and on the number of edges observed in the graph of Figure 5-1, it seems that a possible re-ordering of the research challenges could also be of benefit, especially in case this graph is further populated by findings of other cases towards a more generic image of the relations between the nodes. However, from the preliminary work that has been conducted based on the four cases, one might argue that some research challenges (like for example “Collaborative Modelling”) sit on top of other and can be seen as supersets of other challenges.

Furthermore, the research conducted also revealed that the research challenge “Identity Management” seems somehow disconnected from any other research
challenge (and this has been also evident in the long list of the cases observer in D1 of the study), and thus it might not have a place amongst the others. However, as this is a very important area and a prerequisite for many eGovernment and Policy Making 2.0 applications, it is suggested to treat it as a “Policy Making 2.0” enabler. Thus, the study would propose to complement the Research Roadmap with a set of Policy Making 2.0 “Enablers”, which would be a set of technologies and methodologies (like Identity Management, Cloud Computing, Social Media, Mobile Technologies, etc.) that could be directly exported from neighbouring domains and could be used to support the creation of applications and Policy Making 2.0 tools.

Roadmap Recommendation 3. Promote Shift from Gov Labs to Open Apps

One of the fundamental characteristics of Policy Making 2.0 is the inclusion of citizens in the decision making process through their interaction with various tools. Of course, the direct inclusion of citizens is not always possible as various tools and methods are quite complex and require specific background knowledge to be used. This situation is quite evident today and up to a fact this is one of the main issues behind the lock-up situation of Policy Making 2.0 in a top-down approach, where a clearly bottom-up (crowdsourced based) approach that is actively being exploited and used by high level policy makers, is severely lacking at the moment.

As the “magic quadrant” in Figure 5-2 shows, the current landscape could be divided in four spaces:

- “Gov Labs” where applications are still highly experimental and they are only addressed (or can be used) by policy experts,
- “Gov Farms” where again policy experts are the users but applications and tools are in a highly mature and operational state,
- “Open Labs” where direct engagement of citizens is quite high but applications are again experimental, and finally
- “Open Apps” where there exist at the same time high engagement of citizens and maturity of applications to be used for everyday purposes.

This magic quadrant does not contain tools, as most magic quadrants do, but the research challenges as identified by the CROSSTER research roadmap.

28 http://en.wikipedia.org/wiki/Magic_Quadrant
As Figure 5-2 reveals, most of the research challenges that involve the direct engagement of citizens are still considered as quite immature, and this also argues for their lower utilisation and verifies their presence in the research roadmap. At the same time, the research challenges that at the moment do not engage citizens in a direct manner, are considered more mature, however they have just passed the infantry years and results of their utilisation and impact on the policy making process became evident only in the last few years.

In this context, although these are considered as more “ready-to-use”, research is still required not only to further improve them and integrate them in the everyday activities of policy makers, but also for enhancing their social characteristics so that they will eventually engage citizens in a more direct way.
Roadmap Recommendation 4. Define the Timing Horizon for Research

A final practical recommendation for the CROSSOVER research roadmap, which is generated as a consequence of the analysis of the four case studies and as indirect implication of the previous roadmap recommendations is that all research challenges should be clearly accompanied by a time horizon. Such a horizon shall focus research effort towards achieving measurable and quantifiable results in a given time frame.

The next Figure (Figure 5-3) presents a conceptual hype curve (or hype cycle)\(^\text{29}\) regarding the research challenges identified in the CROSSOVER roadmap. This hype curve is based on information that springs out of:

- the current trends of the ICT (in general) and of the Policy Modelling domain
- the views that have been recorded during the interviews that took place during the study. This was possible as the interview people elaborated their though on the future research activities regarding their case, the desirable improvements and the potential extensions in terms of utilisation and exploitation of emerging or existing technologies and methodologies over an horizon of the next upcoming 10 years.

It needs to be noted that the placement of each research challenge on the curve has been performed having in mind both the mature and the immature sub-areas it contains. In general, the position of the different research challenges on the curve in Figure 5-3 is in accordance with their maturity level as presented in Figure 5-2 and as a result an indicative timeframe for research can be drawn, grouping research challenges into those that are considered

- more mature and could deliver concrete results in a short term horizon of no more than 3 years,
- on the verge of maturity and could produce results within 3 to 5 years of research and
- still in infancy and require more intense and long-lasting research efforts, putting their major concrete contribution to the domain of Policy Making 2.0 in a timeframe that lies 5 to 10 years ahead from today.

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Based on the previous recommendations, it has to be noted that the timelines presented in Figure 5-3 are neither fixed, nor do they represent a complete image of the domain, as they have been heavily based on the four investigated cases of the study. Although these cases are highly representative of the domain, further investigation of other cases and exploration of the links between the various research challenges is required in order to optimise the time horizon for future research.

Moreover, a cross analysis of these timeliness, of the graph relationships of the research challenges and of their position regarding their maturity and engagement of citizens is required in order to derive to the final roadmap that will reveal well-coordinated mechanisms for exposing the potential of the domain in the most quick and efficient way.
6 Conclusions

As presented in the initial sections of this deliverable, the study at hand has reviewed and analysed a long list of existing cases in the domain of Policy Making 2.0 and after choosing a representative set of 4 cases which cover a wide spectrum of policy steps, domains and methodologies/technologies/tools, proceeded to a deeper analysis that was able to shed light to important dimensions that are being considered by the CROSSOVER research roadmap.

Based on the work conducted during the study, the research team has ended up with two sets of recommendations addressed both to policy and decision makers and to practitioners and researchers of the Policy Making 2.0 domain.

The first set of recommendations deals with the presentation of policy implications as captured by the analysis and the interviews conducted with people involved in the various cases identified. Those are the following:

P.R.#1. Build your case in Policy Making 2.0 in an agile manner.
P.R.#2. Continuously embed high-quality (open) data into your policy models.
P.R.#3. Tap the power of visualization and social networks to effectively communicate policy outcomes.
P.R.#4. Invest on real-time simulation technologies.
P.R.#5. Create intuitive, yet diverse interfaces depending on the profile of the stakeholders.
P.R.#7. Engage stakeholders from the very beginning.
P.R.#8. Incubate your case into the interested public organization.
P.R.#9. Treat your case as a product/service to ensure sustainability and further development.
P.R.#10. Think out-of-the box for the deployment of your case in other settings and contexts.

The second set of recommendations aims to provide the necessary input in order to complement the CROSSOVER Research Roadmap, based on the reflection of the information retrieved from the four cases on the on-going and emerging results of the roadmapping exercise. Those are the following:

R.R.#1. Handle the Roadmap’s Elements as Nodes in a Connected Graph
R.R.#2. Build Clusters of Research Challenges and Define Policy Making 2.0 “Enablers”
R.R.#3. Shift from Gov Labs to Open Apps
R.R.#4. Define the Timing Horizon for Research

These recommendations are the main conclusions of the study at hand and could be used (and after further validation with other cases) for the enrichment of the final CROSSOVER Research Roadmap.
Annex A – Detailed Review of Final Four Cases

A.1 2050 Pathways Analysis

A1.1 Case Description

<table>
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<tbody>
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<td>Status</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Sector</td>
<td>Environment, Climate Change</td>
</tr>
<tr>
<td>Policy Making Cycle Stage</td>
<td>Design</td>
</tr>
</tbody>
</table>

The UK Department of Energy and Climate Change (DECC) built the 2050 Calculator to help the public engage in the debate, and for Government to ensure that its short- and medium-term planning was consistent with achieving the long-term aim. More specifically, as the UK is committed to reducing its greenhouse gas emissions by at least 80% by 2050, relative to 1990 levels, a transformation of the UK economy is needed while ensuring secure, low carbon energy supplies to 2050, and face major choices about how to do this. In the Carbon Plan published in December 2011, the Calculator was used to illustrate three 2050 futures that show some of the plausible routes towards meeting the target.

The 2050 Pathways Analysis features four resources:

5. A web-based tool for the public to try their own ideas for reducing greenhouse gas emissions.
6. An in depth Excel-based tool and reporting system which includes the methodology/the models that are used for the analysis.
7. A web-based presentation for younger audiences about greenhouse gas emissions.
8. A toolkit for leading an energy debate in schools.

The 2050 Calculator is targeted at citizens, policy makers, senior officials and politicians as well as technical experts through different interfaces.

The 2050 Pathways presents a framework through which it is possible to consider some of the choices and trade-offs we will have to make over the next forty years. It is system-wide, covering all parts of the economy and all greenhouse gases emissions released in the UK. It is rooted in scientific and engineering realities, looking at what is thought to be physically and technically possible in each sector.30

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30 Department of Energy and Climate Change
2050 pathways is a tool to help policy makers, the energy industry and the public understand these choices. For each sector of the economy, four alternative trajectories have been developed, ranging from little or no effort to reduce emissions or save energy (level 1) to extremely ambitious changes that push towards the physical or technical limits of what can be achieved (level 4). The 2050 Pathways Calculator – available on the DECC website - allows users to develop their own combination of levels of change to achieve an 80% reduction in greenhouse gas emissions by 2050, while ensuring that energy supply meets demand.31

The supportive tools of the initiative provide different ways of securing a low-carbon future for the UK can be tried out:

- By creating each user's own pathway using the 2050 Web Tool.
- By exploring what a low-carbon UK might look like in 2050 by playing the simplified My2050 simulation.
- By taking the debate into the classroom in the schools toolkit.

The procedure that 2050 Pathways follows in order to perform the aforementioned analysis can be found in the following figure:

![Figure A-1: 2050 Pathways Analysis Procedure](http%3A%2F%2Fwww.decc.gov.uk%2Fen%2Fcontent%2Fcms%2Ftackling%2F2050%2F2050.aspx&ei=iXQUNHIO6eM4ATCoIDwAg&usg=AFQjCNEEZYMQSr60aPcSKWGM-xOV7d0DlQ&bvm=bv.1355534169,d.bGE)

A1.2 Case Motivation and Deployment

The 2050 Pathways project was initiated in the summer of 2009. At that time, the UK Department of Energy and Climate Change (DECC) was newly formed and tried to formulate its first white paper. The department had at that time to work towards some initially set targets (e.g. reduce greenhouse gas emissions by at least 80% by 2050), without having concrete answers on whether this objective was possible or the way this target could be achieved due to lack of data and appropriate models. This need sparked the idea for a brand new initiative - the 2050 Calculator.

The DECC already had in hand various analytical models (such as MarkAl32) that could be used; however, these models were really complicated and hard to use. In addition, decision makers were doubtful on which model was the proper one to use, especially when two (or more) alternative models gave different answers on the same questions. As a result of that, the department decided that a different, new kind of model was needed in order to be fast, transparent, stable and effective. Thus, this was a fine opportunity for the 2050 Pathways project to start. The DECC White Paper33 had close attention of various administrations (e.g. Secretary of State, Permanent Secretary, Director-Generals, Director of Strategy). In addition, the chief scientific advisor of the department at that time, Professor David MacKay, was really keen on this piece of work and was really fond of an idea like the 2050 Calculator.

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32 http://www.iea-etsap.org/web/Markal.asp

Figure A-2: Playing the My2050 Game for the demand side
In a fully operational (with Excel model and user-friendly web tool) model, the project was available in 2010. The tool was updated twice in 2011, including launching the Game version My2050.

Concerning the deployment, there were lots of involved stakeholders. There was a core team (6-10 people) of the DECC (who were leading the work), people from other governmental departments (e.g. transport, industry department) and probably hundreds of external stakeholders (from NGOs, academia, industry, experts). All the needed development was based in collaboration with various actors. Indicative categories of the actual effort included:

- 6-10 persons for the first phase, about a year (designing and building the model)
- Searching and collecting the necessary information
- Call for evidence (6 people for 7 months)
- Adding costs analysis (4 people for 9 months)
- Maintaining and improving model (4 people)
- International and UK engagement work (4 people)

The various stakeholders were also involved in the deployment of the project, in two distinguished, yet interdependent, phases:

- The building phase, which included modellers, peer reviewers of the numbers that were used
- The running phase

Regarding the funding sources, the project was initiated and initially funded by the DECC. Small parts of extra funding were occasionally found from other sources (e.g. a public engagement organization helped to fund the My2050 game (53,000 pounds)). More recently, two million pounds were provided by the International Climate Fund so as to help promote the 2050 Pathways initiative in 10 developing countries (besides the UK).

As far as the CROSSOVER Policy Cycle is concerned, the project probably fits in the first step, this of Agenda Setting. This is due to the fact that the concept is a high-level one (e.g. reduce gas emissions to 80% by 2050). As the data are currently being updated and a comparison between the projected and the actual results will take place, probably the case could in the near future fit into the Monitor and Evaluation Policy Cycle step as well.

A1.3 Implementation

The implementation of the project was itself a pretty challenging task. As a first step, an experienced/lead modeller (using the most recent version of MS Excel) was engaged in order to fulfil the demanding task of modelling the necessary

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components. The overall 2050 Pathways Analysis model\(^\text{35}\) was build using MS Excel (so MS Excel was used as the modelling tool) which parsed different functions and numbers in order to provide the final results of the model.

In addition, a project management team was needed in order to put all the stakeholders together and coordinate the whole work. Moreover, experts were engaged in a role of a “team leader”, coordinating the work in individual teams that dealt with specific issues. A partner with Web2.0 and programming experience was also involved.

![Figure A-3: Indicative results of My2050 Game](image)

Other necessary intangible “components” of the project’s implementation were objectivity, diplomacy, transparency, collaboration and understanding.

The main model of the case is based on a spreadsheet. The project uses mostly open source software, which was a strategic decision of the project team. In addition, the platform provides the end user with the ability to comment and make propositions for ameliorating the platform and the whole concept. There is also integration with social media: the platform gives the end user the opportunity to share his/her Pathway to Facebook and Twitter.

In the course of the three years of the project’s life, various additional components have been added. Compared to the initial implementation of 2009, the greatest addition was the My2050 serious game (available in 2011). Secondly, a cost analysis notion was added. Moreover, some updates took place

in the model (including visualisation), in order to make it easier to understand and more user friendly.

It has to be noted that the end users of the platform have the ability to correct the data embedded in the model. They can download and remove the initial data and upload their own, something that actually happened in South Korea case. The aforementioned model has been specifically set up to support the energy system and notion and it would probably be difficult to be implemented in other policy areas. Nevertheless, following the same principles, the same work could be performed for any other policy areas from scratch.

Regarding the data used in the project, they fall into the category of public/open (e.g. official UK population). They do not always exist in the format needed (as expected), but they are always open. It still is one of the main challenges to look for the best and most reliable data sources. As mentioned before, the tool itself gives the end user the opportunity to see the utilized data himself.

**A1.4 Results Achieved and Impact**

At the start of the project there were no specific KPIs set. However, the numbers of visitors and of interactions with the tool have demonstrated the success and impact of the case. In the first three months from the official project launch there were about 10,000 unique visitors in the platform. Regarding My2050 there are over 16,000 pathways up to the date. Regarding the stakeholders, about 200 were involved in the initial (building) phase and after the launch about 500 stakeholders were contacted. Moreover, a week-long online debate including 5-6 experts took place with lots of comments from open public.

One of the project’s main purposes was (and still is) to inform policy makers in a documented manner; from this point of view, it can be considered as successful. The most concrete example is the UK “Carbon Plan 2011” government document (how will the UK look in 2050), published in late 2011 which included as one of the main pieces of evidence and visualisation the 2050 Pathways Calculator. In addition, the same tool was used in budget Annual Energy Statements. Moreover, the tool was used in General Election briefing work.

It is important to note that there are Master’s programs, both in and outside of the UK, that engage the 2050 Pathways models and tools in their courses. In addition, the my2050 game is also communicated to pupils of various schools in the UK; there is a “schools’ toolkit” available and downloadable from the project’s website, as well as from other websites, including the department of Education website.

It has to be noted that due to the project’s open source nature, it is quite difficult to tell how many and who exactly are using the platform.

In addition, a large number of presentations have been conducted in workshops, schools, conferences, NGOs, international colleagues etc. A presentation was made to the European Commission too. Really positive media coverage has also
been noticed (around 15 key articles regarding the project\textsuperscript{36,37}). Other references to the case have also been made (e.g. cultural festivals).

The main pillar of the success of the project is definitely the innovations that it brings to life. One of these core innovations is the radical transparency and the ease of use. The model aims to encompass all technically possible futures and form a fruitful debate based on realistic scenarios (and not on guesses). The model provides actually valuable feedback to high-level decision makers relative to communicating and interrogating different scenarios (e.g. what citizens really want, which conveniences they are willing to sacrifice etc.).

**A1.5 Challenges Encountered and Lessons Learnt**

Complex and ambitious projects such as Pathways 2050 always face quite a number of challenges. Effective collaboration and dialogue is always time consuming; this was the case for Pathways 2050 also. The identification of time limits to be spent in dialogue is of critical manner. Another challenge is to try to keep the ethos of the project alive, despite changes in personnel. In addition, although tools and technologies may seem easy to use by experts, they might still be difficult for open public; facilitators are always of use. Last but not least, keeping the interest towards the initiative alive for a long time (especially after the initial success) is also a challenging task.

Based on the Pathways 2050 experience up to today, there are many lessons that have been learnt and can be offered as recommendations. One of the core lessons learnt was that there is a need to involve stakeholders as early as possible. In addition, being open and transparent is estimated by end users. Collaborative working is also one of the main assets of every large scale project, provided that proper people have been selected for each position. The 2050 Pathways team included members from government, industry, NGOs, academia etc.

Moreover, actual innovation can really excite people and make them efficient. In addition, it was concluded that if something is designed in a correct and efficient manner, it could find acceptance to audiences that were not targeted at the beginning.

A dynamic, instead of a static approach is also more possible to find acceptance in the end users. Additionally, "be simple" is another lesson learnt; simplifying things helps both stakeholders and end users.

**A1.6 Sustainability**

As every on-going initiative, 2050 Pathways took specific actions in order to engage stakeholders from the very beginning and sustain (or even increase) them up to today.

\textsuperscript{36} https://www.gov.uk/2050-pathways-analysis

\textsuperscript{37} http://www.involve.org.uk/2050-pathways-public-dialogue/
As also mentioned previously, the main plan for increasing the stakeholders’ engagement was presenting them the whole initiative and involving them from the very beginning. The project team also published regularly “Calls for Evidence” so anyone that may have been missed/overseen would get to feed in his/her evidence. The development of new tools for different audiences (e.g. Excel, web tool, My2050, school toolkit) has also proved to be a successful stakeholder engagement strategy.

Peaks were recorded when the project first went online and when an article was published in BBC website38. The project has not made the most out of social media, but it provides the user with the capability to share his/her Pathway on Facebook/Twitter.

The project’s stakeholders’ engagement strategy also includes various organisations that work with schools and promote the initiative, as well as periodic newsletters.

Looking towards the future, the 2050 Pathways team is currently updating all possible data. In addition, a comparison between the (in the past) projected and the actual results will also take place, in order to test the credibility of the model and its results.

Secondly, an international implementation of the project, aiming at 10 developing countries (including China, Indonesia, South Africa, Bangladesh etc.), is under preparation (it will probably be running by the end of 2014).

In addition, the inclusion of historical data (meaning data between the initiation of the project up until today) in the model (in order to provide a more complete image) is also a future plan.

Last but not least, there is a constant will to make the tools more efficient and attractive.

A.2 GLEAM

A.2.1 Case Description

<table>
<thead>
<tr>
<th>URL</th>
<th><a href="http://www.gleamviz.org">http://www.gleamviz.org</a></th>
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**CROSSOVER Roadmap Research Challenge Group/Research Challenges**

- Policy Modelling
  - Collaborative Modelling
  - Model Validation
  - Immersive Simulation
  - Output Analysis and Knowledge Synthesis
- Data-powered Collaborative Governance
  - Visual Analytics
  - Open Governmental Data
  - Big Data

To effectively limit the social and economic damage caused by infectious diseases, the public health communities need to be in the position to anticipate the spatial and temporal evolution of epidemics and evaluate the potential impact of available containment and prevention strategies.

The global epidemic and mobility model, GLEAM, combines real-world data on populations and human mobility with elaborate stochastic models of disease transmission to deliver analytic and forecasting power to address the challenges faced in developing intervention strategies that minimize the impact of potentially devastating epidemics.\(^{39}\)

GLEAM is a discrete stochastic epidemic computational model based on a meta-population approach in which the world is defined in geographical census areas connected in a network of interactions by human travel fluxes corresponding to transportation infrastructures and mobility patterns. The GLEAM 2.0 simulation engine includes a multi-scale mobility model\(^ {40}\) integrating different layers of transportation networks ranging from the long range airline connections to the short range daily commuting pattern.\(^ {41}\)

Elaborate stochastic infectious disease models to support a wide range of epidemiological studies are used, covering different types of infections and intervention scenarios in order to respond to the spread of a pandemic crisis in very short times.

Real-world data on population and mobility networks are used and integrate those in structured spatial epidemic models to generate data driven simulations of the worldwide spread of infectious diseases.

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\(^{39}\) GLEAM Vision. Available at: http://www.GLEAMviz.org

\(^{40}\) http://www.gleamviz.org/model/

\(^{41}\) GLEAM in Detail. Available at: www.GLEAMviz.org/GLEAM-in-detail/
GLEAM runs on high performance computers to create in-silico experiments that would be hardly feasible in real systems and to guide our understanding of typical non-linear behaviour and tipping points of epidemic phenomena.

Figure A-4: The three population and mobility data layers in GLEAM

A suite of computational tools is provided to help modelling the spread of a disease, understanding observed epidemic patterns, and studying the effectiveness of different intervention strategies that policy makers think to put forward to minimize the exposure of population and to neutralise the disease spread. The tools are available to researchers, health-care professionals and policy makers either as direct download from the GLEAM website (light version), or via communication with the GLEAM team in order to get the full infrastructure. The tools allow end users to create their own models and simulate them through the GLEAM platform, so anyone can construct his own model with different parameters. Of course, relevant competences are needed, such as a background in modelling, epidemiology, computer simulation, etc. As it is argued below, the use of such a model requires the support of people or of groups that posses interdisciplinary skills, in order not only to construct a solid and close to reality model, but also to interpret the results correctly.

The basic structure of GLEAM model consists of three distinct layers:

- The population layer
- The mobility layer
- The epidemic layer
A.2.2 Case Motivation and Deployment

The initial motivation for GLEAM was a research question of public health concern: "can we do forecasting regarding the global spreading of diseases?". Under forecast it is not meant to predict when the next pandemic will strike (or what it will be), but, given the fact that the World Health Organisation (WHO) or some other similar agencies provide some warnings about a cluster of cases of a small outbreak of epidemics, to try to be in a position to create a forecasting infrastructure for the geographical and time spreading of these infectious diseases. This concept is quite similar to creating a weather forecast.

The main starting point was based on research to find the algorithms, the needed data etc. From 2003 till 2009, the GLEAM team was occupied with the creation of the basic computational model that integrates all the available/collected data. Categories and sources of data included: data from census agencies, data regarding population at very high resolutions, data from a world map implemented by NASA with the world population divided to 5x5 miles area boxes, the entire database of airlines, about 40 databases from different countries for local mobility, transfer, etc.

All this data has to be integrated into the model that simulates the spreading of the diseases. This is just the engine of the GLEAM infrastructure and the motivation to develop the entire infrastructure came in 2009 where the team was working with agencies and private companies for analysing the H1N1 pandemic. It was realised that it was more than difficult to communicate large amounts of data to stakeholders as nobody knows what people are really interested in and, at the same time, modification questions are constantly popping up in order to calibrate the model for studying different issues. Thus, it was decided to create a computational infrastructure that allowed the GLEAM team to setup a basic model in case of an emergency and to do almost the same heavy calibration that is performed in a supercomputer environment, and also to make this data available for exploration through a visual interface to agencies and people who could try to change the model’s parameters, try different
containment measures, etc. without coming back to the GLEAM team for these needs of support.

A-6: GLEAM simulation visualisation

In addition, it was decided as a main principle to have parts of the model public, in order to let them be used for academic purposes and to empower students and people teaching about infectious diseases spread and so the public version evolve which does not contain all features of the full platform.

The GLEAM research team started working on the project prior to looking for funding and projects willing to sponsor the attempt. Initially the work performed in areas such as computational epidemiology, network of diseases etc. was funded as part of scientific research, but not as part of the GLEAM project. Once the idea was more concrete, GLEAM got funding from various US agencies (NIH\(^{42}\), Defence Agency) and from the EC through some research projects (EPIWORK IP project\(^{43}\) and EPIFOR\(^{44}\)). In the website the list of all funders is available. Also, funding is still coming from 2 major corporations (their names cannot be disclosed).

At this time, the case is supported through funding for new features. EPIWORK project funding is used to expand the functionality of the platform, to provide APIs to introduce specific agent based models within the existing model and to integrate the platform with another epidemic data sharing platform that is constructed in EPIWORK. There are many research areas that allow GLEAM to keep the platform alive and still advance development. Another part of the funding comes from various research contracts and from corporations that want

\(^{42}\) National Institutes of Health. Available at: [http://www.nih.gov](http://www.nih.gov)

\(^{43}\) EpiWork - Developing the framework for an epidemic forecast infrastructure. Available at: [http://www.epiwork.eu](http://www.epiwork.eu)

\(^{44}\) EpiFor - Complexity and predictability of epidemics: toward a computational infrastructure for epidemic forecasts. Available at: [http://www.epifor.eu](http://www.epifor.eu)
to use the platform for their epidemic preparation plans (e.g. to evaluate the number of workers within an area that could get infected).

As also mentioned before, there are many deployments of GLEAM, including the US Defense Agency, agencies like the EC JRC ISPRA\textsuperscript{45} that uses and implements GLEAM in its Crisis Management Unit or the INSERM institute (see section 3.2.8), and other undisclosed corporations.

A.2.3 Implementation

In an initiative such as GLEAM, the expertise required in the research team is very interdisciplinary. The team includes people coming from physics, computer science, mathematical biology, public health institutes, graphic designers for the interface, HCI experts. Having such a multidisciplinary team and creating a common vision and goal is quite difficult in terms of unifying languages, skills, understanding of each other, and different way of work.

People from JRC have played a critical role in the course of implementation, as they have been constantly providing feedback and can be considered the first link to policy making. The GLEAM team has also been talking a lot with policy makers from agencies that work on public health and disease prevention, aiming to receive additional feedback.

The 1\textsuperscript{st} release of the platform took place in 2010 (2012 was the 3\textsuperscript{rd} year of the fully operating release). There have been 4 major releases up to today (current release: GLEAMViz 4.0) and the major changes focused on improving visualisation and additional capabilities. Moreover, the last release has a different updated engine for the simulation that is 10 times faster than the previous one. A number of 3-4 minor updates are also performed every year.

The GLEAM platform is an open nature. Commercial software has been used only for development, like Adobe Air for the client (needs licensing for developers), but for the end user it still remains free. However, the public release available to anyone does not include all the features of the software; the full software is released only to specific agencies (like the JRC) that are then in a position to install and maintain the software on their servers. For several reasons the full model cannot be offered to all users (e.g. the GLEAM team cannot directly support 20 or 50 installations and therefore support is only provided to important agencies that are running the full model). Moreover, the full release runs on HPC that we provide to the community so we cannot allow every user to use all the features, as a super-computing centre would be necessary; something that is not feasible at the moment.

The basic model is developed by the GLEAM research team and is considered as a unique model, as the GLEAM team is the one of the very few groups with global capabilities at this time in terms of epidemic modelling. Creation of specific APIs and collaboration with other 2 groups to create an integration of the GLEAM

\textsuperscript{45} JRC-Ispra. Available at: http://ec.europa.eu/dgs/jrc/index.cfm?id=6450
model with localised agent based models which are much more detailed and will bring in the platform other computational models too is currently being planned.

The data used for the tool is mostly public data, but when talking about specific implementations (like a pandemic plan for a big corporation), then the tool integrates data from these organisations that are not public and cannot be publicly shared. Moreover, the tool also integrates commercial data, like the IAA data, the OEG database, data from various census bureaus etc. These, not open, data is only used for computations and cannot be redistributed through the tool. Everything else can be accessed through the tool (like world population data, etc.) and is publicly available in various sources.

The GLEAM website has also a library of models (4-5 models available) and this will be enlarged by a future release (to 10-12 models). Last but not least, the GUI allows the end user design his/her own models on a drag and drop canvas.

![Figure A-7: GLEAMviz Simulator](image)

A.2.4 Results Achieved and Impact

The main achievement of GLEAM so far was the production of the forecast for the H1N1 pandemic in real-time which was a quite successful exercise and showed the power of the model. A validation paper\textsuperscript{46} has been published in December 2012 showcasing that the GLEAM predictions were quite spot on.

Many stakeholders are also using the software and support their policy-making procedures in terms of designing measures to prevent or constrain the spread of diseases. Examples include the US Defence Agency, the JRC, and other corporations that are using the software. It has to be noted that JRC is using the tool in its long-term strategy for studying and responding to the spread of epidemics (through communicating the simulation results to DG SANTO policy officers), based on the experience that has been accumulated from using the GLEAM toolkit during the H1N1 disease.

The core innovation of GLEAM lies within the computational model which can integrate data from various sources and provide a close to real time forecast (by combining various real-time data sources) on the spread of epidemics on a global level, which was not possible before at that level of precision and punctuality.

Moreover, through the visual interface users are in a position to create their own models and investigate specific diseases and issues that they are interested in.

A.2.5 Challenges Encountered and Lessons Learnt

The main challenge in the GLEAM case has to do with sustainability. The research effort so far has sustained the tool, but at a certain point policy makers need to provide funding for maintaining such ICT computational tools for actual policy making, as it is happening with other product categories. Only few agencies have small crisis management units that can maintain such tools. Many big agencies do not have a computational or modelling unit and this requires a change of culture from the institution and the agencies.

The first lesson learnt is that the use of Web2.0 technologies for the policy-making domain is not an easy task, as policy makers are not used to work with these tools. There is some scepticism or in some other cases too much trust. These computational tools are quantitative and it can be taken for granted that policy making cannot be done solely by looking at the numbers. What needs to happen is to complement the policy making process with this quantitative information but neither to disregard nor underestimate the value of such information. This is due to the fact that behind each model there are assumptions, modelling compromises, incomplete/ missing data, etc.

Based on the above, more and more accurate data is always needed. Policy makers are used to work with data not suited for quantitative use. This way the modeller might end up with very rough statistics that are not proper for precise calculations. The same applies for forecasting; the better data you have, the better and more accurate the forecast will be. With very poor data you might get a very disturbed picture of the future. So one needs to deal with how we can improve and create a culture in the policy making environment for real-time high quality data. It is also surprising that satellites are available for weather, but there is no such map for human mobility (so in the case of GLEAM it had to be created from scratch). The actual technology was there but it was not used to get this kind of data. People in the policy making environment need to understand that those data can provide an edge to the decision making process.
The major key success factor of GLEAM has definitely been the fact that the predictions regarding H1N1 pandemic were really accurate, while working in real time helped to build a dynamic dialogue with the policy makers, starting to build a trust relationship.

Of course, success means amongst other things to provide something which is needed and that no one else can provide. There are many groups working at different levels (local/ regional/ country). GLEAM escalated to a global level, not reinventing the wheel but specialising and providing innovative things and views.

Based on the GLEAM experience there are some recommendations that can be derived. A first recommendation will be to build into the agencies’ units that can deploy, operate and further develop such tools. Agencies should use people that work in this research projects and let them lead inter-agency for moving the tools to the new level within these organisations and focus on the issues they need to tackle.

Moreover, it can be taken for granted that such tools and Web2.0 technologies are being replicated easily. One should aim at integrating different tools and methods in an effort to help to achieve better policy making. It has been seen that with the US storm, where 20 models were used and one could see different dimensions, but the models were converging in similar results. So it is a matter of creating different models that converge to similar results.

Moreover, there is a real need for creating and sharing high quality data in real time.

A.2.6 Sustainability

In the initial steps of GLEAM there was no sustainability strategy, as the community of epidemic modelling and computation tools is pretty small. The major stakeholders have been contacted during conferences, workshops, etc. It was the H1N1 pandemic which brought many people to the platform and then the tool has been disseminated by word of mouth based on its application on different pandemic scenarios.

At this time, the GLEAM team is actively participating in conferences and meetings to present the tool. Moreover, other material has been/ is being created, such as short movies, brochures, advertisement events, while we have also a component called “Epidemic Planet” that is exhibited in museums to attract audience. In this content, GLEAM tries to push the tool into the education environment to facilitate students to learn more about epidemic spreading and global diseases, in order to make the younger generation more familiar with the tool and the project.

In addition, future plans include several improvements and enrichments regarding the tool itself. Another direction of work has been towards human infection diseases, and the creation of a model for vector born diseases (like malaria) that require the knowledge from other vectors such as mosquitos is foreseen. In this context, the tool can be surely used for other issues as well.
Another direction is to move into other areas of contagion, so as to deal not only with infectious diseases, but also work with knowledge information for other epidemiological concepts.

Moreover, the GLEAM team plans to include more data and models in the platform and, depending on the resolution and the needs of the users, to create different ways to investigate the evolution of the epidemic. In principle, the basic idea is to use social media like Twitter for such purposes, which will bring the tool also cover early detection and not only forecasting, and also investigate how this can be applied in other phenomena. This can be seen as a task for the next 5-10 years.
A.3 Opinion Space 3.0

A.3.1 Case Description

| URL                  | http://www.state.gov/opinionspace/  
|                      | http://opinion.berkeley.edu       |
| Status               | Ongoing                          |
| Sector               | Foreign affairs, Global policies  |
| Policy Making Cycle  | • Agenda Setting                 |
| Stage                | • Monitor and Evaluation         |

CROSSOVER Roadmap

Research Challenge Group/Research Challenges

- Policy Modelling
  - Collaborative Modelling
  - Easy Access to Information and Knowledge Creation
  - Output Analysis and Knowledge Synthesis
- Data-powered Collaborative Governance
  - Opinion Mining and Sentiment Analysis
  - Visual Analytics
  - Open Governmental Data

Launched by the U.S. Department of State and hosted on, "Opinion Space" bridges the worlds of politics and social media in an interactive visualization forum, where users can engage in open dialog on foreign affairs and global policies. It invites users to share their perspectives and ideas in an innovative visual "opinion map" that will illustrate which ideas result in the most discussions and which ideas are judged most insightful by the community of participants.

Using an experimental gaming model, Opinion Space incorporates techniques from deliberative polling, collaborative filtering, and multidimensional visualization. The result is a self-organizing system that uses an intuitive graphical "map" that displays patterns, trends, and insights as they emerge and employs the wisdom of crowds to identify and highlight the most insightful ideas.

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47 U.S. Department of State. Available at: http://State.gov
Opinion Space exploits the power of connection technologies to 'depolarize' discussions by including all participants on a level playing field and by encouraging communication between people who may not agree with each other. In Opinion Space the layout is determined completely by the data entered by participants: it is computed using statistical dimensionality reduction techniques. Using Principal Component Analysis (PCA) from advanced mathematics, multiple opinions (more than two) can be projected onto two dimensions and still approximate original distance relationships. So if the yellow dot that represents a user is located on the left, that doesn't mean you're more liberal. Opinion Space is designed to move beyond the usual left-right linear spectrum to display "constellations" of opinions. Opinion Space also includes "landmarks" (blue dots) that represent the opinions of public figures based on "educated extrapolation."

Actually, rather than solidifying opinions into binary silos that are by nature oppositional, Opinion Space gathers information from users on a range of topics and then places each user on a map in relation to the opinions of others. The "geography" of the map changes as new users enter the system. Clusters of orbs, resembling little solar systems, form around certain combinations of shared opinions.

In an illustrative example, the user once sign in the platform has to answer 5 questions that deal with nuclear weapons, proactive diplomacy, climate change, investing in food and women empowerment. The user selects whether he agrees with the statements presented (using an analogue slider to express his agreement/disagreement) and his position (marked by a blue spot) gets placed in the 2D opinion Space. Then the user is presented with more questions that he can answer using free text to state his position. After that, the user is able to
explore other user's opinions, where he can state the degree he agrees with these statements or not.

In summary, Opinion Space helps policy makers:

- Understand the diversity of their communities.
- Solicit feedback and creative suggestions on specific topics.
- Rapidly identify the most insightful ideas and suggestions.
- Increase satisfaction and engagement with their communities.

Opinion Space also helps citizens:

- Visualize their relationships to other people.
- Express thoughtful ideas and suggestions about emerging issues.
- Engage in friendly competition with other people.
- Learn and gain insights from other people.

A3.2 Case Motivation and Deployment

The initial concept behind Opinion Space was to bring the world of big data to brainstorming (the process of generating ideas): how can the end user take advantage of the world of big data in the process of generating ideas? Can algorithms and statistical techniques (that worked well in other areas, such as robotics) operate towards this direction?

After the election of President Obama, the government had a social media orientation, which provided fertile ground for the first trigger case.

Opinion Space was based on a few prior projects that dealt with:

- Recommending NPOs to people so as to donate,
- Recommending jobs (background recommendation systems in general).

The combination of recommendation systems and visualisation was the main trigger behind Opinion Space. Policy makers need to know what the population they serve thinks; and this is definitely a complicated problem. Surveys are not the solution; they can be communicated only to a certain number of people and need processing. Policy makers need to be able to take a quick "snapshot" of what people think. That's the need that Opinion Space solves.

Opinion Space has been based on a mix of funding grants (e.g. NSF grants). In addition, every individual project has also received some industry funding.

Typically the way that individual implementations work is through initial contacts that lead to implementation; there are no contracts in the business sense. Organisations fund Opinion Space in order to view the results of this kind of research in their domains (e.g. Fujitsu funded Opinion Space in order to see the results of sentiment analysis on e-learning).

The first two projects of Opinion Space (in 2009) were with the US State Department. Then, by generalising the system, Opinion Space worked with a US auto-maker (that requested to stay anonymous), with an insurance company, an HR department in UniLever (what employees thought about various policy
decisions in the company), in various academia-oriented questions, in local state measures (e.g. California) etc.

Figure A-9: Rating other opinions’ in Opinion Space

Opinion Space is fully operational in its current state. Nevertheless, as a research platform it still remains experimental. The great amount of data is very structured and this helps towards continuing research on text analysis, statistical modelling etc.

A.3.4 Implementation

Opinion Space uses a technique in order to project a five-dimension (up to eight-dimension) space in the two-dimension space. This is used in order to visualise diversity, which is critical for the purposes of Opinion Space. This technique was selected because it is established in other domains, such as robotics. Visual analogue slider is also used in the frames of Opinion Space in order to give users the ability to rate in a continuous manner and not in a binary one (like/dislike).

Thus, mathematics, mathematical modelling, industrial and artificial intelligence background can be found in the members of the Opinion Space team. Design groups and human-computers interaction groups were/ are also consulted.

Policy makers are also directly involved. They make their questions but they always need our assistance. The Opinion Space team involvement is not necessary, but it actually makes the system operate in a better way. Policy makers are also involved in the course of the development: the development is modular and they provide feedback in every step. In this way, they also provide initial ideas and they get familiar with the whole system.
Opinion Space has been running since 2009. Besides 1.0, 2.0 and 3.0 (current version), there were various unnamed versions of the initiative (mostly based on the 3.0 code).

Version 1.0 basically just visualised diversity and it was not really an idea generation platform. In version 2.0 the development tried to capture and visualise the user interaction and the main innovation introduced was the ranking system; users could evaluate each other’s ideas. In version 3.0 the idea was to make the whole platform user centric. We incorporated ideas from human-computer interaction into the platform. Another innovation was the introduction of more and more sophisticated statistical tools. After that the main focus was on increasing traffic.

In addition, there is an additional moderator space for policy makers. It gives them a wrap-up of the top ideas and allows them to change ideas etc.

Opinion Space primarily uses open source software. However, Opinion Space’s license is assigned to the Berkeley University.

Specific technologies and tools include a web application that hooks up to a database analytic system (a relational database to be more specific, as a lot of the available data is extremely structured) through middleware. The UI is a flash-based interface and the statistical platform is Python-based. Opinion Space also incorporates techniques from deliberative polling, collaborative filtering, statistical inference, and dimensionality reduction. Opinion Space’s techniques can be easily applied to other sets of existing open data.

### A.3.5 Results Achieved and Impact

One of the first and main indicators was the participation rate; users that arrive in the platform for the first time and those that become active participants. People that arrive in websites are always more than those who actually participate (in some projects the rate was close to 50% and in others around 10%).

In the State Department instance (of Opinion Space 3.0), more than 2000 different ideas were collected (about US foreign policy). In addition, more than 5000 individual responses were collected. It cannot be said whether the final decisions were based on some of the ideas provided, but a detailed report was provided to the policy makers. The project with a US auto-maker (targeted towards recognising ways of improving their image) resulted to about 1000 ideas and about 100,000 ratings evaluating these ideas (e.g. more specifically they talked about green vehicles).

Based on the previous paragraphs and to Opinion Space’s understanding, the results exceeded even the optimistic expectations, taking into consideration that the target groups are specific and limited in most of the implementations. If the cases targeted towards vast amounts of open public, the goal was not met. But in terms of specific target groups, they exceeded expectations.
One of the core innovations and successes of Opinion Space is the very fast way to browse (and rate) amongst a large number of ideas (even if this is a visualisation-oriented innovation). From the scientific point of view, the greatest innovation was bringing statistical analysis in structured discussion/data.

One of the best endorsements regarding Opinion Space was Hillary Clinton’s reference to the initiative. Other endorsements include high level officers of collaborating companies as presented in the Opinion Space website.

As far as the Opinion Space team is aware of, Opinion Space has not yet been incorporated in any formal decision making procedures. The State Department, however, uses “informally” Opinion Space in order to get ideas and opinions on specific policies.

A.3.6 Challenges Encountered and Lessons Learnt

Challenges that the Opinion Space teams need to tackle with are of various natures. Firstly, the Opinion Space platform performs a lot of actions so maybe a lighter version should be considered.

In terms of policy makers, many concerns on privacy have been raised; different regulations regarding data make things even more complex.

In addition, when introducing a new concept/technology, users might be reluctant in using it.

Last but not least, the choice to implement the platform on Flash has led to loss of all Apple-devices users.

In terms of risks, two principal risks can be identified:

(i) implementation – the result might not be the desired or requested one,
(ii) not well structured ideas/questions (e.g. what is the meaning of life) or inability to refer to the proper audience may result to failure in participation.

Regarding lessons learnt, above all is that the slightest effort needed by the user really affects participation; everything needs to be easy and user friendly. For example, by increasing the start-questions from 5 to 8, participation decreased almost 50%. In addition, the Opinion Space team learnt more about machine learning techniques and algorithms and their capabilities and sensitivities.

From the policy makers point of view (State Department to be more specific), they learnt that ideas can be very diverse and scattered; and many times this is neglected by media and press.

In addition, when someone applies social media systems in policy making procedures he always seeks for the lightest application possible, which works across all platforms (operating systems, mobile devices) and is easily set and operated.
Regarding the overall Opinion Space concept, one can say that the platform works particularly well when you apply it to a specific use case or/ and a well-formulated idea.

**A.3.7 Sustainability**

First of all, Opinion Space can trigger/ invite users of other/ older Opinion Space cases to participate in new ones. The “core” users of Opinion Space are about a couple of hundreds.

In addition, the Opinion Space team uses Google adwords, SEO and sends emails to relative emailing lists.

The increase of users really depends on the timing, as well as on how interested are people about the specific subject under consideration.

Opinion Space is technically capable of handling any kind of question. Any brainstorming/ idea generation project in any kind of organization can be supported.

In addition, there is a continuous effort to make the platform easier and more user-friendly. Opinion Space team is working on a lighter Opinion Space implementation, without the initial five questions; it will just ask the user to comments and his/ her comments will be evaluated. In addition, work is performed on a “global” version of Opinion Space based on HTML, which will work across any platform.

In terms of research, the team is working on machine learning techniques that can help dealing with larger amounts of data. Moreover, amelioration of algorithms is also a continuous research theme.

There is also a plan of collaborating between Opinion Space and the State Department once again. Last but not least, independent projects come up in the course of time.
A.4 UrbanSim

A.4.1 Case Description

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| CROSSOVER Roadmap Research Challenge Group/Research Challenges | • Policy Modelling  
  o Systems of Atomized Models  
  o Immersive Simulation  
  • Data-powered Collaborative Governance  
  o Big Data  
  o Visual Analytics |

UrbanSim is a software-based demographic and development modelling tool for integrated planning and analysis of urban development, incorporating the interactions between land use, transportation, environment, economy and public policy with demographic information. It simulates in a 3D environment the choices of individual households, businesses, and parcel landowners and developers, interacting in urban real estate markets and connected by a multi-modal transportation system. The 3D output of the aforementioned process is presented using indicators, which are variables that convey information on significant aspects of the simulation results. This approach works with individual agents as done in agent-based modelling, and with very small cells as in the cellular automata\(^48\) approach, or even at building and parcel levels. UrbanSim differs from these approaches by drawing together choice theory\(^49\), a simulation of real estate markets, and statistical methods in order to achieve accurate estimation of the necessary model parameters (such as land policies, infrastructure choices, etc.) in order to calibrate uncertainty in its system. As an example of its use, one could refer to the project on Modelling Land Use Change in Chittenden County\(^50\), where the model parameters based on statistical analysis of historical data, the model then integrated market behaviour, land policies, infrastructure choices in order to produce simulations on household, employment and real estate development decisions (where the first two were based on an agent-based approach while the latter on a grid-based approach).


\(^{50}\) [http://www.uvm.edu/rsenr/countymodel/Workshop08by3.ppt](http://www.uvm.edu/rsenr/countymodel/Workshop08by3.ppt)
In the above figure (Figure 11), the blue grid lines delimit 150-by-150 meter grid cells used to model development and location choices made by households and businesses; red lines define traffic analysis zones used to model the flow of vehicles.

The first documented application of UrbanSim was a prototype application to the Eugene-Springfield, Oregon setting\(^{51,52}\). The system has been applied to the modelling of several U.S. cities, including Detroit, Michigan\(^{53}\), Salt Lake City, Utah\(^{54,55}\), San Francisco, California\(^{56}\), and Seattle, Washington\(^{57}\). In Europe, applications of the UrbanSim system include Paris, Brussels, Belgium and Zurich, with various other applications not yet documented in academic literature.\(^{58}\)

In the case of Salt Lake City Utah, UrbanSim supports metropolitan planning and policy analysis in a more scientifically rigorous manner than the land-use model

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\(^{54}\) Waddell, P. and F. Nourzad. (2002). Incorporating Non-motorized Mode and Neighborhood Accessibility in an Integrated Land Use and Transportation Model System, Transportation Research Record No. 1805 (119-127)


previously used by the Wasatch Front Regional Council\textsuperscript{59}, with land-use forecasts being influenced by the proposed transportation system. By integrating UrbanSim with the regional travel models, a range of land use and transportation policy interventions can be combined into policy scenarios and the systematic effects of these scenarios can be explored on urban development outcomes and the quality of the transportation system.

Three software tools (i.e. GIS\textsuperscript{60}, UrbanSim, and Travel Model\textsuperscript{61}) are used concurrently and pass information back and forth to each other - for example, modified GIS layers were provided to UrbanSim, which in turn is able to modify the layer and port it back into the GIS as a new layer depicting a specific urban scenario. This flexible technology package, while not unique to this planning effort, allows planners to model future land use patterns and populations, create a travel model for the future community, and depict the results in tables and maps. Thus, alternative solutions can be created and evaluated.

\section*{A.4.2 Case Motivation and Deployment}

UrbanSim as a software platform has been developed for the last 15 years now. The initial idea came after an extensive literature review mostly on urban economics, micro-simulation and GISs. The software platform itself was developed from scratch.

In the mid 1990’s (when UrbanSim was first conceived) the original motivation was to interact in the policy analysis domain at the metropolitan scale, principally around the issues of transportation and land use, as well as environmental planning. The context was initially limited to the U.S. including the metropolitan planning organisations of each geographical area, which are the legally mandated organisations to undertake regional transportation planning, and to funnel federal funds for transportation projects.

The challenge that UrbanSim was initially trying to address was the shortcoming in analytical capacity of Metropolitan Planning Organisations (MPOs), as they were unable to effectively analyse the secondary or cumulative impacts of transportation investments (e.g. new highways, highway widening, rail transit) on urban development (e.g. where new housing gets developed). The consequence of this limitation was that there was a significant bias towards overestimating the benefits of new construction and highway capacity expansion and this became the basis for legal challenges, mainly by the environmental movement (they challenged legally decisions of implementing new construction projects without considering the long-term impact).

Thus, the UrbanSim platform was designed and implemented as a way to analyse the effects of changes in the transport system on urban development (travel patterns, effectiveness of transport projects).

\textsuperscript{59} http://urbansim.org/Community/SaltLakeCityUtah
\textsuperscript{60} http://en.wikipedia.org/wiki/Geographic_information_system
\textsuperscript{61} http://en.wikipedia.org/wiki/Transportation_forecasting
Nevertheless, this original motivation has evolved over the years. It still maintains the core of allowing analysis of secondary/accumulated effects of transport-related investments, but now more broadly encompasses the desire of many local and regional planning policy makers to assess the impacts of land use policies (e.g. in California there is legislation to reduce greenhouse gas emissions not only by changing types of fuels/vehicles; the law also for MPOs to coordinate with local cities to change land use patterns in ways that reduce the need to travel by car). So, based on this agenda, UrbanSim now deals with evaluating packages of measures of specific planning or transportation policies that include examining building codes, incentives, impact, different policies etc. At this time, UrbanSim has a portfolio of transfer-related projects but also land use policies.

More recently, increased interest has been noted in analysing policies that relate to portable housing (caravans), equity and economic development. In addition, increased interest has been shown towards engaging open public in decision making processes/policy design (e.g. recent project in San Francisco area is aiming to develop a 3D visualisation system that would complement UrbanSim in providing capacity for community residents and local planners to be able to visualize alternative scenarios and have a stronger intuition around what these alternatives might look like in terms of their impact on urban development over the next 30 years62).

The initial funding came from a consulting project in order to design and develop an urban simulation model of the Honolulu MPO. Subsequently, a National Science Foundation grant was obtained (for an urban research initiative) which led to a substantial increase in the research on how to approach such a complex simulation and policy analysis platform. The initial findings led to several more grants from NSF (probably 6 different – over $10,000,000 in total). In addition, the EU FP7 project “Sustain City”63 has brought some additional funding to further support the development of the tools and to work on introducing new characteristics.

Nevertheless, most of the real-world application growth has come from contracts with various MPOs that have actually used the system. There have been quite a number of deployments including USA, Europe and Africa.

It has to be noted that the experience in the US is very different than in Europe (and also other international applications). The main difference is that UrbanSim has been actively involved in developing the applications in close collaboration with NPOs in US and has moved from a research to an applied context (they are actually being used in formal/legal planning efforts – public administrations fund and actually use the platform), while in Europe UrbanSim had a modest advisory role.

The reason behind the different philosophies of deployment in the US and in the EU case is not clear, yet it could be attributed to the following limitations in the EU endeavour:

62 http://www.urbansim.org/Community/SanFranciscoCalifornia
63 SustainCity. Available at: www.sustaincity.eu
• Since UrbanSim is a research project most of the work is being done by research teams scattered throughout Europe without any active involvement of government agencies. Much time has thus been devoted on doing research that the participating research teams were interested in, but with less engagement of the actual planning agencies.

• UrbanSim provided some innovations in terms of access to software/algorithm/models improvements. Yet there were difficulties caused by the new users of UrbanSim that had not interacted with the platform before and were not experienced in developing models, calibrating them, adding data etc. This is of course normal, as the tool has been available for more than 10 years in the US (but had never been deployed in the EU before), and as a result US practitioners have used it to develop related models and are in that way highly experienced in creating such models.

A.4.3 Implementation

In terms of methodologies, UrbanSim uses preliminary data analysis to organize an integrated UrbanSim data system (data fusion\(^{64}\) or data integration\(^{65}\) methodology), behavioral models\(^{66}\), metric models, regression models\(^{67}\), free choice models\(^{68}\) and equilibrating dynamics. Most recently methodologies for community engagement have been implemented (through a visual environment in which users can compare side by side two different propositions). In terms of technologies, free choice modelling can be also considered as a technology, technologies for analysing uncertainty, techniques for validating models, technologies for 3D urban modelling).

Due to its complex nature, UrbanSim requires a multidisciplinary development team: Ph.D. graduates in computer science, computer graphics, urban planning, transportation planning and modelling, civil engineering, urban real estate design and development and finance. The core team also closely collaborates with experts in community engagement and participation.

Policy makers have been involved in the implementation, especially in the US cases. When applied projects with planning organizations are implemented, the end-users are active participants in the whole process (even from the research part). Planners and analysts from the PAs are actively involved in what UrbanSim calls “agile modelling” which is actually a continuous iteration of modelling activities in order to streamline and optimise the models that will be used for the tool. UrbanSim follows a very modular approach that allows the team to reconfigure and add any required part of the model, due to the fact that the model may alter dramatically amongst various application cases due to the different characteristics of each area. Policy makers are also involved in monthly

\(^{64}\) http://en.wikipedia.org/wiki/Data_fusion
\(^{65}\) http://en.wikipedia.org/wiki/Data_integration
\(^{66}\) http://en.wikipedia.org/wiki/Behavioral_modeling
\(^{67}\) http://en.wikipedia.org/wiki/Regression_analysis
\(^{68}\) http://en.wikipedia.org/wiki/Choice_modelling
iterations where they use and test the model under development and provide feedback. This helps not only in terms of feedback, but also in terms of the policy makers getting familiar with the model and platform.

The first platform implementation was implemented in Java. In 2005 a decision was taken in order to re-implement it in Python. Most recently (during the last year), a new extension of UrbanSim has been developed, UrbanVision⁶⁹, which is a 3D urban visualisation and supports also editing scenario analysis, where the user can edit parcels, building or zoning data and generate and visualise this alternative scenarios.

![Image of UrbanSim zoning data scenarios comparison]

**Figure A-11: UrbanSim zoning data scenarios comparison**

Initially, UrbanSim was available as an open source license downloadable from the web for more than 10 years. UrbanVision and some additional extensions are implemented in a new platform in C++. Those were decided to be distributed as closed source, with various pricing profiles (e.g. for public agencies, private agencies, educational/ research institutes etc). The decision was taken mostly due to competition from commercial entities.

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With the modularity followed in UrbanSim, different configurations for any models can be created and the user (e.g. policy makers, expert consultants etc.) is taught how to change those configurations (e.g. change a residential location model with another). However, users have very diverse interests and technical background levels. The number of users that actually want to go deep into the models is relatively small. Support is provided towards any UrbanSim-related activity.

As far as the data utilized in the frames of the whole UrbanSim approach are concerned, in the past, the various involved agencies (e.g. public authorities) have typically been very protective of their data. Some data (the minority of them) were indeed legally protected/ confidential/ proprietary (in various senses), while the majority was open. Yet, authorities were protective with all of them and kept them private after the completion of the project. What UrbanSim is beginning to do, both by working with a university (University of California, Berkeley) and by developing the proper tool, is to create an online platform in which it is requested from agencies to contribute their data in order to become publicly available and create an API to access them. This could constitute a valuable offer towards enriching the notion and actual quality of Open Data. This repository could be used both for research and for the models (having access to an archive of data is a key factor towards successful models).

Figure A-12: UrbaSim 3D street level simulation at San Francisco Bay Area
A.4.4 Results Achieved and Impact

As far as the impact is concerned, the European case is not at the same level as the US ones. In the US there are quite a number of MPOs that actively utilize the UrbanSim platform. The most indicative application, representing the approach common in the US, is probably the San Francisco Bay one. The results of the aforementioned case have involved examining and analysing five alternative scenarios that required articulating a set of assumptions about land use policies, transport policies and macro-economic growth (the analysis in now complete – relevant publications will be available in the next few months).

In one of them, analysing visibility of the proposed policy though reverse engineering was attempted, that made the task much more challenging, both in terms of research and implementation. The agency has now accepted the results, with documentation and visualization supporting them.

In the San Francisco case, the 3D visualization system was created in order to achieve higher visibility amongst citizens than the plain UrbanSim tool. The intention was to use this system in a number of workshops held during January 2012. User engagement was intense even from the development/testing phase. In addition, the public agencies used it in a series of meetings with community organizations. Each of these meetings had from 15 up to 200 participants each. The point of these meetings was to communicate the different scenarios to the public and to receive feedback on the preferences of the citizens.

Unfortunately, the visualization (Figure 12) was effectively used only in a couple of these meetings; they were obstructed by the Tea Party movement.

One of the most innovative elements of UrbanSim is the combination of various technological and theoretical aspects, as well as the withdrawal of strong assumptions regarding urban planning and adoption of less strong assumptions (than markets are an equilibrium). For example, the impacts of transport projects on urban planning are far from being instantaneously realized (in fact they might evolve over decades). In addition, the capacity of being able to support these less strong assumptions can also be considered as a core innovation.

The core innovation in the particular case of San Francisco can be found between the following two:

(i) the visualization, that resulted to higher community engagement (UrbanVision component) and
(ii) the creation of a new approach towards modelling real estate markets, based in pro forma analysis.

The case has been recognized by policy makers and incorporated in their formal procedures. Thus, it can be said that it has been incorporated in the long-term policy making by policy makers of the San Francisco area.
A.4.5 Challenges Encountered and Lessons Learnt

One of the key lessons learnt from the UrbanSim case has been the fact that having a balance between academic research (mostly funded by NSF but also others) and real-world applications towards producing real working systems, is a really effective approach.

Moreover, when dealing with such applications, it is very important to engage people from the early steps of the project, in order to get them familiar with the tool and acquire as much feedback data as possible.

Another recommendation deals with early engagement; policy makers and end users (e.g. expert consultants) in general need to be engaged in the project as soon as possible.

Adequate time for the development of the models and testing of the models is also necessary.

Additionally, finding out a new public engagement strategy, more capable on avoiding public disruption movements is also advisable (probably through smaller meeting and interaction through the web), as public disruption was eventually an unexpected challenge.

Some of the main challenges faced were the very short time frames of the project (regarding its implementation) and having rather poor data available from agencies to begin the project.

Having too much software development at the same time was another (probably inevitable in such projects) risk.

A.4.6 Sustainability

The agile modelling approach mentioned earlier is part of the stakeholders’ engagement strategy, as well as early collaborative testing of the model and the visualisation tools. The stakeholders’ engagement strategy did increase the participation over some months, but participation spiked during January 2012, when the public meetings took place. After this phase, more analytical modelling followed, and another round of public engagement took place.

UrbanSim is already exploring transportation and land use domains, as well as urban design. Environmental issues (e.g. greenhouse gas emissions) were motivation to some projects (such as UrbanSim for Canada70); so environmental planning is also quite relevant. Energy consumption and/ or water consumption constitutes issues of interest too. Modelling the impact of climate change (e.g. on weather) is also a topic of interest. Finally, as also mentioned earlier, economic development/ policies are also under consideration.

The UrbanSim team is currently thinking on how to organize communicating UrbanSim to European public administrations (and establish an office in Europe

70 http://res.ca/UrbanSim/UrbanSimIntro.htm
as well) and other countries (e.g. Singapore, Argentina). In addition, the expansion of the UrbanSim development team and the establishment of more partnerships are on-going.

In addition, the online platform in which agencies are asked to contribute their data is still an on-going effort. Moreover, further amelioration of the robustness and generalization of the model is also an on-going piece of work. There is also collaboration with academia on big data, based on an NSF grant.
Annex B - Interviews with the Final Four Case

B.1 2050 Pathways Analysis

B1.1 Interview with Case Project Team

The interview regarding the 2050 Pathways Analysis case took place through teleconference infrastructure (Skype) on Friday 30/11/2012 at 15:00 CET.

The attendees of the meeting were the following:

**2050 Pathways Analysis Team**
- Edward Hogg - edward.hogg@decc.gsi.gov.uk
- Clare Maltby - Clare.Maltby@decc.gsi.gov.uk
- Ruth Curran - Ruth.Curran@decc.gsi.gov.uk

**CROSSOVER Team**
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- Francesco Mureddu - francesco.mureddu@tech4i2.com

**NTUA Team**
- Sotiris Koussouris - skous@me.com
- Fenareti Lampathaki - flamp@epu.ntua.gr
- Panagiotis Kokkinakos - pkokkinakos@epu.ntua.gr

1. Rationale

**Question 1.1 - What was the motivation/justification to design, develop and deploy the case? Which needs of policy makers are you addressing? How is your case linked to the policy cycle? Was it based on previous work/project or did you start it as a new initiative? Who were the initiators of the initiative?**

| The project began in summer 2009 and the my2050 simulation was not part of the initial work (it came a bit later). At that time, the Department of Energy and Climate Change was newly formed and tried to formulate its first position/ strategy/ white paper. The department had at that time to work towards some targets (e.g. reduce greenhouse gas emissions by at least 80% by 2050), without having the answers on whether it was possible or how it could be done. This need sparked the idea for the 2050 Calculator – it was a new initiative. The department already had various analytical models (such as MarkAl) that could be used, but these models were really complicated and hard to use. In addition, decision makers were not sure which model was the right one to use, especially when two (or more) models gave different answers on the same questions. As a result of that, the department decided that a different kind of model was needed in order to be fast, transparent, stable and effective. Thus, this was a fine opportunity for the project to start. The White Paper had close attention of the most senior people (e.g. Secretary of State, Permanent Secretary, Director-Generals, Director of Strategy) In addition, the chief scientific advisor of the department at that time, Professor David MacKay, was really keen on this piece of work and was really fond of an idea like the 2050 calculator. Concerning the implementation, there were lots of involved stakeholders. There was a core team (6-10 people) of the department of Energy and Climate Change (who were |
leading the work), people from other governmental departments (e.g. transport, industry department) and probably hundreds of external stakeholders (from NGOs, academia, industry, experts). All the needed development was based in collaboration with various actors. Regarding the Policy Cycle, the project probably fits in the first step, this of Agenda Setting. This is due to the fact that the concept is a high-level one (e.g. reduce gas emissions to 80% by 2050). As the data are currently being updated and a comparison between the projected and the actual results will take place, probably the case could in the near future fit into the Monitor and Evaluation Policy Cycle step.

Question 1.2 - What was your funding source at the beginning? How did you manage to get this funding? Which stakeholders have been involved? What is your case’s business model at the moment?

The project was initiated by the Department of Energy and Climate Change, which was also the funding source. Indicative categories of the actual effort included:

• 6-10 persons for the first phase, about a year (designing and building the model)
• Searching and collecting the necessary information
• Call for evidence (6 people for 7 months)
• Adding costs analysis (4 people for 9 months)
• Maintaining and improving model (4 people)
• International and UK engagement work (4 people)

Small parts of extra funding were found occasionally (e.g. a public engagement organization helped to fund the My2050 game (53.000 pounds) and the so called “Deliberative Dialogue”, but still the main source of funding is the leading department. More recently two million pounds were provided by the International Climate Fund so as to help promote the initiative in 10 developing countries besides the UK.

Question 1.3 – Describe the different deployments of your initiative/case. Where is it deployed? What are the themes/topics of interest? Is it in experimental mode or fully operational? What is the role of various stakeholders involved?

The project was launched in summer 2010, fully operational with Excel model and user-friendly web tool. The tool was updated twice in 2011, including launching the Game version My2050. With additions and ameliorations, the only completely operating deployment of the case is the one described in the document at hand and it can definitely be considered as fully operational. An international version of the project (existing in China, Belgium, South Korea and aiming at 10 developing countries) is in the making.

As far as the various stakeholders involved are concerned, two phases can be distinguished:

• The building phase, which included modellers, peer reviewers of the numbers that were used
• The running phase

2. Implementation

Question 2.1 - Which specific methodologies/approaches were used? How were they selected? What is the expertise required of the research team involved and
how is the interaction with users addressed? Are policy makers involved in the implementation as users?

First of all an experienced/lead modeler (using the most recent version of Excel) was necessary in order to fulfill the demanding task of modeling the necessary components. In addition, a project management team was needed in order to put all the stakeholders together and coordinate the whole work. Moreover, experts were put as leaders in individual teams that dealt with specific issues. Of course, a partner with Web2.0 and programming experience was also involved. Other necessary “components” are objectivity, diplomacy, transparency, collaboration and understanding.

We have identified as potential challenges touched by 2050 Pathways Analysis the following:

- Policy Modelling
  - Collaborative Modelling
  - Immersive Simulation
  - Output Analysis and Knowledge Synthesis
- Data-powered Collaborative Governance
  - Open Government Data
  - Serious Gaming for Behavioural Change
  - Collaborative Governance

Question 2.2 - How long have you been running the platform/system? How many major updates have you implemented and what was the reason for these, if any? What specific technologies/tools were used? Were they open source/free/commercial? Are there any other technologies you are planning to deploy?

The project started in the summer of 2009. The greatest addition was the my2050 game that was not available from the very beginning (available in 2011). Secondly, a cost analysis notion was added, which was quite a challenging task. Moreover, some updates have taken place in the model (including visualisation), making it easier to understand and more user friendly.

The my2050 is considered a serious game. The main model of the case is based on Excel. The project uses open source software, which was a strategic decision of the project team. In addition, the platform provides the end user the ability to comment and make propositions for ameliorating the platform and the whole concept. There is also integration with social media: the platform gives the end user the opportunity to share his/her pathway to Facebook and Twitter.

Question 2.3 - Which are the policy/simulation/computational models you are using to support the platform/system? Can other models replace them, or is the platform/system built entirely on their operations/input-outputs? What kind of data do you use for your cases (open data/big data/public sector data/private date/etc.)? How are you handling them?

The end users have the ability to correct the data that is embedded in the model. They can download and remove the initial data and upload their own (e.g. that happened in South Korea case).

The model has been specifically set up to support the energy system and notion and it would probably be difficult to be implemented in other policy areas. In any case, following the same principles, the same work could be done for any other policy areas from scratch.

All data used in the project are public/open (e.g. official UK population). They do not
always exist in the format needed, but they are always open. The challenge is to look for the best and most reliable possible source. The tool itself gives the end user the opportunity to see the utilized data himself. Of course, one can find many different types of data in the model; from simple (like population) to sophisticated (like data referring to engineering or physics).

3. Results Achieved and Impact

Question 3.1 - What are the main results achieved by the case/initiative? What are the key indicators of the project/initiative (either impact-oriented or operation/technology-oriented)? How were they selected/developed? Were/ Are they met?

At the start of the project there was no specific set of KPIs set. In the first three months from the official project launch there were about 10.000 unique visitors in the platform. Regarding the my2050 there are over 16.000 pathways up to the date. Regarding the stakeholders, about 200 were involved in the initial (building) phase and after the launch about 500 stakeholders were contacted. Moreover, a week-long online debate including 5-6 experts took place with lots of comments from open public. In addition, a large number of presentations have been conducted in workshops, schools, conferences, NGOs, international colleagues etc. A presentation was made to the European Commission too. Really positive media coverage has also been noticed (around 15 key articles regarding the project). Other references to the case have also been made (e.g. cultural festivals).

Question 3.2 - What is the impact achieved (or expected) of the project/initiative both overall and per stakeholder group? Who were the stakeholders/stakeholder groups involved served? How (if) is the case been used in practice to support policy making?

The project’s initial purpose was to inform in a documented manner policy makers; and it was very successful. The most concrete example is the UK “Carbon Plan 2011” government document (how will the UK look in 2050), published in late 2011 which included as one of the main pieces of evidence and visualisation the 2050 Pathways calculator. In addition, the tool was used in budget statements and Annual Energy Statements. Moreover, the tool was used in General Election briefing work. It is important to note that there are Master’s programs, both in and outside of the UK, that engage the 2050 Pathways models and tools in their courses. In addition, the my2050 game is also communicated to pupils of various schools in the UK (there is a “schools’ toolkit” available and downloadable from the project's website, as well as from other websites – including the department of Education website). There are also a few other organisations that use the project’s calculator. NGOs are also utilizing the tool, in order to set their strategies and plans out. It has to be noted that due to the project’s open source nature, it is quite difficult to tell how many and who exactly are using the platform.

Question 3.3 - Which is the core innovation of your project/initiative? Has your case been recognised by policy makers? If so, to what extent? How has it been incorporated in long/short term policy making by decision makers?

One of the core innovations of the projects is the radical transparency and the ease of use. The model aims to encompass all technically possible futures and form a fruitful
debate based on realistic scenarios (and not on guesses). The model provides actually valuable feedback to high-level decision makers relative to communicating and interrogating different scenarios.
The 2050 Pathways is part of a long-term governmental strategy. As also stated before it is part of the UK "Carbon Plan" document, published in late 2011.

4. Challenges encountered and lessons learned

Question 4.1 - What are the key lessons learned? Which were the key success factors and drivers that enabled positive developments?

One of the core lessons learned was that there is a need to involve people as early as possible; the early involvement of all kind of stakeholders was really helpful in the case. In addition, it helps to be open; people appreciate openness and transparency. Collaborative working was also fruitful and constituted a real benefit. Moreover, actual innovation can really excite people and make them efficient.
In addition, we learned that if you design something really well, it could find acceptance to audiences you did not have in mind at the beginning. A dynamic, instead of a static approach is also more possible to find acceptance in the end users. Additionally, “be simple” is another lesson learnt; simplifying things helps both stakeholders and end users.

Of course, recruiting the right people for the right position is critical for the success of each project. The team included members from government, industry, NGOs, academia etc.
As a high level conclusion also, without the internet, the project wouldn’t have meaning, wouldn't have been implemented at all. Last but not least, you have to keep reminding people why you are doing what you are doing.

Question 4.2 - What are the main drawbacks of your case and the barriers you faced during implementation?

Effective collaboration and dialogue is always time consuming. One has to draw the line and identify the limits of the time that are needed to be spent in dialogue. Another challenge is to try to keep the ethos of the project alive despite changes in personnel. In addition, although it may seem easy to use to experts, it may still be difficult for open public; facilitators can be of use. Keeping the interest alive for a long time (especially after the initial success) is also challenging.

Question 4.3 - Which recommendations would you provide based on the experience gained in your case? Which risks have you identified and should be taken under consideration? How to overcome the barriers faced?

Based on the up to today project's experience, we could say that the main recommendations are:
• Plan carefully; take into consideration the timelines of all stakeholders
• Involve people as early as possible
• Be simple and create simple to use tools
• Hire the right people at key positions, especially after launch for the steady state phase of the project
5. Sustainability

Question 5.1 - Was there any specific stakeholder engagement strategy so as to gain visibility and 'buy-in'? Did you manage a steady increase of participating users, or was there a peak due to a special event?

As before, the main plan increasing the stakeholders’ engagement was presenting them the whole initiative and involving them from the very beginning; even from when we had a blank sheet of paper. There is also a Delphi debate for expert discussion. The project team also published “Calls for Evidence” so anyone that may have been missed/ overseen would get to feed in his/ her evidence. The development of new tools for different audiences (e.g. Excel, web tool, My2050, school toolkit) was also a successful stakeholder engagement strategy. Peaks were recorded when the project first went online and when an article was published in BBC website. The project has not made the most out of social media, but it provides the capability to share on Facebook/Twitter. The project’s stakeholders’ engagement strategy also includes various organisations that work with schools and promote the initiative. Newsletters also exist.

Question 5.2 - Do you think that your case/tools could be applied in other domains? If yes, please name them and discuss the possible changes that would be required.

The model has been specifically set up to support the energy system and it would probably be difficult to be deployed in other domains. In any case, following the same principles, the same work could be done for other policy areas from scratch.

Question 5.3 - What are your future plans/ steps regarding the case/initiative?

First of all, data is currently being updated and a comparison between the projected and the actual results will take place. As such, the case could probably in the near future fit into the Monitor and Evaluation Policy Cycle step. Secondly, an international implementation of the project, aiming at 10 developing countries (including China, Indonesia, South Africa, Bangladesh), is in the making (by the end of 2014). In addition, the inclusion of historic (earlier) data is also a future plan. At the moment there is no strong link among the three models of the project and that’s something the team is currently working into. We will keep informing all the stakeholders about the project’s advancements and keep aiding decision makers in using the platform is also a continuous effort. In addition, there is a constant will to make the tools more efficient and attractive.

B4.2 Testimonials from end-users

Nick Pidgeon, Cardiff University
We have been using the 2050 Pathways Analysis tool (in fact the My2050 Calculators) in academic research activities that are investigating how people would respond and whether they will be willing to accept changes in energy planning. This research is part of a 20m GBP project titled “Public Acceptance of Whole-Energy System”71 and funded by the UK Energy Research Centre. At the beginning of the project the research team

71 http://www.ukerc.ac.uk/support/tiki-index.php?page=Transforming+the+UK+Energy+System
needed a tool to generate future scenarios and has decided to adopt the 2050 tool as it was in place and has showed quite good results.

The main decision taken was to utilise the my2050 version of the toolkit, as it is more illustrative and user friendly and more appropriate for the general population. As stated in the briefing note of this project\textsuperscript{72}, the my2050 tool is a unique and useful tool for engaging members of the public around energy futures and energy transitions. It offers a positive basis for engagement focused on solutions, rather than problems, while the basis for it, the pathways calculator, is found to be too technical for use with non-specialists within the field of energy systems.

In the frame of the project, different workshops were held where the tool was used in order to generate future scenarios in order to investigate then their acceptance by people. One key aspect that was found as missing from the my2050 tool is “Cost”, although it is clearly a very important factor when discussing energy futures. People want to know about cost and cost implications of various choices.

Following the workshops, a big survey has been carried out, with over 2,000 people taking part. This was also based on the toolkit, however the project team worked heavily on the selection of people in order to create a representative set of the society, which is not the actual case in the original 2050 Pathways Analysis, as it is open to the public and there is no evidence whether the people participating are forming a representative set of the UK population. At the end of the studies, the results will be presented to the UK regional and national governments, as policy makers are heavily interested in the outcomes of this research.

Summing up, the model seems as a very interesting and quite accurate one regarding the realistic generation of scenarios and is ideal for a number of studies.

\textsuperscript{72} http://www.ukerc.ac.uk/support/tiki-download_file.php?fileId=2420
B.2 GLEAM

B2.1 Interview with Case Project Team

The interview regarding the GLEAM case took place through teleconference infrastructure (Skype) on Thursday 29/11/2012 at 16:00 CET. The attendees of the meeting were the following:

**GLEAM Team**
- Alessandro Vespignani - a.vespignani@neu.edu
- Nicola Perra - n.perra@neu.edu

**CROSSOVER Team**
- Francesco Mureddu - francesco.mureddu@tech4i2.com

**NTUA Team**
- Sotiris Koussouris – skous@me.com
- Fenareti Lampathaki – flamp@epu.ntua.gr
- Panagiotis Kokkinakos – pkokkinakos@epu.ntua.gr

1. Rationale

**Question 1.1 - What was the motivation/justification to design, develop and deploy the case? Which needs of policy makers are you addressing? How is your case linked to the policy cycle? Was it based on previous work/project or did you start it as a new initiative? Who were the initiators of the initiative?**

The initial motivation for GLEAM was a research question of public health concern "can we do forecasting regarding the global spreading of diseases". With forecast we do not mean to predict when the next pandemic will strike (or what it will be), but, given the fact that the World Health Organisation (WHO) or some other agencies, raises some warnings about a cluster of cases of an infectious disease, be able to provide a forecasting infrastructure for its geographical and time spreading. This concept is quite similar to create a weather forecast.

The main starting point was based on research to develop the algorithms, collect the needed data, etc., and from 2003-4 till 2008-9 the team was occupied with the creation of the basic computational model that integrates all the data. GLEAM integrates data from census agencies, data regarding where people live at very high resolutions by the Socio-Economic Data and Application Center (SEDAC) that estimates population with a granularity given by a lattice of cells covering the whole planet at a resolution of 5x5 miles, 99% of the global air travels, about 40 databases from different countries for local mobility, commuting, transfer, etc.

All this data has to be integrated into the model that simulates the spreading of the diseases. This is just the engine of GLEAM. In 2009 the team was working with agencies and private companies for analysing the H1N1 pandemic. We realised it was difficult to communicate large amount of data to stakeholders as you don't know what people are really interested in and at the same time modification questions are constantly popping up in order to calibrate the model for studying different issues. So we decided to create a computational infrastructure (GLEAMviz) that, using in the background GLEAM, allowed us to setup any model in case of an emergency and to do almost the same heavy calibration that we do in a supercomputer environment, and also to make this data
available for exploration through a visual interface to agencies and people who could try to change the model's parameters, try different containment measures, etc. without coming back to the GLEAM team for needs of support. Also we decided to have something public that can be used for academic use to teach large-scale infectious diseases spread modelling without being forced to implement the engine. The public version does not contain all features of the full platform.

Regarding the Policy Cycle, GLEAM is targeting mostly the middle steps of this, namely policy design and implementation phases, as it aims to forecast and identify how disease are spreading in order to allow decision makers to design policies and deploy policy measures.

**Question 1.2 - What was your funding source at the beginning? How did you manage to get this funding? Which stakeholders have been involved?**

The research team started at the beginning working on the project and then after some time it started looking for funding and projects willing to sponsor the attempt. Initially the work performed in areas such as computational epidemiology, disease spreading on networks etc. was funded as part of scientific research, but not as part of the GLEAM project. Once the idea was more concrete, we got funding from US agencies (NIH, Defense Threat Reduction Agency), the EC through some projects (EPIWORK IP project and EPIFOR). In the website (www.gleamviz.org) there is the list of all funders. Also funding is coming from 2 major corporations (cannot disclose name).

At this time, the case is supported through funding for new features. EPIWORK funding is used to expand the functionality of the platform, to provide APIs to introduce specific agent based model within the existing model, to integrate the platform with another epidemic data sharing platform that is constructed in EPIWORK. There are many research areas that allow us to keep the platform alive and still do development. Another part of the funding comes from research contracts, from corporations that want to use the platform for their epidemic preparation plans (e.g. to evaluate the number of workers within an area that could get infected).

**Question 1.3 – Describe the different deployments of your initiative/case. Where is it deployed? What are the themes/topics of interest? Is it in experimental mode or fully operational? What is the role of various stakeholders involved?**

There are many deployments, including the US Defense Threat Reduction Agency (DTRA), undisclosed corporations and agencies like the EC JRC that uses GLEAM in its Crisis Management Unit. The collaboration with JRC started during H1N1 pandemic and at that point the GLEAMviz tool was not available but now the agency is getting the full computational infrastructure. Moreover there are also contacts with other agencies, such as the CDC, ECDC, WHO, etc. on a collaborative side.

2. Implementation

**Question 2.1 - Which specific methodologies/approaches were used? How were they selected? What is the expertise required of the research team involved and how is the interaction with users addressed? Are policy makers involved in the implementation as users?**

The expertise required in the research team is very interdisciplinary, so we have people coming from physics, computer science, mathematical biology, public health institutes, graphic designers for the interface, and HCI experts. You have to have a multidisciplinary team and create a common vision and goal, which is quite difficult in
The data used for the tool is mostly public data, but when talking about specific GLEAM platform, so anyone can construct the tool allows people to create their own models and simulate them through the GLEAM platform, so anyone can construct his own model with different parameters. The data used for the tool is mostly public data, but when talking about specific terms of unifying languages, skills, understanding of each other, and different way of work.

People from JRC have been providing feedback and can be considered the first link to policy making and we have been talking a lot with policy makers from agencies that are providing feedback. Now one of the developers is working at INSERM (National Institute for Heath in France). So the end users have been involved in the loop.

GLEAM touches the following Research Challenges of CROSSOVER:

- **Policy Modelling**
  - Collaborative Modelling
  - Model Validation
  - Immersive Simulation
  - Output Analysis and Knowledge Synthesis

- **Data-powered Collaborative Governance**
  - Visual Analytics
  - Open Governmental Data
  - Big Data

**Question 2.2 - How long have you been running the platform/system? How many major updates have you implemented and what was the reason for these, if any? What specific technologies/tools were used? Were they open source/free/commercial? Are there any other technologies you are planning to deploy?**

The 1st release of the platform was in 2010 and now we are at the 3rd year of the full release. There have been 4 major releases (now we are in the GLEAMViz 4.0) and the major changes were on improving visualisation and capabilities. Moreover, the last release has a different engine for the simulation that is 10x faster and in total about dozen releases. 3-4 updates every year.

The platform is open and the software too. Commercial software has been used only for development like Adobe Air for the client (needs licencing for developers), but for the end user it is free. However we have a public release, which does not have all the features of the software, and the full software is released only to specific agencies (like the JRC) that are in a position to install and maintain the software on their server. For several reasons we cannot offer the full model to all users, as for example we cannot directly support 20 or 50 installation and therefore support is only provided to major agencies that are running the full model. Moreover the full release runs on HPC that we provide to the community so we cannot allow every user to use all the features, as we would need a super-computing centre, which is not feasible at the moment.

**Question 2.3 - Which are the policy/simulation/computational models you are using to support the platform/system? Can other models replace them, or is the platform/system built entirely on their operations/input-outputs? What kind of data do you use for your cases (open data/big data/public sector data/private date/etc.)? How are you handling them?**

The GLEAM research team develops the model. The tool is a unique model. We are the only group with global capabilities at this time in terms of epidemic modelling. We are planning to create APIs and collaborate with other 2 groups to create an integration of the GLEAM model with localised agent based models which are much more detailed and will bring in the platform other computational models too.

The tool allows people to create their own models and simulate them through the GLEAM platform, so anyone can construct his own model with different parameters. The data used for the tool is mostly public data, but when talking about specific...
implementations like a pandemic plan for a big corporation, then the tool integrates data from these organisations that are not public and cannot be publicly shared. Moreover, the tool also integrates commercial data, like the IATA data, the OAG database, and data from various census bureaus. This data is only used for computations and cannot be redistributed through the tool. Everything else that can be accessed through the tool (like world population data, etc.) is publicly available in various sources.

The website has also a library of models (4-5 models available) and this will be enlarged by a future release (to 10-12 models) but the GUI allows to design your own models on a drag and drop canvas.

3. Results Achieved and Impact

Question 3.1 - What are the main results achieved by the case/initiative? What are the key indicators of the project/initiative (either impact-oriented or operation/technology-oriented)? How were they selected/developed? Were/Are they met?

| The number of active users is above 100. However many user accounts are from institutional laboratories, Universities. Thus they correspond to multiple individual users. |

Question 3.2 - What is the impact achieved (or expected) of the project/initiative both overall and per stakeholder group? Who were the stakeholders/stakeholder groups involved/served? How (if) is the case been used in practice to support policy making?

| The main results of GLEAM so far were the production of the forecast for the H1N1 pandemic that was quite successful. A validation paper that will be published in December 13th, 2012 will showcase that the GLEAM predictions were quite spot on. The main stakeholders that are using the software and support their policy-making procedures are the DTRA, the JRC, and the corporations that are using the software. |

Question 3.3 - Which is the core innovation of your project/initiative? Has your case been recognised by policy makers? If so, to what extent? How has it been incorporated in long/short term policy making by decision makers?

| The core innovation of GLEAM lies within the computational model which can integrate data from various sources and provide a forecast on the spread of epidemics on a global level, which was not possible before. Moreover, through the visual interface users are in a position to create their own models and investigate specific diseases and issues that they are interested in. JRC is using the tool in its long strategy, starting with the H1N1 disease. |

4. Challenges encountered and lessons learned

Question 4.1 - What are the key lessons learned? Which were the key success factors and drivers that enabled positive developments?

| The first lesson learned is that the use of Web2.0 technologies for the policy-making domain is not an easy task, as policy makers are not used to work with these tools. There is some scepticism or in some other cases too much trust. These computational implications |
Moreover, there is a real need for creating and sharing high quality data in real time. Results, so we can trust even more the results of the tools. Similar results. So it is a matter of creating different models that converge to similar results, so we can trust even more the results of the tools.

Policymakers, as it is happening with other product. Only few agencies (from the big ones) have small crisis management units that can maintain such tools. Big agencies do not have a computational or modelling unit and this requires a change of culture from the institution and the agencies.

The main drawback in our case had to do with the sustainability problem. The research effort so far has sustained the tool, but at a certain point policy makers shall understand that they should provide funding for maintaining these ICT computational tools for policymakers, as it is happening with other product. Only few agencies (from the big ones) have small crisis management units that can maintain such tools. Big agencies do not have a computational or modelling unit and this requires a change of culture from the institution and the agencies.

A first recommendation will be to build into the agencies units that can deploy, operate and further develop such tools. Agencies should use people that work in this research projects and let them lead inter-agency for moving the tools to the new level within these organisations and focus on the issues they need to tackle. Moreover, as we have watched that tools and Web2.0 technologies are being replicated easily, one should aim at integrating different tools and methods in an effort to help to do a better policymaking. We have seen that with the US storm Sandy, 20 models were on use and you could see different dimensions, but the models were converging in similar results. So it is a matter of creating different models that converge to similar results, so we can trust even more the results of the tools. Moreover, there is a real need for creating and sharing high quality data in real time.
5. Sustainability

Question 5.1 - Was there any specific stakeholder engagement strategy so as to gain visibility and 'buy-in'? Did you manage a steady increase of participating users, or was there a peak due to a special event?
Initially there was not such strategy as the community of epidemic modelling and computation tools is pretty small. The major stakeholders have been contacted during conferences, workshops, etc. It was the H1N1 pandemic which brought many people to the platform and then the tool has been disseminated by word of mouth based on the other usage scenarios.
At this time we are actively participating in conferences and meetings to present the tools. Moreover other material has been/is being created, such as short movies, brochures, and advertisement events. We have also a component called “Epidemic Planet” that is exhibited in museums to attract audience. In this context we try to push the tool into the education environment to facilitate students to learn more about epidemic spreading and global diseases to make the younger generation more familiar with the tool and the project.

Question 5.2 - Do you think that your case/tools could be applied in other domains? If yes, please name them and discuss the possible changes that would be required.

GLEAM has been developed to model disease spreading. The basic contagion process involved has clear biological roots that allow simple modelization. Other types of contagion instead, as for example knowledge diffusion, and adoption of a convention or a product, have a completely different nature and are much more difficult to threat. One of the possible, ambitious, extensions of our framework is its application in these different domains tackling a broad range of contagion processes.

Question 5.3 - What are your future plans/ steps regarding the case/initiative?
Our future plans include improvements and enrichments regarding the tool. Moreover, so far we have been working on human infection diseases. We hope to extend the model considering also vector born diseases (like malaria) that require also the modeling of vectors such as mosquitos. In this context the tool can be surely used for other issues as well.
Another direction is to move into other areas of contagion, so to deal not only with infectious diseases, but also work with knowledge Information for other epidemiological concepts. Moreover we plan to include more data and models in the platform and depending on the resolution and the needs of the users to create different ways to investigate the evolution of the epidemic. The basic idea is to use social media like Twitter, etc. to raise a flag when the signal of a potential disease is detected, and then run the simulations to test its possible impact. This will allow using the tool also for early detection also for different phenomena. But this is a task for the next 5-10 years.

B4.2 Testimonials from end-users
Nikolaos Stilianakis, JRC
GLEAMviz is a tool covering epidemics at a global level. It is pretty sophisticated and one of the best tools around, however as it happens with most modelling tools the user has to understand what is going on in the model in order to use it. Moreover, the tool is not a
simulation tool for every kind of disease but it is used specifically for fast spreading epidemics where the transportation plays a big role. It can be used as a prevention tool for planning and preparing by running scenarios, but it has to be noted that it is mainly used for global scope diseases, not small, local level outbreaks.

In this context, it is a good and valuable tool for a policy make who understands how epidemics work and has a scientific background on the field so he can interpret the results correctly. This is a fact for almost all modelling tools, as they are all based on assumptions and one has to understand how these underlying models work. So an administrator in a National Public Health Institution, at a EU level or in the Commission has to have some scientists supporting him to use the tool in the proper manner.

The JRC has used the tool during various fast-spreading diseases (in collaboration with the GLEAM team in Torino), and has communicated the results to the DG SANCO's unit working the emerging public heath threats, which took them under consideration.

JRC has the full version of the tool installed (not just the light version which is publicly available to everyone) and it at any time ready to run a simulation if issued by DG SANCO.

Vittoria Colizza, INSERM

In France, several epidemiological models have been deployed, but these mostly targeted threads on a national level (so within the country) and not on an international level. The GLEAM model has thus been employed but in most cases, as various institutes are only stuffed by doctors, medical stuff, epidemiologists or policy makers, there is a need for physicists and computer engineers to deploy the model and operate the toolkit.

Based on this need, a new attempt has been initiated under the HarMS-flu project\(^\text{73}\) in order to be able to adapt the GLEAM model on a country level and ease out the complexity of modelling so that it will be utilised by policy makers and medical stuff directly. More specifically, quoting from its website, "the HarMS-flue project brings together modellers, developers, medical doctors, epidemiologists, and public health professionals in order to: (i) collect, analyse and understand hosts interactions and behaviours at different scales and under different conditions (e.g. during an epidemic or in the absence of it), as well as epidemiological data; (ii) formulate theoretical approaches and develop computational frameworks for the harmonization of the different scales at play, informed by the data collected, and assess their predictive power; and (iii) develop a data-driven multi-scale computational platform, integrating the data and modelling knowledge acquired in the previous directions of the project, for the simulation of an infectious disease spread and possible interventions”

Going back to GLEAM, what is quite difficult to achieve in order to operate such a model successfully is the fact that the user needs to feed the model with a huge amount of accurate facts and data that need to be estimated correctly. Moreover, once this is done, the next difficult task is to interpret the results in a correct manner and to convey them in the most appropriate manner to high-level policy makers so that they understand their importance. In order to overcome this difficulty, it is important to go step by step and side by side with policy makers over the whole modelling cycle, so that they understand first-hand the basic ingredients and philosophy of the model, what the model can produce ad which are the limitations that the model has.

\(^{73}\) http://harmsflu.weebly.com
Moreover there is a need to bring on board also other modellers for collaboration and for sharing data resources in order to further extend the model and its applicability and there is a need to construct emergency centres like the ECDC. Also empirical data should be compared to the GLEAM outputs in order to see whether they converge and this will help researchers to study how to input specific data that may improve the predictions. This could be also boosted by the creation of a data sharing platform where people could upload datasets and share them with the community. This will help to develop a more streamlined process to link the model with other real-time input data and will allow a more dynamic validation mechanisms using also empirical data.

**Dennis Chao, Fred Hutchinson Cancer Research Center**

GLEAM is definitely one of the most developed software tools in its category; actually, for this kind of product, there is actually not much competition.

One of the most interesting parts of GLEAM is the very detailed airline transportation model that they have; something difficult and expensive. In addition, GLEAM is efficient and user friendly as a piece of software itself (e.g. user interface, graphic design). Moreover, GLEAM as a product is better than others in terms of outreach; the GLEAM team has performed effectively towards this direction.

GLEAM could apply to all kinds of diseases and epidemics. It is configurable and capable of doing so. The model can be altered and/or updated by the end user pretty easily. Although there is no personal experience in using GLEAM with policy makers, there definitely exists utilization of GLEAM in terms of European research (e.g. FP7 projects). Alternative uses of GLEAM would be teaching in universities; even high school students can easily use it and learn from it.

As future steps, collaborations with public administrations and/or NGOs could be envisioned, in order to achieve great results in terms of public health and relative application. In addition, in case things are not too tightly coupled, the visualisation component –GLEAMViz- could be a stand-alone piece of software.

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B.3 Opinion Space 3.0

B3.1 Interview with Case Project Team

The interview regarding the Opinion Space 3.0 case took place through teleconference infrastructure (Skype) on Friday 30/11/2012 at 08:00 CET.

The attendees of the meeting were the following:

**Opinion Space 3.0 Team**
- Sanjay Krishnan - sanjaykrishn@gmail.com

**CROSSOVER Team**
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- Francesco Mureddu - francesco.mureddu@tech4i2.com

**NTUA Team**
- Sotiris Koussouris – skous@me.com
- Fenareti Lampathaki – flamp@epu.ntua.gr
- Panagiotis Kokkinakos – pkokkinakos@epu.ntua.gr

1. Rationale

**Question 1.1** - What was the motivation/justification to design, develop and deploy the case? Which needs of policy makers are you addressing? How is your case linked to the policy cycle? Was it based on previous work/project or did you start it as a new initiative? Who were the initiators of the initiative?

Initially, we wanted to bring the world of big data to brainstorming (the process of generating ideas): how can we take advantage of the world of big data in the process of generating ideas. Can algorithms and statistical techniques (that worked well in other areas, such as robotics) operate towards this direction?

After the election of President Obama, the government had a social media orientation, which provided fertile ground for the first trigger case.

Opinion Space was based on a few prior projects that dealt with: (i) recommending NPOs to people so as to donate, (ii) a job recommendation system (background recommendation systems in general). The combination of recommendation systems and visualisation was the main trigger behind Opinion Space.

Policy makers need to know what the population they serve thinks; and this is definitely a complicated problem. Surveys are not the solution; they can be communicated to a certain number of people and need processing. They need to be able to take a quick "snapshot" of what people think. That’s the need that Opinion Space solves.

Opinion Space can be seen definitely as belonging to Agenda Setting phase of the Policy Making cycle. Nevertheless, it can also be used in order to evaluate policies and actions. Therefore, it also fits in the Monitor and Evaluate phase.

**Question 1.2** - What was your funding source at the beginning? How did you manage to get this funding? Which stakeholders have been involved? What is your case’s business model at the moment?

Opinion Space has been based on a mix of funding grants (e.g. NSF grants). In addition, every individual project has also received some industry funding.
Typically the way that individual implementations work is through initial contacts that lead to implementation; there are no contracts in the business sense. It’s more like the fund Opinion Space in order to view the results of this kind of research in their domains (e.g. Fujitsu funded Opinion Space in order to see the results of sentiment analysis on e-learning).

**Question 1.3 – Describe the different deployments of your initiative/case. Where is it deployed? What are the themes/topics of interest? Is it in experimental mode or fully operational? What is the role of various stakeholders involved?**

The first two projects (in 2009) were with the US State Department. Then, by generalising the system, we worked with the US auto-maker, with an insurance company, an HR department in UniLever (what employees thought about various policy decisions in the company), in various academia-oriented questions, in local state measures (e.g. California) etc. Opinion Space is fully operational in its current state. Nevertheless, as a research platform it still remains experimental. The great amount of data is very structured and this helps towards continuing research on text analysis, statistical modelling etc.

**2. Implementation**

**Question 2.1 - Which specific methodologies/approaches were used? How were they selected? What is the expertise required of the research team involved and how is the interaction with users addressed? Are policy makers involved in the implementation as users?**

Opinion Space uses a technique in order to project a five-dimension (up to eight-dimension) space in the two-dimension space. This is used in order to visualise diversity, which is critical for the purposes of Opinion Space. This technique was selected because it is established in other domains, such as robotics. Visual analogue slider is also used in the frames of Opinion Space in order to give users the ability to rate in a continuous manner and not in a binary one (like / dislike). Thus, mathematical, mathematical modelling, industrial and artificial intelligence background can be found in the members of the Opinion Space team. Design groups and human-computers interaction groups were also consulted. Policy makers are directly involved. They make their questions but they always need our assistance. The Opinion Space team involvement is not necessary, but it actually makes the system operate in a better way. They are also involved in the course of the development: the development is modular and they provide feedback in every step. In this way they also provide initial ideas and they get familiar with the whole system. We have identified as potential challenges touched by Opinion Space the following:

- Policy Modelling
  - Collaborative Modelling
  - Easy Access to Information and Knowledge Creation
  - Output Analysis and Knowledge Synthesis
- Data-powered Collaborative Governance
  - Opinion Mining and Sentiment Analysis
  - Visual Analytics
  - Open Governmental Data
Question 2.2 - How long have you been running the platform/system? How many major updates have you implemented and what was the reason for these, if any? What specific technologies/ tools were used? Were they open source/ free/commercial? Are there any other technologies you are planning to deploy?

Opinion Space has been running since 2009. Besides 1.0, 2.0 and 3.0 (current version), there were various unnamed versions of the initiative (mostly based on the 3.0 code). Version 1.0 basically just visualised diversity and it was not really an idea generation platform. In version 2.0 we tried to capture and visualise the user interaction and the main innovation introduced was the ranking system; users could evaluate each other's ideas. In version 3.0 the ideas was to make the whole platform user centric. We incorporated ideas from human-computer interaction into the platform. Another innovation was the introduction of more and more sophisticated statistical tools. After that the main focus was on increasing traffic. In addition, there is an additional moderator space for policy makers. It gives them a wrap-up of the top ideas and allows them to change ideas etc.

Opinion Space primarily uses open source software. However, Opinion Space's licence is assigned to the university.

Specific technologies and tools include a web application that hooks up to a database analytic system (a relational database to be more specific, as a lot of the available data is extremely structured) through middleware. The UI is a flash-based interface and the statistical platform is Python-based. Opinion Space also incorporates techniques from deliberative polling, collaborative filtering, statistical inference, and dimensionality reduction.

Question 2.3 - Which are the policy/simulation/computational models you are using to support the platform/system? Can other models replace them, or is the platform/system built entirely on their operations/ input-outputs? What kind of data do you use for your cases (open data/big data/public sector data/private date/etc.)? How are you handling them?

Opinion Space's techniques can be easily applied to other sets of existing open data.

3. Results Achieved and Impact

Question 3.1 - What are the main results achieved by the case/initiative? What are the key indicators of the project/ initiative (either impact-oriented or operation/ technology-oriented)? How were they selected/ developed? Were/ Are they met?

One of the first and main indicators was the participation rate; users that arrive in the platform for the first time and those that become active participants. People that arrive in websites are always more than those who actually participate (in some projects the rate was close to 50% and in others around 10%).

In the State Department instance, more than 2000 different ideas were collected (about US foreign policy). In addition, more than 5000 individual responses were collected. It cannot be said whether the final decisions were based on some of the ideas provided, but a detailed report was provided to the policy makers. The project with a US automaker (targeted towards recognising ways of improving their image) resulted to about 1000 ideas and about 100.000 ratings evaluating these ideas (e.g. more specifically they talked about green vehicles).

Question 3.2 - What is the impact achieved (or expected) of the project/ initiative both overall and per stakeholder group? Who were the stakeholders/ stakeholder
Regarding Opinion Space, the platform works particularly well when you apply it to mobile devices and is easily set and operated.

First of all, when you apply social media systems in such procedures you always need the lightest application possible, which works across all platforms (operating systems, mobile devices) and is easily set and operated.

Regarding Opinion Space, the platform works particularly well when you apply it to a

4. Challenges encountered and lessons learned

Question 4.1 - What are the key lessons learned? Which were the key success factors and drivers that enabled positive developments?

The first and main lesson learnt is that the slightest effort needed by the user really affects participation; everything needs to be easy and user friendly. For example, by increasing the start-questions from 5 to 8, participation decreased almost 50%. In addition, we learnt more about machine learning techniques and algorithms and their capabilities and sensitivities.

From the policy makers point of view (State Department to be more specific) they learned that ideas can be very diverse and scattered; and many times this is neglected by media and press.

Question 4.2 - What are the main drawbacks of your case and the barriers you faced during implementation?

The Opinion Space platform performs a lot of actions so maybe a lighter version should be considered. In terms of policy makers, many concerns on privacy have been raised; different regulations regarding data make things complex. In addition, when introducing a new concept/technology, users might be reluctant in using it. Last but not least, the choice to implement the platform on Flash has led to loss of all Apple-devices users.

Question 4.3 - Which recommendations would you provide based on the experience gained in your case? Which risks have you identified and should be taken under consideration? How to overcome the barriers faced?

First of all, when you apply social media systems in such procedures you always need the lightest application possible, which works across all platforms (operating systems, mobile devices) and is easily set and operated.

Regarding Opinion Space, the platform works particularly well when you apply it to a
specific use case or/ and a well formulated idea.
In terms of risks, two principal risks can be identified: (i) implementation – the result might not be the desired or requested one, (ii) not well structured ideas/ questions (e.g. what is the meaning of life) may wh or inability to refer to the proper audience may result to failure in participation.

5. Sustainability

Question 5.1 - Was there any specific stakeholder engagement strategy so as to gain visibility and 'buy-in'? Did you manage a steady increase of participating users, or was there a peak due to a special event?

First of all, Opinion Space can trigger/ invite users of other/ older cases to participate in new ones. The "core" users of Opinion Space are about a couple of hundreds.
In addition, the Opinion Space team uses Google adwords, SEO and sends emails to relative emailing lists.
The increase of users really depends on the timing, as well as on how interested are people about the specific subject under consideration.

Question 5.2 - Do you think that your case/tools could be applied in other domains? If yes, please name them and discuss the possible changes that would be required.

Opinion Space is technically capable of handling any kind of question. Any brainstorming/ idea generation project in any kind of organization can by supported.

Question 5.3 - What are your future plans/ steps regarding the case/initiative?

First of all, there is a continuous effort to make the platform easier and more user friendly. We are working on a lighter Opinion Space without the initial five questions; it will just ask the user to comments and his/ her comments will be evaluated. In addition, we are working on a “global” version of Opinion Space based on HTML, which will work across any platform.
In terms of research, we are working on machine learning techniques that can help dealing with larger amounts of data. Moreover, amelioration of algorithms is also a continuous research theme.
There is also a plan of collaborating with the State Department once again. In addition, independent projects come up in the course of time.
B.4 UrbanSim

B4.1 Interview with Case Project Team

The interview regarding the UrbanSim case took place through teleconference infrastructure (Skype) on Thursday December 4, 2012 at 17:30 CET.

The attendees of the meeting were the following:

**UrbanSim Team**
- Paul Waddell - waddell@uanalytics.com

**CROSSOVER Team**
- Gianluca Misuraca – gianluca.misuraca@ec.europa.eu
- Francesco Mureddu - francesco.mureddu@tech4i2.com

**NTUA Team**
- Sotiris Koussouris – skous@me.com
- Fenareti Lampathaki – flamp@epu.ntua.gr
- Panagiotis Kokkinakos – pkokkinakos@epu.ntua.gr

1. Rationale

**Question 1.1 - What was the motivation/justification to design, develop and deploy the case? Which needs of policy makers are you addressing? How is your case linked to the policy cycle? Was it based on previous work/project or did you start it as a new initiative? Who were the initiators of the initiative?**

UrbanSim is a project based mostly on a software platform being developed quite a few years now. In the mid 1990’s (when UrbanSim was first conceived) the original motivation was to interact in the policy analysis domain at the metropolitan scale principally around the issues of transportation and land use, but also environmental planning. The context was initially only USA with the metropolitan planning organisations of each area, which are the legally mandated organisations to undertake regional transportation planning and to funnel federal funds for transportation projects dealing with this matter.

The challenge that UrbanSim was initially trying to address was the shortcoming in analytical capacity of Metropolitan Planning Organisations (MPOs); they were unable to effectively analyse the secondary or cumulative impacts of transportation investments (e.g. new highways, highway widening, rail transit) on urban development (e.g. where new housing gets developed). The consequence of this limitation was that there was a significant bias towards overestimating the benefits of new construction and highway capacity expansion and this became the basis for a legal challenges, mainly by the environmental movement (they challenged legally decisions of implementing new construction projects without considering the long-term impact).

So we designed and implemented the UrbanSim platform as a way to analyse the effects of changes in the transport system on urban development (travel patterns, effectiveness of transport projects. Regarding the Policy Cycle, the project probably fits in the Policy Design and Implementation phase

Nevertheless, motivation has evolved over the years. It still maintains the core of allowing analysis of secondary/ accumulated effects of transport-related investments,
but now more broadly encompasses the desire of many local and regional planning policy makers to assess the impacts of land use policies (e.g. in California there is legislation to reduce greenhouse gas emissions not only by changing types of fuels/vehicles; the law calls also for MPOs to coordinate with local cities to change land use patterns in ways that reduce the need to travel by car). So, based on this agenda, UrbanSim now deals with evaluating packages of measures of various policies that include examining building codes, incentives, impact, different policies etc. At this time, UrbanSim has a portfolio of transfer-related projects but also land use policies. Thus, the motivations have broadened in the course of time.

More recently, increased interest has been noted in analyzing policies that relate to portable housing, equity and economic development. In addition, increased interest has been shown in public engagement in decision making processes/policy design (e.g. recent project in San Francisco area aiming to develop a 3D visualisation system that would complement UrbanSim in providing capacity for community residents and local planners to be able to visualize alternative scenarios and have a stronger intuition around what these alternatives might look like in terms of their impact on urban development over the next 30 years).

The initial idea came after a long literature review mostly on urban economics, micro-simulation and GISs. The software platform itself was developed from scratch.

**Question 1.2 - What was your funding source at the beginning? How did you manage to get this funding? Which stakeholders have been involved? What is your case’s business model at the moment?**

The very initial funding was from a consulting project in order to design and develop and urban simulation model of the Honolulu MPO. Subsequently, a National Science Foundation grant was obtained (for an urban research initiative) which led to a substantial increase in the research on how to approach such a complex simulation and policy analysis platform. The initial findings led to several more grants from NSF (probably 6 different – over 10,000,000$ in total). In addition, an EU FP7 project called “Sustain City” (www.sustaincity.eu) has brought some funding. Nevertheless, most of the real-life application growth has come from contracts with various MPOs that have actually used the system.

**Question 1.3 - Describe the different deployments of your initiative/case. Where is it deployed? What are the themes/topics of interest? Is it in experimental mode or fully operational? What is the role of various stakeholders involved?**

There have been a lot of deployments including USA, Europe and Africa. It has to be noted that the experience in the US is very different than in Europe (and also other international applications).

The main difference is that UrbanSim has been actively involved in developing the applications in close collaboration with NPOs in US and has moved from a research to an applied context (they are actually being used in formal/legal planning efforts – public administrations fund and actually use the platform), while in Europe we had a modest advisory role, we provided some innovations in terms of access to software/algorithm/models improvements but most of the work is being done by research teams scattered throughout Europe and the government agencies have not been active partners and much time has been devoted on doing research that the participating research teams were interested in, but with less engagement of the actual planning agencies.

The reason behind this lack of collaboration in the European case is not clear. Maybe due to the need for immediate innovation relevant to EU context. The two main limitation of the project deployment in the EU were: (i) not having active PA partners from the very beginning of the project and (ii) the difficulties caused by the new users of...
UrbanSim that had not interacted with the platform before and were not experienced in developing models, calibrating them, adding data etc.

2. Implementation

Question 2.1 - Which specific methodologies/approaches were used? How were they selected? What is the expertise required of the research team involved and how is the interaction with users addressed? Are policy makers involved in the implementation as users?

In terms of methodologies, UrbanSim uses preliminary data analysis to organize an integrated UrbanSim data system (data fusion or data integration methodology), behavioral models, metric models, regression models, free choice models and equilibrating dynamics. Most recently methodologies for community engagement have been used (though a visual environment in which users can compare side by side two different propositions. In terms of technologies, free choice modeling can be also considered as a technology, technologies for analyzing uncertainty, techniques for validating models, technologies for 3D urban modelling.

We have identified as potential challenges touched by URBASIM the following:

- Policy Modelling
  - Systems of Atomized Models
  - Immersive Simulation
- Data-powered Collaborative Governance
  - Big Data
  - Visual Analytics

UrbanSim has a quite multi-disciplinary team: PhD holders in computer science, computer graphics, urban planning, transportation planning and modelling, civil engineering, urban real estate design and development and finance. We are also collaborating with people that are experts in community engagement and participation. Policy makers are definitely involved in the implementation, especially in the US cases. When applied projects with planning organizations are implemented, the users are active participants in the whole process (even from the research part). Planners and analysts from the PAs are actively involved in what UrbanSim calls “agile modeling”. UrbanSim follows a very modular approach that allows the team to reconfigure and add any necessary part of the model, due to the fact that the model may alter dramatically amongst various application cases. Policy makers are also involved in monthly iterations where they use and test the model under development and provide feedback. This helps not only in terms of feedback, but also in terms of the policy makers getting familiar with the model and platform.

Question 2.2 - How long have you been running the platform/system? How many major updates have you implemented and what was the reason for these, if any? What specific technologies/tools were used? Were they open source/ free/commercial? Are there any other technologies you are planning to deploy?

The first platform implementation was in Java. In 2005 a decision was taken in order to re-implement it in Python. Most recently (in the last year), a new extension of UrbanSim has been developed, UrbanVision, which is a 3D urban visualisation and supports also editing scenario analysis.

Initially, UrbanSim was available as an open source license downloadable from the web for more than 10 years. UrbanVision and some additional extensions are implemented
researching and drafting of four case studies on applications of ICT solutions for governance and policy modelling

in a new platform in C++. Those were decided to be distributed as closed source, with very differential pricing for public agencies, private agencies, educational/ research institutes etc. The decision was taken mostly due to competition from commercial entities.

Question 2.3 - Which are the policy/simulation/computational models you are using to support the platform/system? Can other models replace them, or is the platform/system built entirely on their operations/ input-outputs? What kind of data do you use for your cases (open data/big data/public sector data/private date/etc.)? How are you handling them?

With the modularity followed in UrbanSim, different configurations for any models can be created and the used is taught how to change those configurations (e.g. change a residential location model with another). However, the user community is very diverse in an interest and technical background level. The number of users that actually want to go deep into the models is relatively small. We also provide support towards any UrbanSim-related activity.

As far as the data as concerned: in the past, the agencies have typically been very protective of their data. Some data (the minority of them) were indeed legally protected/ confidential/ proprietary (in various senses), while the majority was open. Yet, authorities were protective with all of them and kept them in their computers after the completion of the project. What UrbanSim is beginning to do is, both by working with a university and by developing the proper tool, is to create an online platform in which we ask from agencies to contribute their data in order to become publicly available and create an API for access to them. This repository could be used both for research and for the models (having access to an archive of data is a key factor towards successful models).

3. Results Achieved and Impact

Question 3.1 - What are the main results achieved by the case/initiative? What are the key indicators of the project/ initiative (either impact-oriented or operation/ technology-oriented)? How were they selected/ developed? Were/ Are they met?

Regarding the European case, it can be said that it is not in the same level as the US ones. In the US there are quite a number of MPOs that actively utilize the UrbanSim platform. The most indicative application is probably the San Francisco Bay one. The results of the aforementioned case have involved examining and analyzing five alternative scenarios that required articulating a set of assumptions about land use policies, transport policies and macro-economic growth (the analysis in now complete).

In one of them, analyzing visibility of the proposed policy though reverse engineering was attempted, that made the task much more challenging. The agency has now accepted the results, with documentation and visualization supporting them.

Question 3.2 - What is the impact achieved (or expected) of the project/ initiative both overall and per stakeholder group? Who were the stakeholders/ stakeholder groups involved / served? How (if) is the case been used in practice to support policy making?

In the San Francisco case the 3D visualization system was created in order to attract more citizens. The intention was to use this system in a number of workshops held in January 2012. User engagement was intense even from the development/ testing phase.
In addition, the public agencies used it in a series of meetings with community organizations. Each of these meetings had from 15 up to 200 participants each. The point of these meetings was to communicate the different scenarios to open public and to get feedback on the preferences of the citizens. Unfortunately, the visualization was effectively used only in a couple of these meetings; they were obstructed by the Tea Party movement.

Question 3.3 - Which is the core innovation of your project / initiative? Has your case been recognised by policy makers? If so, to what extent? How has it been incorporated in long/short term policy making by decision makers?

One of the most innovative and controversial elements of UrbanSim is the combination of various aspects (named in question 1.1) as well as the “move away” of strong assumptions regarding urban markets and adopt less strong assumptions (than markets are an equilibrium). For example, the impacts of transport projects on urban planning are far from being instantaneously realized (in fact they might evolve over decades. In addition, the capacity of being able to support this less strong assumptions can also be considered as a core innovation.

The core innovation in the particular case of San Francisco can be found between the following two: (i) the visualization way of community engagement (UrbanVision component) and (ii) the creation of a new approach towards modeling real estate development based in pro forma analysis (that enabled the reverse engineering exercise described in Question 3.1.

The case has definitely been recognized by policy makers and incorporated in their formal procedures. Thus, it can be said that it has been incorporated in the long term policy making by policy makers of the San Francisco area.

4. Challenges encountered and lessons learned

Question 4.1 - What are the key lessons learned? Which were the key success factors and drivers that enabled positive developments?

One of the main key lessons learned from the UrbanSim case has been the fact that there is always an option to have a balance between academic research (mostly funded by NSF but also others) and real-life applications towards producing real working systems. Moreover, when dealing with such applications, it is very important to engage people from the early steps of the project, in order to get familiar and acquire as much data as possible.

Question 4.2 - What are the main drawbacks of your case and the barriers you faced during implementation?

Some of the main challenges faced were the very short time frames of the project and having rather poor data available from agencies to begin the project. In addition, public disruption was another challenge.

Moreover, having too much software development at the same time was another risk.

Question 4.3 - Which recommendations would you provide based on the experience gained in your case? Which risks have you identified and should be taken under consideration? How to overcome the barriers faced?

The first recommendation deals with early engagement; policy makers and end users in general need to be engaged in the project as soon as possible.

Adequate time for the development of the models and testing of the models is also
necessary. Additionally, finding out a new public engagement strategy, more capable on avoiding public disruption movements is also advisable (probably through smaller meeting and interaction through the web).

5. Sustainability

Question 5.1 - Was there any specific stakeholder engagement strategy so as to gain visibility and 'buy-in'? Did you manage a steady increase of participating users, or was there a peak due to a special event?

The agile modeling approach described earlier is part of the stakeholders’ engagement strategy, as well as early collaborative testing of the model and the visualisation tools. The stakeholders’ engagement strategy did increase the participation over some months, but participation spiked during January 2012, when the public meetings took place. After this phase, more analytical modeling followed, and another round of public engagement took place.

Question 5.2 - Do you think that your case/tools could be applied in other domains? If yes, please name them and discuss the possible changes that would be required.

UrbanSim is already exploring transportation and land use domains, as well as urban design. Environmental issues (e.g. greenhouse gas emissions) were motivation to some projects, so environmental planning is also quite relevant. Energy consumption or water consumption constitute interesting issues too. Modelling the impact of climate change (e.g. on weather) is also a topic of interest. Finally, as also mentioned earlier, economic development/policies are also under consideration.

Question 5.3 - What are your future plans/ steps regarding the case/initiative?

The UrbanSim team is currently thinking on how to organize communicating UrbanSim to European public administrations (and establish and office in Europe as well) and other countries (e.g. Singapore, Argentina). In addition, we have recently begun expanding our development team and partnerships. In addition, the online platform in which we ask from agencies to contribute their data if an on-going effort. Moreover, ameliorating the robustness and generalization of the model is also an ongoing piece of work. There is also collaboration with academia on big data, based on an NSF grant.

B4.2 Testimonials from end-users

Bilal Farooq, EPFL

Transportation is definitely not an independent entity; it is connected to land usage, energy usage etc. Thus, it definitely makes sense to model it as a complex interconnected system. The application of this approach was implemented in the context of the SustainCity research project that took place in Paris, Brussels and Zurich. Already operating tools (MATSim for transportation and UrbanSim for land

http://www.sustaincity.org
usage) have been selected due to the fact that UrbanSim was heavily advanced on the land use side, but no so much on the transportation side. UrbanSim was selected after an extensive state of the art desk research, where it was deduced that it was the most easy to transfer platform.

The UrbanSim models urge for large amounts of data; especially in the Brussels case, the greatest challenge was to locate, collect and transform in a useful form the necessary (statistic, demographic etc.) data. In addition, real estate markets, but also transportation systems are rather different in Europe than in the US. Thus, another challenge was to ascertain that the UrbanSim models were flexible enough in order to fit the European cities’ needs.

The actual transfer was pretty difficult; the support from and collaboration with the UrbanSim team was critical in order to achieve the (eventually) strongly positive outcome. Various project partners performed updates, extensions and advancements in the platform too. The project is now in its final phase (out of an 18 months initial duration): various simulations (e.g. alternative policy implementation scenarios) are conducted.

Various stakeholders (e.g. public administrations, consulting companies) are already involved in the procedure; however, the project is research-oriented. It is unclear whether it will be eventually used or not.

In terms of lessons learned, the early involvement of decision makers (and all other stakeholders) proved to be extremely fruitful (especially in the Zurich case). In addition, relevant to the aforementioned, regular communication between the project team and end users should be established. Moreover, UrbanSim provides the user with amazing data (large amounts of organised data); in SustainCity we were not able to fully exploit all these data. In terms of platform, it has to be supported (from a software point of view) and it also has to be flexible. As far as the 3D visualisations are concerned, although the were not intensively used in SustainCity, they are considered as highly useful, especially when dealing with non-experts, in order to help them understand the concept and the envisioned outcomes.

The scope of the project is to aid policy makers in taking better decisions; that's what it is envisioned as a future step of the SustainCity project.
### Annex C – List of Complete Set of Cases Initially Identified

The following list includes the initial cases retrieved during T1 of the study.

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<td>The public and government can solve problems together</td>
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