

Summary Proceedings of “Information for Innovation and Socioeconomic Development”, an International Workshop held in Florence, Italy, June 23 – 24, 2013

“Information for Innovation and Socioeconomic Development”

**An International Workshop held in
Florence, Italy, June 23 – 24, 2013**

**Summary Proceedings,
Editors**

**Francoise Pearlman
Mary Ann Stewart**



Overview

“Information for Innovation and Socioeconomic Development”

International Workshop at the crossroad of Earth Information, Technology and Social Sciences, was conducted as a pre-event to the INSPIRE conference, June 23 – 24, 2013, Florence, Italy.

This workshop was the latest in a series of workshops on the “Socioeconomic Benefits of Environmental Information”, which have been held alternatively in Europe and the United States.

The focus of the previous workshops was on methodologies and use case development. With this workshop, we intended to broaden the focus to include the following themes:

1. Information (Earth Observation, geospatial data, community generated data) as a driver for economic and social development, including measures of well-being that move beyond GDP as an indicator
2. Economic impact of innovations stemming from Open Data and the re-use of Public Sector Information
3. Importance of communications to reach across disciplines from scientists to citizen-scientists to end-users.

Keynote addresses highlighted the state of the art, in this multi-disciplinary field and introduced the three themes above. The workshop had a combination of invited presentations, submitted papers, and panel discussions on these themes. In addition, use cases addressing quantitative results were included.

Recommendations for a path forward were presented at the conclusion of the second day. Biographical summaries for the speakers are provided in Attachment I.

Approximately 68 international participants coming from Western and Eastern Europe, North America, and Australia attended the workshop over the 2 days. They belonged to the public sector, academia, and industry, and covered a variety of specialty areas. A list of participants is provided in Appendix II, and a group picture is provided below.

This event is the next step in building a multi-disciplinary community of practice to further support the use of geospatial information as a socioeconomic driver. The workshop provided opportunities to network with both developers and users of geospatial information to encourage long-term mutual support. In addition to the LinkedIn site created as an outcome of last year’s workshop, the new socioeconomicbenefit.org website was introduced. The website highlights upcoming events and useful links, and provides a repository for a list of experts, relevant literature, and use cases. These tools will support communications within the community.

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Agenda

**“Information for Innovation and Socioeconomic Development”
International Workshop at the crossroad of Earth Information,
Technology and Social Sciences, June 23 – 24, 2013, Florence, Italy.**

Day 1, June 23, 2013

Time	Topic	Speaker
SESSION 1: Introduction – Chair David Harper		
9:00	Introduction and objectives – Setting the Stage	Max Craglia, JRC, EC; Andrew Coote, ConsultingWhere, UK; Jay Pearlman, J&F Enterprise, USA
SESSION 2: Assesment of Socioeconomic Impacts – Chair Jay Pearlman		
9:30	Benefits realized from INSPIRE	Max Craglia, JRC
9:50	Valuing geospatial information – a review	Alan Smart, ACILAllen, Australia
10:10	Advances in well being evaluation through citizen science participation: new values, new tools and measures	Cristina Capinieri, University of Siena, Italy
10:30	Break	
11:00	Good basic data in Denmark	Tina Svan Colding, Danish Ministry of the Environment
11:20	Questions and Discussion	
12:20	Lunch	
SESSION 3: Economic Impacts of Innovation (Open data and re-use of public sector information)		
Chair - Andrew Coote		
13:45	Economic Value of Geo Services	Ed Parsons, Google, UK

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Time	Topic	Speaker
14:05	Economic benefit of free and open data policy	Marc De Vries, The Green Land, The Netherlands
14:25	SMEs as key players in geospatial-driven innovation	Giacomo Martirano, smeSpire, Italy
14:45	Funding public sector information – someone has to pay	Guenther Pichler, ESRI
15:05	Break	
15:35	The societal impact of standardization in the geospatial community – the point of view of SMEs and public administration	Giuseppe Conti, Trilogis
15:55	Socio-economic opportunities from open data and models	Kenji Takeda, Microsoft Research
SESSION 4 –Communication to decision makers and society at large; Chair – Andrew Coote		
16:20	Toward the preparation of environmental legislation on the basis of scientific evidence	Nicola Pirrone, CNR, Italy
16:40	Effective communication	Geof Bowker, UC Irvine, USA
17:00	Identifying and Communicating with Science Stakeholders	Suzie Allard, University of Tennessee, USA
17:20	Questions and discussion	
18:00	Adjourn day 1	
Day 2, June 24, 2013		
9:00	Discussion and Summary day 1	Jay Pearlman, Max Craglia, Andrew Coote, Mary Ann Stewart, Rich Bernknopf
SESSION 5 – Practical Experiences – individual use cases; Chair – Mary Ann Stewart		
10:00	Perspectives: How Economic Analysis Changes with One’s Point of View	David Arthurs, Hickling Arthurs Low Corp, Canada
10:20	Space sector contribution to economy and society	Claire Jolly, OECD
10:40	Break	
11:15	SEAWETRA, a prototype for marine environment management	Aurèlie Moulins, CIMA Foundation, Italy

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Time	Topic	Speaker
11:35	Civil Protection Agencies beyond the simple rescue: prediction and prevention in a scenario of climate changing	Franco Siccardi, Civil Protection, Italy
11:55	GEOSS Challenges and Opportunities	Barbara Ryan, GEO
12:15	Lunch	
13:45	Questions and discussion	
SESSION 6: Path forward and wrap-up; Chair- Max Craglia		
14:30	Panel - Matching solutions with needs	Richard Bernknopf chair (and background) – Mary Ann Stewart, Suzie Allard, Alan Smart, Kenji Takeda
15:30	Break	
16:00	Panel – way forward	Workshop Organizers
17:00	Wrap-up	
17:30	Adjourn Workshop	

Photo Gallery



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Presentations

Session 1 – Chair David Harper from Environment Canada. **Jay Pearlman from J&F Enterprise, USA, Max Craglia from the European Commission Joint Research Center (EC JRC), and Andrew Coote, from ConsultingWhere, UK.**

The panel welcomed the attendees. Jay Pearlman then walked through the agenda.

Andrew Coote reviewed the workshop objectives: to be a dialogue among participants rather than a series of lectures; to build a community; to provide clarity to the issue of quantification (in addition to timing, and political understanding); and to provide advice on best technique in various situations. He mentioned the need to justify to clients why they should spend money on this technology to provide a basis for decision makers to assess the tradeoffs among competing investments. After discussing what is demanded of the socioeconomic benefits community, Andrew summarized who are suppliers and what disciplines are included (economists, communicators, citizen scientists, natural scientists, among others), and posited the question – ‘do we meet the needs of this community? Finally, he highlighted the key questions to be addressed as a result of the workshop:

- How are political decisions made?
- What can we learn to facilitate the communication of value?
- Is establishing economic value only an issue for the public sector?
- Has the commercial sector solved the problem?
- What are the components of value to society? Economic benefits are one part of the story.
- Can we put a value on serendipitous or “spin-off” applications, i e., those applications that are not predicted as the basis for justifying an investment in geospatial data?
- Do we only care about value when we are selling the project at the start (ex ante or prospective analysis)? Can we measure the economic value in use as predicted (ex post or retrospective analysis)?

Session 2 – chair Jay Pearlman, J&F Enterprise.

Max Craglia, JRC, EC - Benefits realized from INSPIRE.

Max briefly discussed the background to INSPIRE. Europe is a patchwork of many countries with different traditions, cultures and socio-economic models. This is reflected in terms of their geospatial management choices. Every country in Europe has a different mapping system, sea level, and language. For example the tunnel under the channel was constructed with a 40cm difference between the 2 ends of the tubes.

There is currently a review of the INSPIRE legislation after 7 years; a formal evaluation study is starting this year. The INSPIRE directive provides a decentralized framework; specifying what to do but not how to do it. Each of the 27 countries has their own legislation. INSPIRE includes 34 Thematic scopes for which a common agreement has been reached between the member states. Technical specifications are worked with support from the individual member states, which vote to accept the specifications. The member states retain their own data and maps, which are then converted to common specifications.



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An initial impact assessment was conducted in 2003-2004. The study made use of expert knowledge and case studies. Clear assumptions, generous with costs, and conservative with benefits were documented. Incremental costs due to the Directive were included where possible in monetary terms. Benefits were estimated for the environmental sector. The cost of INSPIRE was estimated at 93 to 138 million € for 10 years; benefits were expected to be 7 to 10 times higher than costs. Higher expenditures were recorded at the sub-national scale (regional and local levels).

The problems to address with the 2007 INSPIRE directive are listed below:

- Difficulties of **access** to information (insufficient metadata at all levels);
- Different projections and scales, making existing information difficult to **integrate**;
- Unclear status of the information as to its **currency**;
- Prohibitive **cost** of geographical data;
- Lack of **interoperability** between data sets, and among web-enabled services;
- Lack of **standardisation** in the codes used to represent the objects described;
- Varying data **quality** from one country to another within the same layer of geographical information;
- Lack of **long-term solutions**, instead, to date there have been: a supply of snapshots, an absence of information on changes resulting in information that becomes quickly outdated, hence the need for duplication of data collection efforts.

After 8 years a workshop on SDI cost/benefits and Return on Investment was conducted in March with the following outcomes: SDI investment cost estimation is possible, but it is hard to value as a proportion of governments' expenditures in the GI sector – to quote Max Craglia “it is an artisan's job rather than science”; it is hard to estimate the benefits as the users need to be identified. Two studies were undertaken, one in Spain and one in Italy to conduct a cost–benefit study of SDI. These studies confirmed the initial assumptions. JRC also surveyed 150 companies doing environmental assessment.

1 Billion Euros are spent on those every year (national projects only), and it is expected that 15% is saved due to the use of SDI.

Craglia summarized a member states conference (March 2013) where participants shared experiences about: implementing INSPIRE, opportunities for cross-border applications, improved sharing of harmonized data (e.g. air quality measures), and improved modeling and alert system. Expansion to other cross-sector areas being considered includes railways.

Max Craglia then introduced the smeSPIRE project. There are over a half million ICT enterprises in Europe, 480,000 are Small and Medium Enterprises (SMEs) with less than 10 employees. SMEs are therefore the core of innovation and jobs in Europe, and are impacted positively by INSPIRE.

In conclusion, a long bureaucratic process has been put in place to build a community in addition to addressing the technical challenges. Methods and infrastructure components can be re-used for increased interoperability across borders and sectors. A mid-term evaluation of INSPIRE is already starting with due date of May 2014. The evaluation will assess the effectiveness and sustainability of the policy.

Alan Smart, ACILAllen - Valuing geospatial information: a review.

Alan Smart reviewed the following applied economics methods: revenue/Value added approach; economic welfare analysis; general equilibrium analysis; and components of value. He asked, ‘Why is valuing geospatial information so difficult?’ The answer



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is that benefits accrue to user groups. Impacts occur across a large number of sectors and often not in the geospatial area itself. The dynamic nature of change adds a level of complexity.

The value added approach is illustrated in an Oxera 1999 study on the economic contribution of the Ordnance Survey (OS) in Great Britain. The value added is the value of the outputs less the cost of the inputs. In the study, the value added was estimated from user groups associated with geospatial products. The largest contribution came from users of OS products, and amounted to 10 to 20% of the GDP for Britain. In general, this approach provides information about the size of the footprint but is not useful for assessing the value of policy changes.

The second method is the economic welfare analysis approach. A Cambridge Study by Pollock et al (2008) looked at the pricing policies for government trading funds, including the Ordnance Survey. This technique makes use of the supply and demand curve; one needs to know what the consumers are prepared to pay versus at what price producers are willing to produce. The study addressed large-scale topographic mapping and transport network products with sales worth £70 million; it was concluded that a move from average to marginal cost pricing would increase economic welfare by £156 million.

Several other examples were given including the ANZLIC Study (2010), which used a similar methodology to address pricing policy in Australia. They focused on the value of making data free. For this, it is necessary to must select specific products. Making data free would result in the overall highest benefit to consumers, but agencies desired revenue so a compromise solution was reached.

Alan Smart discussed industry productivity improvements and computable general equilibrium (CGE) modeling. The economy wide approach estimates direct impacts and includes the indirect effects of inserting geospatial data into economy wide impacts. He uses a database, which is maintained by Purdue University. Direct impacts encompass changes in productivity of labor or capital, changes in resource availability, and changes in income or trade. The technique requires case studies to provide good evidence, and credible assumptions. It does not capture intangibles.

Alan also introduced the components of nonmarket value. The concept of Use values includes direct use, ecological function, and options. Non-use values include existence and bequest.

Cristina Capinieri, University of Sienna– Advances in well being evaluation through citizen science participation, new value, new tools and measures.



Cristina Capinieri is a geographer. She opened her presentation with a reference to the Renaissance, a time of great change where man became the creator of his own fortune. Today we are in period of change also. During the Renaissance, the concept of perspective was introduced to art and architecture. Today we have changes in values. New development models are addressing the quality of life and wellbeing. The Green Renaissance emphasizes awareness of environmental changes, technology changes (change in communication systems result in change of how life is organized),

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and data sharing (open source movement), leading to new ways to investigating the world in qualitative and quantitative dimensions, and through reconciliation of hard sciences and social sciences.

Beyond GDP, wellbeing is becoming a global concern. Money is not everything. What about being really happy? A well being index or similar concept has been addressed in recent projects. The dates tell us this is something new. What do three studies based on surveys (US, Bhutan, Italy) have in common? All three highlight experienced well being, psychological well being, ecological resilience, environment, landscape and cultural heritage. Cristina is currently doing a benchmark study on well being indices.

What is the linkage between well being and citizens science? Citizen science is an old practice, which is being enlarged due to enabling technologies (cell phones, cameras, etc). Here are some of the motivations for citizen participation - do something for nature, help create a better society, explore career options. With citizen science we are sharing in many different ways, from crowd sourcing to bird counting. Some of the more common fields of application include biodiversity, wild species population and distribution, galaxies and extraterrestrial life, and environmental quality (water quality, air and noise pollution). There are different levels of participation, from the “citizen as a sensor”, to collaborative science.

The information production process is interesting. Is there an inherent reward for citizens or do we have to pay them? Cristina gave an example of citizens as sensors regarding noise pollution in Sienna. A free app had over 70000 observations. The level of noise official monitoring has decreased in past 3 years for various reasons. She also mentioned the use of Twitter for governance within communities in Italy; the main topic included community events, and crisis and risk. Sentiments analysis has been performed based on Tweets (Milano). Others have done this as well - Vermont University in US looked at 373 urban areas: the happiest was Napa, CA, the saddest was Beaumont, TX. A UK study showed people happiest when they are outdoors.

In conclusion, new roles and activities are emerging. Coordinators are needed to link sciences and citizens. Participation campaigns will increase awareness and reduce citizen/science divide. . Advantages include a fine data collection capability, local scale knowledge, reconciliation with environment, and cost savings.

Tina Svan Colding, Danish Ministry of the Environment - Open Geographical data in Denmark

An agreement was reached in October 2012 between the Ministry of Finance and the local Denmark Government to open up basic public data for Denmark to everyone. The public sector agency is taking a management approach that takes advantage of the economies of scope of producing high quality data that is updated efficiently in one place.

Basic public data includes items such as real property, addresses, roads and areas, maps and geography - a lot of layers that are part



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of INSPIRE. The Danish Ministry of the Environment has been working with other agencies to raise the awareness of the role of geographical data in eGov and has shown demonstrable results from cooperation with private sector users and from data modeling and distribution. Achievement of this result took close contact with political decision makers and the Ministry of Finance (the agency for eGov), a positive business case and timing. Having the Ministry of Finance at the table was essential. The timing was coincidental with the INSPIRE legislation implementation and associated need for standardization contributed as well. And finally, several ministries cooperated toward a common goal.

The road to open data was guided by 3 keywords: transparency, comprehensibility, and usability. The first step was to change the existing Danish law. It passed unanimously. The next step was the development of licensing for open commercialization. The agreement was an easily understood 1-page document for end users; essentially data is open for commercialization. 400 contracts had to be terminated and reimbursed. To eliminate all barriers regarding access to data a download solution was selected which average consumer could use. Communication focused on the end users in a new home page.

Measuring the effects: knowing that they are working with the Ministry of Finance, they will ultimately have to demonstrate the effects of the change to open data. They began by requesting user registration as part of downloading information; they asked users what agency they were from. No complaints have received from any agency downloading.

What were the Reactions? Denmark has a population of less than 5 Million, which makes for a nice case study. 5600 new users may not sound like a lot but previously they had 800 users. They turned to the Open Street Map community to test the distribution system over Christmas. Subsequently, there were more than ½ billion hits on the distribution system. Who are the users? The majority are citizens, followed by companies, then public sector, then and organizations/NGOs.

In conclusion, Open data in Denmark is an investment with a positive business case, leading to growth in the private sector and more effective public sector. A baseline survey is in work, to find out who uses the data, which data, for what, and what benefits have been generated.

The agency is issuing a functional tender for benchmark case studies in fall of 2013. They will ask for case studies in selected sectors (current users and emerging markets); a description and measurement of the value chain; data aggregated to the national level, providing macro economic indicators. Then, in 2016 a post-measurement study will be conducted. In the meantime, they will work with the selected consultancy to see who used their data in 2012.

Questions and Discussion for Session 2:

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David Harper and Alan Smart discussed leveraging the macro level reports presented by Alan. The \$6-12 Billion result was criticized by industry as being too low. But the numbers have stuck and are not being criticized at the political level. The more studies are done, the better policy makers will be able to articulate the results. Figures from 2008 are used today as a touchstone. David noted that they were able to leverage studies to convince ministers to allocate \$40 Million without any cost to agency.

Rich Bernknopf brought up the separation between the costs of collecting the data and other costs associated with open data. For Max Craglia, the focus was on development of an infrastructure for data sharing, not for collecting data; they measured costs and benefits of data access. Alan Smart added that for each case they netted out the costs. In some cases, the government was not changing its behavior other than not charging; in other cases costs were incurred. Max pointed out that these studies need to be continued; at some point use may be saturated, and we need to catch the turning of the curve.

Susie Allard and Cristina Capinieri addressed the role of citizenship in citizen science. Cristina differentiated between the data collector who may be or not be the owner of the data, and citizens, as data owners, who are freely contributing and building their community. An important part of citizen science is participation in the world, while treating data as a commodity (Cristina referred to it as “commodification”) moves away from that involvement. Data collected is free on the platform, but when a citizen collects data and others use it for commodity business, there is a problem. Max Craglia differentiated between those people providing data that are unaware they are doing so, versus those purposefully contributing. JRC’s objective in citizen science is to further citizen participation in science, to further citizen trust in science and in the EU. The focus is to communicate better and engage better. It goes in the direction of participation in the making of science versus just being told about science. Cristina asked Tina Colding about citizen involvement in the Danish study. Tina asked users if they were willing to be contacted and all were. Now it’s a matter of having time to go back and pursue the matter further. The users may be available to other researchers for query.

Denis Poliquin asked Max Craglia to compare the study to the actual project? Max indicates that JRC is undertaking studies as part of their mandate, and the studies represent a tiny fraction of the overall business. If INSPIRE is a 1Billion Euros operation for the EU and they spend 10,000 Euros, it’s a tiny fraction. They need to share data, experiences, portfolio of evidence, as no one study fits all cases. And always it comes down to a political decision. Spending today for

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tomorrow's benefit means politicians will perceive that it is a mandate for their successor. Note that the need for a business case comes up for geospatial cases, while other areas of government can go ahead without much justification. Even if studies are done for those other areas, the depth may depend on management practices, resulting in red/green light metrics. Is that good enough?

Next, there was a brief discussion about climate change assessment. Would this not send figures through the roof? Is there a reason it was omitted? Tina Colding indicated that it was part of their study but hidden within the utility sector. Max Craglia added that looking at the scale of operations of INSPIRE (national level) where impact of climate change is enormous (flooding or drought for example).

Andrew Coote and Tina Colding talked about assessment of the volume of downloads, comparing the initial downloads to the subsequent use of the data by for example, Google or Bing ingesting it. Tina indicated that they currently are evaluating the first part of the value chain that focuses on their own distribution. They have talked to Google Switzerland about when to address an expanded value chain. This is why it is important to have consultancy describe the value chain. Max Craglia added that one reason why JRC is following up with a survey of small and medium enterprises is to follow the expanded value chain. There are a lot of companies that don't think of themselves as geo companies. Jay Pearlman added an example of Landsat data distribution, to further the points being made. If Google provides an alternative access to all Landsat data and the U.S. government supplier of that data, Eros Data Center, sees a decline in requests, it is difficult to see if there is less use of the data. Tina knows that there are companies that want to build up services based on the use of the Danish data. Again, it is important to reach out to the end users. Rich Bernknopf mentioned the Willingness of pay for Landsat Data study, which used a snowballing technique, found in the criminal justice literature. The biggest users were government and military. But it takes a long time to follow through because those users want to be hidden. In addition, people who get greatest value from data are not distributors of data.

Hugo De Groot brought up the tendency of business models to swing back to prior norms, and how that can be avoided. If there was a rich application market, giving economic returns, this may not happen. He gave the example of well-organized business plans developed by Google or Bing. How far are we with business models that would prevent the pendulum from swinging back? Do we have something that will ensure sustainability, coming from business users rather than big consultancies? Max Craglia wondered if, to allow sustainability, the environment has to be closed to the market. Tina Colding described the Danish business model: the agency is producing and distributing data in different formats but it is up to the private sector to develop applications, except for something in the public interest. Max Craglia noted that the private sector will identify their own business models. We can measure what comes out at the end of the line, and that will change over time. Tina Colding added that it is important to be clear about where the agency places itself in the market or value chain. When government agencies open up data, they are taking away some of the market benefits (if they exist), and thus cannot prevent the pendulum from moving. Alan Smart looked at Energy reforms over past years: the pendulum won't swing back because industries are benefitting. It depends on where you are as an industry on the adoption curve. Policy areas needing resolution include standards, interoperability, and charges. Once these are worked out, the business models are less likely to swing back as costs are

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too high. For example, consider negotiations around world trade. Andrew Coote noted that the marginal cost of keeping data that has been made free by others is relatively low. One group not represented here in this workshop is the highways industry. They treat highways as assets, which will depreciate if money is not invested in maintenance. We have an infrastructure in SDI, and should follow their example for creating plans to treat data as an asset, which require a long term investment. David Arthur, HAL Canada, stated that the fundamental problem is related to what needs to be invested in and who will make the investment. Over past decade he has been making the argument for national investments in infrastructure, but Google making data available for free destroys the argument, as does citizen input via crowd sourcing. Economics is having trouble keeping up. To conclude that topic, Jay Pearlman contrasted quantification versus quality of life. He also asked how to bound your customer base. Do you take credit for things that occur much further down the chain, for actions that took place as a result of your action?

Mark DeVries from The Netherlands mentioned the experience of the meteorological office in Norway. A law was passed to stop charging for the data; it was communicated that data was free and would remain that way; citizen owned the data. Ed Parsons from Google brought up the role of the public sector in doing what government has historically done. Private industry is very capable of building spatial data infrastructures, as are citizens. It may be a mistake to try to separate collection and distribution. The fundamental issue is what is the role of the public sector compared to the private sector and citizens? We have never asked user communities what they wanted. Max Craglia would add to that question: what are you willing to take on regarding dependencies if citizens are collecting the data. Tina Colding does not agree that the private sector can take over. It is an issue of infrastructure, and quality of data; those items are part of the administrative process. Ed Parsons noted that we must recognize that governments are struggling with the ability to pay for themselves. Alan Smart concluded that there is always a public good component to this data, but the market is changing fundamentally. It can be segregated according to how you use data (for example. an ipad versus a computer is a different market in what you can do with data). Max Craglia noted that we have transitioned from citizen as subject to citizen as customer. This provides opportunities as well as uncomfortable uncharted waters, which should not be described using yesterday's models.



Session 3 – Chair Andrew Coote, Consultingwhere

Andrew spent a few minutes introducing the new web site for the socioeconomic benefits community. For further information, go to <http://www.socioeconomicbenefits.org> .

Ed Parsons, Google - Economic Value of Geo Services.

Ed Parsons first introduced a view of the future from 1969 via a Startrek video excerpt. Perspective - the drinking straw problem. Broadened to a wider community, we used to characterize it as the hat problem - military or hard hats versus the rest of us. Now most people in

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geotechnology wear hipster hats, it is harder to identify them and understand what they are doing with data. The use of the clock is now ubiquitous on computers. By combining time and location information, we end up with a platform, which is beyond an app. An example of is the ability to use Zip car to rent cars by the hour. The car and your mobile phone each know where they are, which makes this business possible. This is at the edge of the value chain.

Now, let us look at perspectives for the geospatial viewpoint. Oxera reports the value of geospatial services at \$274 Billion, versus the airlines industry at \$594 Billion and games at \$25 Billion. Does this seem too big? Consider Boston Consulting study on the value of satellite and geospatial industries. The value is 12% of the US GDP, for a total of \$274 Billion. Direct impacts are separated from downstream consumer benefits. There are real time navigation benefits, such as lives saved from faster cardiac response. This is a vibrant and growing industry with 13% annual growth rate. Ed Parsons briefly mentioned the recent acquisition of Waze for \$1.3 Billion by Google. The objective is to understand how the crowd-sourcing process works.



Marc De Vries, the green Land - About geese and golden eggs, Economic benefit of free and open data policy

Marc de Vries presented the recent study ‘ABOUT GEESE AND GOLDEN EGGS - facts and figures on economic effects of opening up GMES data’ that he did under an assignment of the European Space Agency, in collaboration with EARSC. In essence, the study advocates a free and open data policy for GMES Sentinel data, being the most effective way to help Europe’s space EO services industry to develop, boosting

innovation, economic growth and creating new jobs across Europe. Quite uniquely, and drawing upon research from other domains, the study holds solid evidence on the large economic benefits to be the result of a free and open data policy for GMES Sentinel data.

Mark introduced the economic benefits of a free and open data policy for the GMES Sentinel data in the form of a fairy tale “the geese and the golden eggs”.

ESA’s PSI reuse policy dilemma: GMES is a public task, which results in Earth Observation data being collected. In addition, the data is reused outside the context of the public task. Who should pay for this? What would be most economically beneficial?

According to the PSI economics theory, PSI goods are non-rivalry and non-exclusionary goods, i.e. public goods. Production costs for the 1st copy are high, while costs for the 2nd copy are low. Since the 1st copy is produced by a public task, those costs are sunk. Other costs to the users include transaction costs (relatively high), enforcement costs associated with charging require monitoring which incurs a cost, and distribution costs which are close to zero. In conclusion, having no or minimal charges will lead to maximizing benefits.

Mark provided a list of empirical evidence in general markets assessments and concrete cases and studies. He identified three phases: sowing, growing and harvesting. For each phase, he identified the benefits and costs

The Sowing phase sees a large demand for data, and cost recovery from the commercial sale of data.

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During the growing phase, benefits are derived from reuse and market dynamism. These are balanced by the cost of efficiency effect.

The Harvesting phase illustrates the impact of not charging. Benefits are manifested as employment growth, while cost is via taxation. In the Dutch KMI case, when they stopped charging for data (with a resulting actual drop in price of 80%), employment tripled and reuse increased ten-fold.

Giacomo Martirano, smeSPIRE - SMEs as key players in geospatial driven innovation

Small and medium Enterprises (SMEs) form the backbone of the EU economy. Micro, small and medium-sized enterprises are defined according to their staff headcount and turnover or annual balance-sheet total.

	N° of Employees (E)	Turnover (T), in M€	Balance sheet (B), in M€
Medium	$50 \leq E < 250$	$10 \leq T < 50$	$10 \leq T < 43$
Small	$10 \leq E < 50$	$2 \leq T < 10$	$2 \leq B < 10$
Micro	$E < 10$	$T < 2$	<u>B</u> < 2M€

In 2012, SMEs represented 99.8% of nonfinancial enterprises, and provided 67% of the jobs. The overwhelming majority are micro scale enterprises of less than 10 employees. Giacomo Martirano gave some performance figures for comparing the role of SMEs in the EU, Japan and the US.

Are Geospatial Information and communication technology (ICT) SMEs a new paradigm? Up to 2% of ICT SME's are dealing with the geospatial domain. The smeSpire project conducted a study to assess the market potential of the geo-ICT sector in Europe, by means of 3 data collection activities:

- Document analyses (studies, policy documents, statistics, etc);
- Survey among Geo-ICT companies in Europe;
- Interviews with companies, associations, public authorities.

An online survey was launched in November 2012, addressing more than 30 questions about general characteristics, activities, knowledge and skills, and impact of INSPIRE. By June 2013 more than 270 Geo-ICT companies completed the survey, becoming members of the smeSpire Network. There were numerous findings of the study:

- Geo-ICT companies in Europe have the competence, skills and knowledge to participate in the implementation of INSPIRE
- Impact of INSPIRE on the innovative performance of Geo-ICT companies in Europe is already high, and expected to increase in the future; the current impacts are related to the introduction of

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new products/services, while future impacts are related to the introduction of new customers in addition to new products/services; INSPIRE already has a quite significant (43%) impact on companies' turnover.

However, it was noted that there are still barriers to overcome and gaps to fill-in.

In conclusion, micro-companies are willing to cooperate and become partners. Geo-ICT SMEs are almost ready to offer mature solutions to implement INSPIRE, but who is willing to pay for that? How can the public and the private sector build synergies to boost the economy of the Geo-ICT sector?

Guenther Pichler, ESRI - Funding public sector information – someone has to pay

Guenther Pichler focused on national mapping and cadastral organizations in Europe. Who pays and where are payment points? He set the context within the European legislation, including copyright and competition law; and access to environmental information. INSPIRE focuses on data sharing between public authorities for public tasks that may have an impact on the environment. Regarding the data sharing business model, originally, it was thought that public sector geographic information should be available free for use by public authorities and community institutions. This has evolved into "reasonable return on investment." Some Network Services, such as “Discovery” or “View” services, may be available to the public free of charge. However, commercial re-use charges can be made for “view” services to cover the costs of maintaining the services or the data (large volumes, frequently updated). Restrictions can also apply for reasons of confidentiality, security, and intellectual property rights. Spatial data sets and services provided by Member States to Community institutions and bodies in order to fulfill their reporting obligations under Community legislation relating to the environment shall not be subject to any charging.

A survey of the National mapping and cadastral agencies was conducted in 2006 by EuroGeographics to show different funding models (public sector, private sector, joint funding, etc). Funding models have evolved over time, from government funded to some percentage of cost recovery from user payment, and moving back towards government funded. At each stage there have been pros and cons with the models. Recent changes in national policy occurred in Denmark, Finland, The Netherlands, and Great Britain. For example, Finland, after opening up data delivered 50 times as much data during first three months of 2013 as during the previous year.

Funding options are difficult to generalize. In general there are four broad options: mixed (cost recovery), user pays, free and open, “freemium”. The mixed (cost recovery) model provides stronger customer focus, recognizes the value of data, and reduces dependency on government funding. However, it is out of line with customer expectations and policy direction. The “User pays” model offers about the same pros and cons as the cost recovery model above. The free and open model is simple and cost effective to administer and implement, provides an income stream to government through corporation tax, and is In-line with policy trends and customer expectations. However, this model lacks a clear understanding of the product portfolio offered. Not knowing makes it difficult to get costs under control. Sales, marketing and back office costs are frequently underestimated. In addition, this model is wholly reliant on Government or EU

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funding. In the “Freemium” model, the cost of the data is a function of quality. This stimulates the market as it stimulates demand for and greater use of higher value premium data. The model is not completely dependent on central government funding, but it is potentially complex and requires government to fund the free products.

In conclusion, this is an evolving story, which has no right or wrong answer. Here are some key considerations; Geospatial information (GI) needs to be seen as infrastructure; the government needs to fund activities to ensure the quality of the data; return on investment should be addressed. The key questions are who pays, and where are the payment points. There is no such thing as free data.

Questions and discussion for Session 3:



Tina Colding had a question for Guenther. Denmark now has adopted a free model. The concern for upcoming years will be - is it working. Will they actually get the needed funding? If not, they will end up with the mixed model again, with payment and invoices. Guenther Pichler- Many are going to the “freemium” model as a risk balancing approach.

Kenji Takeda from Microsoft - One of the principles of free and open data is that the taxpayer, who is thus entitled to use the data particularly for a business, has paid for data.

Guenther - Taxpayer payers pay for all phases in the free and open model where the government pays for everything. It could as well be that 70% funding comes from commercial sales.

Ed Parsons- There are nuances for mapping agencies. Data is sole purpose of these agencies. These models must be more finely tuned for mapping agencies.

Marc DeVries - In Netherlands with free and open, there was no business case based on previous sales.

Andrew Coote – He is thinking of the Ordnance Survey, which recovers 150% of its cost and is highly effective. Pendulum swings are disastrous for a business.

Ed Parsons- Pendulum is a bit overplayed. Agencies are being pushed to free and open during a time of economy financial stress. He would expect the swing to go the other way.

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Susie Allard - What has to happen in education to move to new world, and train people to use the technology?

Guenther Pichler- We must educate people in Geospatial Information (GI) literacy. It is crazy not to support this trend.

Ed Parsons– We need an Information technology literate population, of which subset is GI literate.

Session 4: Andrew Coote, Chair

Giuseppe Conti, Trilogis – The Societal impact of standardization in the geospatial community, the point of view of SMEs and public administrations



Standards are essential for interoperability. What is the value of standards? Studies show a clear connection at the macro-economic level between standardization, productivity and economic growth Standards affect economic growth to the level of 0.3% to 1% of GDP. For example, a study in Germany by DIN 2000 on impact of standards found that between 1961 and 1996, information in standards and technical rules was responsible for 1% of GDP or 15.8 € billion in 1998. An update to the German study found €16.77 billion per year, or 0.72% of GDP as of 2010. Giuseppe also gave several examples of national studies (France, UK, and others) showing the impact of standards on economic growth. In summary, the impact of standards is 10 times more important than the fruits of innovation.

Giuseppe Conti's business is an SME. He discussed the societal impact of standardization in the geospatial community from the perspective of SMEs. The Small Business Act for Europe was passed in 1994 and reviewed in 2011. The Motto: think small first in policy making.

Standards are a vital element of the society in which we live, providing a common and repeatable basis for doing things. SMEs are a critical part of the European economy and have a central role to play in growth and job creation, but their use of standards and their involvement with standardization is typically low. Both SMEs and the economy could benefit from SMEs being more widely involved in the standardization world.

Perception that standards are important to large business presents a psychological problem. Standards are written by technical experts in their field and always represent the background and interest of the companies these experts work for. In order to have SMEs background and interests properly reflected in the process of standard creation, it is important to facilitate the participation of experts from SMEs in this process.

Getting SMEs involved is similar to the chicken and egg problem. On one hand, published standards do not fully take account the needs and interests of SMEs; on the other, SMEs are not fully exploiting the benefits of standards.

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At Trilogis, they developed a geospatial solution for gas companies, and are hoping this year to move to the water domain. Fully INSPIRE/OGC/whatever compliant is a dangerous myth. They are advocating standards because, in addition to technical interoperability between different products, standards strengthen innovation capacity.

Studies which have considered the relationship between standards and innovation noted two opposite points of view: standards can either foster innovation, by defining performance targets and key performance indicators, or limit innovation by defining narrow, specific solutions as part of product design.

Setting standards requires a balance between speed and consensus. SMEs being agile by nature have a possible advantage, thus providing a competitive edge with big players.

Our playground is big data. Are you sure given amount of technology and innovation we have, that this is right standard? In conclusion, increased contribution of SMEs to standardization activity is desirable; SMEs can benefit greatly from actively participating in and influencing their development. Innovative SMEs may want to initiate new standardization activities. Guiseppe Conti's recommendation to other SMEs is to try to leverage standards to pave the way for innovation.

Kenji Takeda, Microsoft Research – Socioeconomic opportunities from open data and models

We live in an information society. Access, Usability, and Opportunity are key words.

There has been a push in the academic realm over the past 10 years to make research available via open access, coming from the most expensive publishing around. Current distribution costs are essentially zero. Jim Gray from Microsoft Research in late 1990s got data from USGS to experiment with access. He is a proponent of putting all scientific data on line, starting from the top of pyramid to make literature available, moving down to derived and recombined data, and further down to raw data. He states that many disciplines overlap and use data from other sciences; the Internet can unify all literature and data, increasing scientific velocity, and leading to a huge increase in scientific productivity.



Data intensive science makes use of data acquisition and modeling, collaboration and visualization, analysis and data mining, dissemination and sharing, and archiving and preserving. The Fourth Paradigm addresses data intensive scientific discovery, with case studies in disciplines including environmental science. It can be downloaded as a free e-book. . Where are we going? On May 9, 2013 a memo came from the White House saying government funded science needs to be made freely available online. On June 13 the EU issue a similar memo and more recently the G8 reached an agreement on an open data charter (releasing data for improved governance and innovation). This is hot off the press.

Kenji than gave several examples of usability, such as the National library of medicine in the US. As another example, real-time data regarding transports in London were made much more available with application programming interfaces (APIs) leading to an explosion of users.

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Similarly, the British Ordnance Survey is delivering large maps over the web using public cloud storage. Data marketplaces are being stood up, such as the UK Met portal.

Here are examples of opportunity: improving water information value with San Diego Supercomputer; NSF Earth Cube Initiative. Climbing the ladder – at the top of pyramid we find supercomputer centers, and universities with expert users; then come 99.9% of the rest of science users, who are constrained. We are trying to move the world to a more seamless environment. This paradigm shift could be enabled by availability of powerful data and analysis tools accessible in the cloud, building of communities around results, and the ability to marshal resources on demand without worrying about how it gets done.



Nicola Pirrone, CNR – Toward the preparation of environmental legislation on the basis of scientific evidence.

The Science Policy Loop is a multi step process. It starts with the discovery of health issues related to the use of hazardous substances or/and its release to the environment by human activities, leading to contaminated fish and seeds/grain. The drivers are then evaluated for their impact to the environment and human health / human welfare. Exposure patterns are evaluated for wildlife species and humans; socioeconomic consequences are addressed, looking at local, regional, and global. The first policy development links Policy

Implementation & Geographical Scale (i.e., country, continental, global). Benefits & Costs are assessed and the policy is reviewed to improve its effectiveness.

Priority air pollutants of global concern include ozone, persistent organic pollutants, Mercury, and particulate matters. International activities within the context of the EU framework included GEO Task HE-02 “Tracking Pollutants” - C1 “Global Mercury Observation System”. the UNEP Mercury Program, and the Task Force on Hemispheric Transport of Air Pollutants (TF HTAP) under the UNECE-LRTAP international conventions. There are also regional programs.

Nicola Pirrone then focused on the case of Mercury. The following items are needed to develop the policy. A Global Mercury Observation System able to provide continuous information on mercury concentrations and fluxes in and between the atmospheric, marine, freshwater and terrestrial ecosystems; Validated regional and global scale atmospheric and marine models as well as socio-economic models; and an International Observatory with the mandate to provide support to Policy Makers in the implementation of strategies and best practices.

The long-range transport of air pollution convention was one of first global policies developed. Energy production is one of the major drivers of pollution. 80% of energy comes from combustion of fossil fuels. Growth in China has resulted in increasing energy demand at the level of one power plant per week. High quality data is important but not so much discussed. Why should anthropogenic activity be regulated? It should be controlled because we have no ability to control actions of nature, but society can control anthropogenic emissions. We need to develop tools to determine who is polluting and thus who will pay the bill for remediation. One of the

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tools used in environmental legislation are models. Cap and trade legislation is based on a reliable tool.

In conclusion: combining different needs results in the best decision. It is our responsibility to provide high quality data. If we put rubbish into system, we can only get rubbish back.. Recommendations for a path forward include promoting and facilitating the sharing of information and development of CIs; and the development of a Permanent Global Observatory to Monitor and Model mercury levels in the environment and human exposure pathways in support of the Policy.

Geof Bowker, UC Irvine – Effective Communication and Scientific Cyberinfrastructure

Geof Bowker introduced several publications addressing cyberinfrastructure/knowledge infrastructure. He defines cyberinfrastructure as the set of organizational practices, technical infrastructures, and social norms that collectively provide for the smooth operation of scientific work at a distance. Knowledge infrastructures are “robust internetworks of people, artifacts, and institutions which generate, share, and maintain specific knowledge about the human and natural worlds”. Since the publication of Malthus Essay on Population in 1796, we’ve been in the business of planetary management. Under the heading of speaking truth to power, Geof presented a number of illustrations of the mismatch between science policy and produced science. For example, a 150-year plan for land use in Canada was based on one year of data on caribou movement. As another example on ecosystem services, a biodiversity discourse starts from the assumption that what we have now is pristine. But what is important is preserving the ability to change rather than preserving species. As scientists, we need to get out of discourses and avoid getting trapped in false arguments.

Examples of infrastructures follow.

- 1) GEON: The GEOsciences Network attempts to bring together 30 to 40 disciplines, assuming that all scientists could communicate. It was based on the use of a shared ontology, but many scientists were not familiar with their ontology. In addition USGS would have had to change all of its data structure to participate. The project did not occur.
- 2) CENS – Based at UCLA, CENS was supposed to develop sensors to sense earthquakes, The project oversold themselves (recommend staying away from the concept of grand challenge). CENS failed because the sensors didn’t work.
- 3) Long Term Ecological Research Network – what are the new questions we need to ask? We must get a new kind of data worker capable of building 50, 100, and 200 year data sets and of working with institutions and policy makers from the beginning of a project. Many years ago, Ma Bell laid down what paths would look like for 50 years. We need to be similarly aware of infrastructural dynamics, and path dependencies. We need to have 20-year policies and standards, which bring scientists and policy makers into that world. Looking at infrastructure tensions, Geof talked about incumbent versus new entrants, and about data. He asked - Who are the ‘incumbents’ of CI development? How can the interests of existing constituencies be balanced against those of innovation and ‘new entrants’? Regarding data and metadata, he asked -What existing data cultures / practices characterize the various CI domain sciences? How can CI be grown to accommodate, reflect, and support those?

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In conclusion, he reminded us that we are managing the planet, and introduced the concept of citizen science.

Suzie Allard, University of Tennessee – Identifying and communicating with Science Stakeholders



Scientific knowledge should be used to inform decisions that affect society. However engaging decision-makers and members of society with science requires targeted messages that impart the key information in language that doesn't rely on jargon or technical expertise. Additionally, the move toward data-intensive science suggests that data-driven messages and strong visualization tools are important ingredients in reaching these key audiences. This talk outlines the basics of message targeting, the ways to use data as a part of the communication strategy, and the challenges associated with protecting data in this open environment. Science is amazing but not everyone knows it. The majority only read popular science magazines, and mass media. It is commonly thought that information moves from disciplinary science out toward the public but information actually travels both ways. Controversies are important because they fire people up.

Who to target for communication? Think about the dynamics of the stakeholder ecosystem.

Where are people getting their information? Others trust us – to be experts with science information, to assess information before releasing it.

Four top strategies lead to maximizing understanding. They include adapting to your audience, having a clear purpose, simplifying and planning.

Adapting to your audience by hitting the sweet spot between you and them. Why do they care? Why should they care? What do they know?

Having a clear purpose - finding common ground, motivation, and creating a shared vision.

Simplifying -. Cut the jargon, explain key terms and provide an overview of issues.

Planning – deliver to the audience the key message, and appropriate content.

The strength of narrative is based on an event or series of events with shared theme that leads to an outcome. Narrative can enhance understanding. Movies shape cultural narrative.

Scientific controversy attracts news people. It may lead to misinformation, and disinformation. When faced with controversy, public becomes hyper-vigilant and thus reluctant to engage in citizen science. This may also slow funding.

Data tells a story. Publishers are beginning to link data sets to publications. Data journalism is a new field. GI needs to reach out to this community.

Questions and discussion – Session 4

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Question from researcher at Padua: He used to program web GIS apps. A colleague wanted to see orthophotos, which he found surprising.

Ray Boglasowski's Question from UK: What do people know? What are their beliefs? His good business cases have not been accepted either due to no funding or implementation too difficult. Must deal with perceptions.

Andrew Coote's response: Timing is everything.

Mary Ann talked about waiting for disaster to strike to get funding. Must we take this path?

Suzie Allard: Timing is everything but think about popular culture, Jungian consciousness. Creating a 100-year infrastructure is a hard sell but think about what people are reading and watching. People want to be forward thinkers. This is the kind of narrative that sells.

Giuseppe Conti: Data leads to information, which leads to awareness, which in turn leads to enlightenment. The ideas of planet management and the dark side of information are great. He would add “May the data source be with you.”

Geof Bowker: Regarding enlightenment, he is working on a project that addresses this. Waiting for disaster is always wrong.

Kenji Takeda: Open access was started in 2001-02 by very frustrated people. Open data will take a decade. Can it go quicker?

Nicola Pirrone: Communication frightens him because there is so much rubbish out there. Not everything should be communicated.

Kenji Takeda: NASA was trying to calculate the probability of an asteroid taking out the Eastern half of the US. It got down to a 1/5000 chance, which was eventually recalculated to 1/500,000.

Suzie Allard: She agrees with Nicola that it's tough to communicate, but not communicating is worse. You get dark side stuff when there is a void. Communication is a way of protecting science, as public imagination can be much worse.

Andrew Coote: He worries that the anchor journalists on TV make it a “badge of honor” not to understand science. There is hope from kids following Star Trek.

Jay Pearlman: he has a question about social and economic impacts. How to engage all in collaboration?

Kenji Takeda: There is a new discipline called web science, which attracts social scientists. Microsoft has been looking at data intensive science. Promotion pathways would be changed to incorporate software development as well as publications. Legal impediments are frequent. May all your problems be technical – then it's easy.

Giuseppe Conti: We are becoming a hyperorganism.

Andrew Coote: We need geoRenaissance people to lead the geoEnlightenment.

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Guiseppe Conti: He read an article from Science about hyperthread. We are thinking in different ways. It is hard to predict how we'll react if thinking differently.

Geof Bowker: History of cybernetics (Bateson & Mead) shows that kind of community being created. He was at a conference on collective beings last week. Built the right kind of community, putting to use Interactional expertise.

Suzie Allard: Recognize externalities and respond. Code switching – find someone on your team who is good at it. Cultural proximity – scientists as a bunch of cultures that have something in common as well as apart.

Nicola Pirrone: Merging environmental and social science is very difficult. He worked to do this way back in 2000. Scientists are less prone to evolve, to adapt. It will take several decades. He worries about open access.

Day 2

Jay Pearlman, discussion and summary of Day 1

Jay Pearlman summarized the key points from the Day 1 sessions, extracting selected charts from the speakers.

In the area of communications, Suzie Allard highlighted the need to have a clear purpose by finding the common ground, the motivation, and creating a shared vision; Geof Bowker noted that boundaries between technical and social work could often shift in either direction and addressed infrastructure tensions; Nicola Pirrone highlighted the linkage between science and policy; Kenji Takeda looked at the paradigm shift which would, in the future, lead to a unified research community, built around research results; Cristina Capinieri addressed the impact of citizen science, its advantages and challenges.

The second area to broadly resonate among the speakers was socioeconomic impacts of information as relating to open data, data quality, and innovation. Alan Smart talked about production and geospatial adoption, and associated sector wide impacts; he also analyzed the components of economic value; Tina Colding reported on implementing and measuring the effects of the new open data policy in Denmark; Marc De Vries addressed the benefits and cost of open data through the various phases of implementation; Max Craglia indicated that cost benefit analyses are performed at the regional and local level; Guiseppe Conti, speaking as an SME recommended leveraging standards to pave the way for innovation; and Guenther Pichler looked at funding models for National Mapping and Cadastral agencies, from government funded to cost recovery.

This was followed by a brief discussion from participants.

Andrew Coote asked about path forward based on the communications to decision makers and engagement models discussed above.

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David Harper responded that you have to understand the machinery of government and engage more levels of decision makers than you may realize.

Andrew Coote commented that it is hard work to understand the decision process; this could be the subject of a white paper eventually.

Jay Pearlman asked Nicola Pirrone to expand upon his comment that the inclusion of social scientists with natural scientists did not work when he tried it 10 years ago.

Nicola Pirrone: In 1999-2000, the Commission established a number of working groups to integrate disciplines and to integrate socioeconomic science with natural science. Finally after 12-15 years of this exercise he can see a difference and sees it was a good move of European Commission to push in this direction. Data quality is the key to everything. Based on data we make decisions, which will have an effect on everyone's life. It drives our ability to validate models and to be able to reproduce results.

Kenji Takeda commented - How do we combine census data with citizen-collected data? For weather collection, calibration is an issue. Putting effort into data quality resulted in better forecasts of weather, but the effort was labor intensive, and took two years.

Nicola Pirrone: Now everyone wants to have sensors everywhere. Sensors must be calibrated. There are limitations to the technology. If reproducibility cannot be demonstrated, it is like putting in trash to your model. If this results in an error in forecasting a natural disaster to the public at large, it could result in wrong advice with severe consequences.

Mary Ann Stewart – She is thinking about Tina Colding’s road to open data as the making of a case study; the user community is being tracked as an inherent part of the process. There is a possibility of tension between scientific results, financial analysis and political process.

Max Craglia - There was a huge span of material presented. He is cherry picking in his comments. First, on the movement toward open data, is there a paradigm shift? Should we reevaluate the way we do things? Should government continue to collect data the way it has traditionally been done, or move from GDP to wellbeing? Regarding the methods discussion, we tend to measure changes in the way we do “old things”, but we are not so good at measuring new things. What can we do now that we could not do before? We have a bias toward innovation, and always measure the positive side, rather than measuring the negative side and how it can be counteracted (issue of quality and data fit for purpose) . Is anybody losing? From a dimension standpoint, there is tension between previous investments and what we can do in the future. Max wondered about the importance of standards. Research has shown that standards freeze current practice, thus creating dependencies, and making it more difficult to innovate. A lot of standards do not work in practice. We need to recognize the diversity of standards and build bridges, cultivating an infrastructure rather than design.

Geof Bowker: We need to push this down into the schools. We teach kids how to read books but we don't yet teach them about how to use databases. This should be a central part of education. There are not enough studies of standards as they are seen as boring.

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Alan Smart had a word of caution about throwing out the economics piece. Without economy you do not have all the good things that come with it. He suggests that intangibles add texture and color. CGE modeling takes both costs and benefits in consideration; there are some winners and some losers.

XX Czech Republic – they have been opening data via their national mapping agency; now they collect all data every day for the whole country; it is being added to INSPIRE for mobile apps (new faster web services).

Rich Bernknopf commented: Many economic studies look at distribution effects to show which sectors of population are affected. At USGS some years back, Parkfield ran an experiment to predict earthquakes. The problem was that the State of California put on alert twice, and there was no earthquake. On third time, the state emergency management director called the state geologist about prediction, refusing to mobilize. Fortunately the earthquake did not occur.



Session 5: Mary Ann Stewart Chair

David Arthurs, Hickling Arthurs Low Corp. – Perspectives: how economic analysis changes with one's point of view.

David Arthurs tends to divide world into easy problems and hard problems. Easy problems can be solved with money. As an engineer, he sees hard problems as the communication problems. Started to make presentation on case studies but kept coming back to communication theme.

How economic analysis is conducted depends critically on the audience. There is no correct answer. The question is - were the assumptions right? Because of all the different assumptions, tools, and measures, one cannot really compare studies. Regarding the story telling, after looking at the emperor and golden egg cartoon, he was originally horrified. But later he realized that the cartoon used symbols. ROI is French for king, even better. So which is more of a fairy tale – the cartoon or the econometric analysis?

We start with an infinitely complex reality. We create complex models, use complex data, make simplifying assumptions, and obtain results, which we attempt to boil down to a message. The audience is constrained by knowledge, interest, and intelligence (bounded rationality). There is no single ROI as it depends on the point of view taken in analysis. Often in David Arthur's work, the point of view depends on the people paying him to do analysis. Each audience will come with vested interest, a lens of what they want to hear. David always goes to new clients and asks if they want to know the truth. Later they tell him that's not the truth they wanted to hear. David Smart mentioned earlier that an economic analysis never results in decision to fund projects; however, it is often used to kill projects.

The value chain view of the world focuses on policy, funding, provision, use, and an individual stakeholder may have more than one role. These can be looked at from the sector's point of view (public, private, individual, or society), the point of view of the purpose, geographic scope, or time horizon. The latter will affect the discount rate. Intangible benefits are the really important

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ones but David is not a fan of attempting to quantify these. Opportunity costs are probably not given sufficient consideration.

In conclusion, David Arthurs shares Max Carglia’s skepticism about the entire industry of benefit assessment. Geof Bowker spoke of truth to power - David doesn't believe he knows what truth is. He noted the complexity of the discourse and the challenge of hitting the swinging pendulum (objectives are many, conflicting and changing). He highlighted the danger of overselling the ROI, overemphasis on GDP, and need for analysis standards. Finally, he wondered if economic analysis is a fairy tale for politicians.

Claire Joly, OECD – Space sector contribution to economy and society

Here are a few fast facts about the Organization for Economic Cooperation and Development (OECD). It was created after World War II, as an arm of NATO. It is the source of economic statistics. It is not a space agency, and thus has no vested interest in that sector, but has developed a growing expertise in analysis of space programs. It has a mandate to better statistically identify the sector, provide comparative data, analysis and forecasts to underpin multilateral co-operation. Active dialogue with major space agencies (including BRIC countries...), international institutions (UN, EUMETSAT...), academia, private sector and industry associations. Work has been going on in this sector for the past 6 years. Space programs have been moving from military motivations to economic motivations. For example, the Indian government has put in place a fleet of EO satellites because they want to have their own data for purposes such as crop analysis, and they want to make decisions based on their own data.

The space sector worldwide is growing. The approach is not only to look at the classic space sector but also to look at commercial activities growing out of R&D activities, avoided costs and other indirect benefits. Is the ‘space economy’ an engine of economic growth? The space sector fared relatively well so far despite the economic crisis, thanks to its specificities as a strategic sector (i.e. national imperatives and institutional R&D funding), but also because of a vibrant and more visible ‘space economy’. The “space economy” includes commercial activities that have been derived over the years from the space sector’s research and development programs. Several mature downstream activities have reached mass markets, and include information technology products and services, such as satellite television and GPS receivers.

Could the estimated USD 175 - 200 billion invested in space programs in 10 years (1996-2005) have contributed to some USD 440 - 645 billion in socio-economic activities? In most countries, governments increasingly require that public agencies assess benefits and costs of their operations, while exploring possible monetization of these benefits. OECD is developing case studies aimed at exploring the broad economic and social dimensions of space-based applications. The approach includes data mining, review of literature, analytical / synthesis, consultations, and cross-fertilization from work in the OECD Directorates. The objectives are to analyze the role of space investments in global food supply (looking at the impact of precision farming); review existing economic impacts assessments; refine findings on socio-economic methodologies used to assess space applications; and give international perspectives. For example, it is dangerous to state that precision farming can bring benefits at a certain level to any farm using it, due to variation in agricultural practices throughout the world. Use in India results in very different benefits.

Positive impacts span productivity gain, cost avoidances, and regional economic growth. Challenges include lack of causality (no direct link between investment and impact), no single framework due to multiple sectors, international spillovers, and subjectivity around noneconomic impacts.

The following items should be taken into consideration when performing assessments: growing demand used as justification for spending; evaluation culture and practices uneven across

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countries; mismatch between manuals / guidebooks by economists and daily reality; ignorance about general evaluation guidelines. One also needs to be aware of unreasonable expectations from “customers”, with ensuing unreasonable methodological approaches to meet these expectations.

The best assessments are those, which take into account both the economic and scientific impacts, make use of survey methods or peer review, identify all the assumptions, and are competitive. One useful and expensive option is to use several assessment methods in parallel to test the assumptions and resulting impacts of a given space program.



Aurelie Moulins, CIMA Foundation - SEAWETRA Web-based GIS marine conservation decision support tool

Everyone likes cetaceans. SEAWETRA is a prototype whale potential habitat model dedicated to the conservation of cetaceans, addressing two main challenges: first, to collect, archive and visualize geographical information coming from multiple sources over a large spectrum, in an interoperable format; second, to develop dedicated tools to help stakeholders and decision-makers

for cetacean conservation.

The systems architecture is based on open source software. Data sources include high resolution earth observations and models and in-situ ground truth field data provided by a variety of sources, such as scientific institutions, crowd-sourced from citizen scientists, the fin whale potential habitat model from JRC, data provided in real time by the CIMA's Automatic Identification System base station, and finally administrative data (national/international laws and public authority catalogues). Only some of the databases are compliant to INSPIRE.

The Web-based GIS working mode makes use of a variety of static and dynamic layers. CIMA decodes and plots the ship itineraries in real time, and plots static layers of land-use in function of the selected time window. The prototype can plot all sightings of a marine species and use to aid conservation. Decision support tool have been developed such as a collision avoidance tool, which aids both whales and ships by providing early warning of cetacean position. Another tool provides stranding emergency information along the coast, for use by coastguards and stranding networks.

In conclusion, the Marine Conservation Decision Support Tool allows exchange of information in English as the common language, providing

- Interoperable information according to the EC Inspire Directive
- Earth observation data and models (with original format as NetCDF) into the WebGIS for marine conservation
- AIS data (ship) in real-time with output static layers to monitor human land-uses
- In situ data collected by different providers using a smart-phone application.

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Targeted users include stakeholders of Protected Sites, administrative authorities, coast guards, agents from shipping companies, scientists, and citizen scientists.

Franco Siccardi, Civil Protection, Italy – Civil Protection Agencies beyond the simple rescue: prediction and prevention in a scenario of climate change

The CIMA Research Foundation is a private non-profit research organization. It is committed to promote the scientific research, technological development and higher education in engineering and environmental sciences in order to improve civil protection, public health and preservation of aquatic and terrestrial ecosystems.



To put the flood control in contest, Franco Siccardi talked about the Middle Age salt routes from the Northern Mediterranean Sea to Central Europe. Walled villages were established to prevent flooding from damaging stored salt. The only way for water to inundate the village was through the carriage gateway at the end of the bridge over the creek. The carriage gateway was equipped by two rails at the pillars. Stop logs were introduced when flooding was possible. Putting the planks into the rails was subjected to rules. The borough master had to take the decision, by weighing the costs of the inconvenience to transit against the risk of getting larger costs due to flooding the warehouses.

Borough master's rules: observe the direction of clouds. If they go to the mountains put the stop logs, if to the sea open the transit. Very similar to the modern rules of putting stop logs if and when the regional Civil Protection diffuses an early warning for possible flood in the area.

In modern times, they are dealing with a very large number of targets. The cost of the effort to reduce risk today could exceed the annual GDP in exposed areas, leading the civil protection to focus on preserving life and possibly citizens' possessions.

Time scale of flooding event in Italy can be very short. You observe the rainfall and the flood is there. Flash flood one evening in Genoa in 2011 shows uncertainty due to climate change effects. The forecasting system predicted possible overtopping and recommended precautions. Monitoring showed change every half hour with a tornados' water spout going toward the city of Genoa. Six people died. Why such critical result? In the ex-post analysis, a sea surface temperature anomaly was observed. Sea surface winds were also noted. Citizens contributed observations of the waterspout during the event.

The Distributed Research Infrastructure for Hydro-Meteorology (DHRIM) FP7 project was expanded to DHRIM-2US, which included various observation systems groups and focused on international collaboration tries to collect such events in real-time. Climate change models are being developed. We know that plant life has changed as a result of climate change, so why not rainfall? We need better monitoring.



Barbara Ryan, Director, GEO secretariat – Demonstrating GEO's Added Value, Challenges and Opportunities

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Barbara Ryan first provided some fast facts on GEO. She reminded the audience about the GEO vision - to realize a future wherein decisions and actions, for the benefit of humankind, are informed by coordinated, comprehensive and sustained Earth observations and information. The real problem is the link between decisions and actions. GEO's objectives can be summarized as improving and coordinating Observation Systems; advancing Broad Open Data Policies/Practices; fostering increased use of EO data and information; and building capacity.

Barbara would like to position GEO upstream of what individual actions are attempting. The organization was created in 2005 to develop and coordinate GEOSS and enhance decision making for nine society benefits area. GEO includes 67 participating organizations and 90 member states.

GEO is currently broadening stakeholder engagements. At the GEO Plenary (Nov. 2012, Brazil) private sector involvement was approved, including commercial companies, foundations, and development banks – i.e. any non-governmental entities. Commercial companies are working along the entire value chain – data providers, value-added information products and services, and downstream (SBA) users. This sector is broad, including not just satellites but also ground based and in situ observations. They have targeted gaps - continuity of observations, spatial and temporal gaps, as well as inadequate data integration. GEOSS requires the data sharing principles, including full and open exchange of data; data and products at minimum time delay and minimum cost; and free of charge or cost of reproduction. The brokering approach has led to an explosion in GEOSS resources, so the focus is about discovery.

The Landsat Story – from 1972 to 2008 USGS sold the data (40 years). In 2008, the department of agriculture stopped buying data from the US and went to India for data, resulting in the change in policy. The change to free distribution over the web was announced by the Secretary of Interior. Over 11 Million Landsat scenes have been distributed since then. Before that, the daily average for the best year of sales was 53 scenes. Currently, the daily average delivered 5700 scenes over the web. When will it level off? It has not yet. The patterns of use have changed. Instead of just one scene, we may receive requests for 30 to 60, which is necessary in order to study change. Who was buying data? Entities that were purchasing data were using Federal funding, so government was just incurring transaction costs to sell the data. Benefits were coming to only one agency, not the government at large. The private sector originally opposed the policy change, but has found that open data distribution has increased their business due to downstream products and services.

In conclusion, Barbara Ryan reviewed challenges and opportunities. As far as challenges, policy linkages must be strengthened for decisions and actions to be effected. Broad, open data policies are needed for global transparency, environmental accounting, and economic development; while much has been accomplished more needs to be done. Articulating the specific value-added components is a challenge. How to tease out incremental benefits? There are many opportunities such as GEOSS leveraging existing national and international activities/programs/systems; GEO's voluntary nature resulting in “coalitions of the willing” who recognize gaps and take actions to harmonize methodologies and algorithms leading to evidence-based decisions; and GEO's commitment to capacity building benefiting both developing and developed countries.

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Finally, the unique aspects of participating organizations in GEO, and the emergence of the private sector engagement should be noted.

Questions and discussion.

Mary Ann Stewart’s question to speakers – What would you most like to work on to further the study of benefits impacts?

Claire Jolly - She would like more workshops like this one, with more international involvement, and more case studies.

Barbara Ryan - Bring methodologies together into one case study, and then get our arms around it.

Aurelie Moulins - One main problem is people not wanting to share data because data owners want to be paid. Without the equivalent budget, we could gather a lot of data and have many platforms.

Franco Siccardi – He would like to see free use of data for a number of reasons. Data comes from tax dollars spent for the benefit of citizens. He is pushing for Italy to open its archives

David Arthurs: Better, freer, open data but for him it would be economic data. Constraints include money, survey fatigue, government policy on data collection regarding citizen opinions.

Marc De Vries question for Professor Siccardi: Hasn’t forecasting become dangerous? Forecasters recently want to jail. Franco Siccardi replied that he is still out of jail. Scientists should step into their responsibilities. His colleagues who stay out are useless. There is a risk of trespassing the limit while trying to help, for example with the special problem of earthquakes in prone countries. Some countries have very old buildings; the cost of reshaping the building environment to have acceptable risk is too high. Society may try to find responsible parties for a disaster but no one is responsible.

Barbara Ryan mentioned the displacement of responsibility from individual to organization via walled city.

Max Craglia had a question to David Arthurs about data collection by government and policy restrictions on surveys. In the public sector, supermarkets collect huge amounts of data. Should government give tax breaks instead of a loyalty card?

David Arthurs - Can we get data from sources other than government? Crowd sourcing is a potential source as small inexpensive sensors are possible.

Max Craglia’s question to Barbara Ryan: Shouldn’t system of systems involve all 7 billion people of the Earth?

Barbara Ryan - Citizen input issues are interesting but be careful about what we are measuring or asking people to do. USGS “did you feel it?” Did you feel the Pisa earthquake? Go on the web and respond. This results in thousands of data points, and allows refinement of sensor network.

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Claire Jolly - Democracies won't rely on supermarket data. There is still a role for the government; we need time series, and data quality.

Kanji Takeda – He looks at citizen science as additional data, similar to Twitter. Live data feeds are a different kind of data, more real. He sees this as an opportunity.

Claire Jolly - Most of the population doesn't use Twitter.

Kanji Takeda - Public understanding of sciences in the UK used to be one way (the assumption was that you were stupid) but has evolved lately toward two-way.

David Harper question to Barbara Ryan - What is GEO's path forward?

Barbara Ryan - GEO is not a UN organization. To take environmental governance seriously, one must look beyond traditional UN mechanisms, which are essential but not sufficient. Sometimes one tries to get an issue into intergovernmental mechanism too soon which results in struggles, as one may need 194 countries to sign up to an action.

Session 6 – chair Max Craglia

Path forward and wrap-up Panel – Matching solutions with needs

Rich Bernknopf (chair), Suzie Allard, Alan Smart, Mary Ann Stewart, Kenji Takeda, The panel discussion focused on topics that have been presented during the workshop and how these types of activities can influence the adoption of geospatial data for analysis, communication, investments, operations, and policies. Depending on the circumstance there may be one or several approaches to assess what methods work best to solve the problem. For example, what type of evaluation is needed for a geospatial investment decision? Does this question require a socioeconomic or economic analysis; for a specific analysis when is a macro or micro model better suited; and when is a qualitative or quantitative approach more appropriate? Background: Rich is an economist and thus presents a different viewpoint than what we've been hearing. He is involved in measuring the tradeoffs between societal preference, and answering the why questions regarding an investment. Geodata is Big Data. Understanding that the intermediate good is not the final good is a fundamental tool in reducing uncertainty in economic and policy decisions. It is composed of spatial and spatiotemporal scientific and technical data. It comes in many forms and, for specific data sets, provides a long-term archive. Its value in use requires demonstration of why and how the data is a component in a decision.

Rich briefly reviewed the approaches to analysis, such as qualitative, or quantitative; revealed preference, stated preference (WTP surveys); retrospective (ex post), or prospective (ex ante); economic impact analysis; macroeconomic models, simulations, industry impact analysis; microeconomic analysis and case studies; cost-benefit analysis - B/C (market, nonmarket) or C/E (savings); and return on investment.

He then identified a set of questions, for the panel's consideration.

- What are the public good attributes of geospatial data? What is the role of the government agencies? What is the role of the private sector?

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- Why quantify the message? What type of study sells a program (macro)? Is there a need for further research and application for use case studies (micro)?
- Can you identify examples of decisions that have been made with these types of analysis?
- How do we identify opportunities beyond cost savings for geospatial data collection platforms?

A brief summary of the discussion follows. What are the public good aspects of geo-data? We need to clarify that public goods are paid for through taxes, and government needs to be willing to fund geo-data as infrastructure. Another characteristic is that public goods have no market. Examples of public goods provided: tide gauges; Twitter sentiment analysis. Rich used to work with public goods items, which needed to be processed. He comments on the narrow definition of geospatial data. Consider what is below the surface of the earth. One other comment is that public data is not necessarily authoritative. Benefits of public goods are not necessarily understood by the relevant organizations. The transition from public to private goods needs to be defined – examples, the boundary of a mine, or traffic information.

What about the role of citizen’s participation? It comes down to definitions; scientists are citizens as well. The role of citizens needs to be reviewed on a regular basis as we are in a changing environment. For crowd-sourced data, government agencies should help us ensure that the data is good and sustainable; the private sector would develop applications (an example was given regarding environmental sensors). On the other hand, in Open Street Map for example, if 70% of citizens say something is wrong, it is probably wrong. Data provenance is an important item to provide. Data quality and feedback to the data provider should be linked. Think of how we harness creativity of the public.

Why quantify? Rich Berknopf’s slide on types of studies could help us categorize the studies. If you do not study the processes for each project, it is very difficult to define an outcome. When submitting a proposal to the government, convince the citizens the project is worth doing; ex-post – provide information on where your decisions have been going (you need to know your audience). Remember that numbers are jargon, and that there are ways to express the size while avoiding numbers and tables. For example, “this is equivalent to 6 Bill Gates”; also use the Big Mac index as an indicator of economic health. Another strategy mentioned is the use of a 3-Dimensional printer to illustrate the use case. Writing on the challenges of expressing information effectively, Mark Twain compared writing 30 pages in 2 days, versus 2 pages in 30 days. When preparing an elevator pitch, do not do on your own, and work up objections ahead of time. Other suggestions included watching finance news in order to know how to deliver a number. From an analysis stand point, cost/benefit is the beginning. Benefits realization is another group of techniques to consider.

When to use macro versus microeconomics? It really depends on what you are trying to do. You can use macroeconomics to describe impact to GDP. For micro-economics, you need the case studies, which can provide communication vehicles.

Examples of decision as reflected in case studies were requested in the next question. The answers included an open data business case, building a case around INSPIRE infrastructure files, and the micro study of the national map. Taking a class on how the government works (Canadian example) is helpful, as few people know how to get a proposal across the line.

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Lastly, How do we identify opportunities beyond cost savings for geospatial data collection platforms? The following were discussed: opportunities with people who use GEO data; automated mines and big ships; searching for the 50 year idea, hackaton style; and opportunities for Small and Medium Enterprises.

Wrap-up and way forward

Jay Pearlman briefly discussed the socioeconomic benefits website at <http://www.socioeconomicbenefits.org> . Please make contributions, even small ones. The LinkedIn community also is important (see http://www.linkedin.com/groups?gid=4538983&trk=my_groups-b-grp-v).

Max Craglia: it is always important to extend people involved as well as to proceed with new studies. There are issues of comparability. For examples, he is not convinced that option curves would be comparable from one country to another. This is a case for a study looking across institutions. We need to explore this opportunity seriously.

Max Craglia: That's what they are doing with INSPIRE.

Denis Polliquin - There is such a study underway in Canada, looking at performance of infrastructure.

Rich Bernknopf - Long Term Ecological Regions in US (LTERs) would be good candidate for a longitudinal study.

Andrew Coote – He is thinking about the next steps. Binding together what we do with OECD (Claire Jolly), and with GEO would be good.

Max Craglia – There is a precedent with the Bickery study of 2011 where evidence from number of projects were examined for socio economic benefit.

Andrew Coote – He would recommend generating two 5-10 page white papers; one on communications; the other to expand upon the pros and cons out of Rich's session. We need to think forward to next workshop. Also we have an opportunity to provide input to Tina's project. There is a book called Jump to Castle, about getting beyond early adopters. How do we go multidisciplinary? The community is building – it would be nice to see decision makers in here.

Max Craglia – He started the INSPIRE study two days ago, putting a questionnaire online on impact of the GEOSS data core.

Barbara Ryan – She would love to point to website. The discussions would be quite relevant to her audience. The comment on a lessons learned white paper takes her back to Rich's framework slide. What is the framework? They need to see at international level what has been accomplished as incremental benefits of GEO; to see the various approaches, results, and see if there is convergence.

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Francoise Pearlman – Our proposal for a socioeconomic benefits session at the fall AGU In San Francisco under Public Affairs has been approved. Please submit abstracts, the due date is soon.

Jay Pearlman - Getting feedback on workshop is helpful. It will be in the form of a small questionnaire.

Mark DeVries – He just produced a document describing development in Denmark. Will be published this week and he will share it.

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Attachment 1 – Biographical summaries

Suzie Allard

Suzie Allard is associate director at the school of information sciences, and adjunct associate professor at the school of journalism and electronic media, at the University of Tennessee. Prior to joining the University of Tennessee, she consulted for the entertainment industry and was a free-lance writer. Her areas of interest include: science data, science/health information and communication, library and information sciences education, and intercultural/international information issues. She has published numerous papers in peer reviewed journals, and book chapters such as “DATAONE interdisciplinary data science education” (2012). Suzie received a Bachelor’s degree in Economics from California State University at Northridge (1982), an MS in Library and information sciences (1999), and a PhD in communications from the University of Tennessee (2003).

David Arthurs



Dr. David Arthurs is the President of Hickling Arthurs Low Corporation (HAL). David specializes in economic analysis, policy development, and strategic planning for public sector science and technology organizations. For the past 15 years, he has been informing the evolution of all aspects of the Canadian geomatics industry, including surveying, geodesy, earth observation, cartography, hydrography, positioning, and geographic information systems.

David has a BSc in Engineering from the University of Waterloo, an MBA from the University of Ottawa, and a PhD from the School of

Business at Queen’s University.

HAL is headquartered in Ottawa, Canada. Clients are decision makers, policy advisors and public sector administrators at the local, regional and national levels who seek specialized information, strategies and assessments that are factual, practical and that can catalyze change. HAL’s practice areas include innovation policy, public administration and strategy, socio-economic impact analysis, and regional economic development.

Richard Bernknopf



Richard Bernknopf is a Research Professor at the University of New Mexico. Before joining the faculty at UNM, Dr. Bernknopf was an economist with the USGS for more than thirty-eight years. Dr. Bernknopf’s research focuses on the demonstration of the relevance (value to society) of natural science information including earth observation and the translation of that information into a form compatible with decision-making processes. During his tenure at USGS, he was a consulting professor and co-director of the Center for Earth Science Information Research at Stanford University, and

co-director of the Spatial Integration Laboratory for Urban Systems at the University of Pennsylvania. Currently he is associated with the Science Impact Laboratory for Policy and Economics at the University of New Mexico and the Wharton Geospatial Initiative at the University of Pennsylvania.

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Goef Bowker



Geoffrey C. Bowker is Professor at the School of Information and Computer Science, University of California at Irvine, where he directs a laboratory for Values in the Design of Information Systems and Technology. Recent positions include Professor of and Senior Scholar in Cyberscholarship at the University of Pittsburgh iSchool and Executive Director, Center for Science, Technology and Society, Santa Clara. Together with Leigh Star he wrote Sorting Things Out: Classification and its Consequences; his most recent book is Memory Practices in the Sciences. More information can be found at: <http://ics.uci.edu/~gbowker>.

Cristina Capinieri



Cristina Capinieri is associate professor at the University of Siena where she teaches human and economic geography since 2000. Since 1990 she has been a member of the NECTAR Group (Network for European Communications and Transport Activities Research) one of the activities of the European Science Foundation and since 1998 she has been appointed scientific secretary of the Società di Studi Geografici (Geographical Studies Society) in Florence. In 1995-1996 she was visiting fellow at the Department of Town and Country Planning, at Sheffield University (UE, Training Mobility Programme) where she developed a research on accessibility and railway services in Italy through a GIS application. In 1997-1998 she developed the contents and worked at the scientific project for the Museum of Landscape (Museo del Paesaggio), situated in Castelnuovo B.ga, Siena, Italy. She appointed as member of Transport Research Board of the National Science Foundation (Usa) (2000-2007). Since 2002 she is one of the founders of the Vespucci Initiative (www.vespucci.org) for the Advancement of Geographic Information Science. She is coordinating LADEST laboratory mainly devoted to GIS and volunteered geographic information. In 2012 she has been appointed Chair of the Cost Action ENERGIC: Software and methodologies for harnessing geographic information from the crowd. Her research interests concern broadly transport networks issues and logistics, Giscience and volunteered geographic information, local development and sustainability, environmental indicators, organic agriculture.

Tina Svan Colding

Tina S. Colding is Head of Function – private sector, Danish Geodata Agency, Danish Ministry of Environment. Prior to this she was team leader - Business development team at National Survey and Cadastre, Danish Ministry of Environment. She holds a Ph.D. in Geography, University of Copenhagen (2005), and an M.Sc. in Agricultural Geography, University of Copenhagen (1997). She has published peer review articles and book chapters on globalization of the agricultural landscape and other environmental topics. She is an external reviewer for the ‘Danish Journal of Geography’.

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Giuseppe Conti



Giuseppe Conti is CTO at Trilogis – Italy, a SME specialising in geospatial technologies, where he is also in charge for management of international activities. In the past years he has worked as senior scientist and bid manager at Graphitech, where he has been involved in a number of international projects on geospatial technologies. He holds a PhD degree from the faculty of Engineering of the University of Strathclyde, Glasgow, UK and master's degree in Building Engineering from the University of Palermo. During his past working experiences he has been working for engineering firms in Italy and UK.

Andrew Coote



Andrew Coote is director, ConsultingWhere, UK. He is an IT consultant specialising in location-based applications with a strong interest in strategy development and socio-economic value assessment.

Andrew has over 30 years experience in developing and using information systems, specialising in management of location-enabled applications. He has held senior management positions in both Government at Ordnance Survey and the private sector at ESRI (UK). His undergraduate degree was in Land Surveying and Geography, he also holds an M.Sc in Computer Science from University College London and a diploma in Company Direction.

He formed ConsultingWhere in 2008. The organisation specialises in providing business strategy advice and business case development support to organisations worldwide. His recent consultancy assignments include facilitating data specification work for the European Union INSPIRE programme, strategic business direction reviews for software companies in the US, Russia and Egypt and advising the New Zealand Geospatial Office. He has led recent studies on the economic benefits of geospatial information for both local government and Ordnance Survey. In the latter case this was part of their evaluation of the impact of the OpenData initiative.

Max Craglia



Massimo (Max) Craglia is a Senior Scientist at the European Commission Joint Research Centre, Italy. Max is a member of the INSPIRE Coordination Team at JRC, with responsibility in the field of metadata, and is scientific coordinator of the GEOWOW FP7 Integrated Project. Since 2006, Max leads a team assessing the socio-economic impact of spatial data infrastructures and INSPIRE. Prior to joining the JRC in 2005, Max was a Senior Lecturer at the University of Sheffield, and participated in several European projects in the field of Geographic Information including GINIE, and MADAME, and was the coordinator of the GISDATA scientific programme funded by the European Science Foundation.

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Marc De Vries



Marc De Vries is one of 4 principals at The Green Land, who offer experience in legal, economic, analytical, research, public sector, IT, change management, community building, and knowledge management aspects of the digital disruption wave that is open data.. He has a legal and economic background. Marc has been heavily involved over the last 15 years in access to and use/reuse of public sector information (open data), in the broadest sense possible. This he did with many hats on (consultant, decision maker, scientist) and for a wide range of customers (the European Commission, ministries, implementing organizations, local authorities).

David Harper



David Harper is the Director of GeoConnections at Natural Resources Canada (NRCan). The GeoConnections program is a 5-year, \$30 million national initiative that supports the integration and use of the Canadian Geospatial Data Infrastructure, an on-line resource that improves the sharing, access and use of Canadian geospatial information. As the Director of GeoConnections, David is responsible for coordinating each of the main governance bodies for geomatics and Earth observations in Canada, including the Federal Committee on Geomatics and Earth Observations, the Canadian Council on Geomatics, and the Canadian Geomatics Community Round Table. He is also responsible for coordinating the development of national policies, standards and mechanisms to facilitate interoperability and re-use of national geospatial datasets, domestically and internationally, as well as leading outreach activities to increase the awareness of the benefits of using geospatial data and tools to support key economic, social and environmental priorities. David holds an M.Sc. from Université de Montréal and a B.Sc. from McGill University.

Claire Jolly

Claire Jolly is Policy Analyst in the OECD International Futures Programme (IFP). C. Jolly is the resident expert on aerospace activities at OECD, which she joined in 2003. She manages research activities on policy, regulatory, economic and financial aspects of the space sector in the OECD Directorate for Science, Technology and Industry. She holds a Masters Degree in Space Studies from the international Space University (1998-1999), and a PhD in International relations from the University of Durham (2006-2009). The theme of her studies focused on the transfer of space technologies.

Giacomo Martirano

Giacomo Martirano is an Electronic Engineer. From 1990 to 1997, he worked in the On-Board Spacecraft Systems Division at Thales Alenia Space. Since 1997 he has been the co-founder and Technical Manager of Epsilon Italia, an independent SME active in the Geomatics sector. On behalf of Epsilon Italia Giacomo was/is responsible for many international projects as well as for projects implementing SDIs at local level for the Public Local Authorities. He is actively involved in many INSPIRE implementations, ranging from data harmonization to network service deployment and to validation and testing. Since 2012 he is also vice-chair of CEN/TC 287.

Aurèle Moulins



Aurèle Moulins is a Postdoctoral fellow with a Ph.D. in Marine Ecology from the University of Lyon, France with the Mention Doctor Europaeus (training experiences in Italy; multi-languages thesis and thesis defense; and the two reviewers from Italy and Spain).

She is expert in the monitoring techniques of the marine ecosystem. Her research regards cetacean habitat modeling; the integration of remote sensing information to models; the dynamic of the cetaceans populations; the monitoring of whale-watching activities; support information to Marine Protected Areas. She participates to the development of Italian operational Coast Guards routines in case of cetacean stranding or with unusual cetacean presence on the coast. She has international experiences as Marine Mammal Observers since 1999 aboard the oceanographic vessels R/V Atalante (of the IFREMER, France) and R/V Urania (of the CNR, Italy); Swiss and French whale-watching sailing boats; Italian whale-watching vessels; French and Italian research vessels.

Antonio Parodi



Antonio Parodi is a Project Leader at the CIMA foundation. He holds a Ph.D. in Fluid dynamics and Modeling of Environmental systems from the University of Padova.

Antonio is an expert in atmospheric modeling and statistical analysis of extreme events, in the development of simplified models of dry and moist convection and the study of the main sources of uncertainty in the high resolution numerical modeling of deep moist convective processes.

Awarded with a CNR-MIT grant in 2002 in the framework of the bilateral USA-Italy investigations on climate change and hydrogeological disasters. Since 2003 has developed teaching activities at the University of Genova in the following fields: Hydraulics, Fluid Mechanics, Dynamics of Atmosphere and Computational methods in Environmental Engineering. Coordinator of FP7 project DRIHMS (Distributed Research Infrastructure for Hydro-Meteorology Study, www.drihms.eu, 2009-2011) and DRIHM (Distributed Research Infrastructure for Hydro-Meteorology Study, www.drihm.eu, 2011-2015). Coordinator of FP7 project DRIHMS (Distributed Research Infrastructure for Hydro-Meteorology Study, www.drihms.eu, 2009-2011), DRIHM (Distributed Research Infrastructure for Hydro-Meteorology Study, www.drihm.eu, 2011-2015) and DRIHM2US (Distributed Research Infrastructure for Hydro-Meteorology Study to United States of America, www.drihm2us.eu, 2012-2014). Antonio Parodi is author and co-author of 29 papers published in international peer-reviewed and referred journals.

Ed Parsons

Ed Parsons is the Geospatial Technologist of Google, with responsibility for evangelising Google's mission to organise the world's information using geography, and tools including [Google Earth](#), [Google Maps](#) and [Google Maps for Mobile](#). In his role he also maintains links with Universities, Research and Standards Organisations which are involved in the development of Geospatial Technology. Ed is based in Google's London office, and anywhere else he can plug in

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his laptop.

Ed was the first Chief Technology Officer in the 200-year-old history of Ordnance Survey, and was instrumental in moving the focus of the organisation from mapping to Geographical Information. He came to the Ordnance Survey from Autodesk, where he was EMEA Applications Manager for the Geographical Information Systems (GIS) Division.

He earned a Masters degree in Applied Remote Sensing from Cranfield Institute of Technology and holds a Honorary Doctorate in Science from Kingston University, London. Ed is a fellow of the Royal Geographical Society and is the author of numerous articles, professional papers and presentations to International Conferences and he developed one of first weblogs in the Geospatial Industry at www.edparsons.com.

Jay Pearlman



Jay Pearlman was Chief Engineer of NCOC&EM at Boeing and a Boeing Technical Fellow where he was responsible for advanced development of information systems. His interests are in oceans research and information science. He has a Ph.D. from the University of Washington and a B.S. from the California Institute of Technology. Jay is a Fellow of the IEEE and was IEEE Co-Chair of the GEO Architecture and Data Committee. Dr Pearlman is currently co-owner of J&F Enterprise, a small technical services company operating in the global dimension. Through J&FE, he is active in advancing the analyses of socioeconomic benefits from Earth and environmental information. Dr. Pearlman has more than 75 publications and 25 international patents.

Nicola Pirrone

Dr. Pirrone graduated (1989) in Nuclear Engineering at University of Pisa in Italy. He worked (1989-1997) as post-doc at IIASA (International Institute for Applied Systems Analysis) and University of Michigan. He is currently Director of the Institute of Atmospheric Pollution Research of the National Research Council of Italy (CNR-IIA) in Rome (www.iaa.cnr.it) and Adjunct Professor at the Department of Environmental Health Sciences of the University of Michigan in Ann Arbor, USA (<http://www.umich.edu/>). Dr. Pirrone serves as expert for major international and national public and private organizations in the field of environmental research and policy development. He is Italian Representative and Head of Italian Delegations in several International Conventions (i.e., UNECE-EMEP, UNECE-HTAP, OSPAR) and programmes (i.e., UNEP, GEOSS) and Chair of European Commission working groups related to Air Quality Directives, mercury contamination, and link between natural sciences and socio-economic sciences. Currently he is Chair of the UNEP Global Mercury Fate and Transport Partnership (<http://www.unep.org/>) aimed to provide scientific support to the UNEP Governing Council in preparing the international treaty on mercury, Chair of the WG on Mercury as part of the Task Force on Hemispheric Transport of Air Pollutants under the UNECE-LRTAP convention (<http://www.htap.org/>), and Chair of the GEO Task “Tracking Pollutants” as part of the GEO Work Plan (2012-2015) to support GEOSS (<http://www.earthobservation.org/>). Dr. Pirrone has been Principal Investigator of over 50 research projects funded by International, European and

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National funding agencies on emission, transport and deposition of atmospheric pollutants, development of observation systems and environmental policy. He has published over 200 papers in the peer-reviewed literature, books and international conference proceedings. He has been Chair/Session Chair/Invited Speaker in several international and national conferences and workshops related to regional and global scale atmospheric pollution and international environmental policy as well as key note speaker in several universities and research institutions covering different aspects of air pollution, environmental legislation and policy. He serves as private expert for major national and international funding agencies in Europe and North America. He is peer-reviewer and guest editor for leading international journals in the field of environmental pollution and for proposal and carrier evaluation for major research and university institutions.

Guenther Pitchler



Guenther Pichler holds a degree in Mathematics and IT from the University of Technology in Graz, Austria. For almost 30 years he has held different positions with GIS software vendors including technical support, product management, sales, account management and business development. From 2002 to 2006 he served as Director Business Development Europe for the Open Geospatial Consortium (OGC) with a focus on encouraging the take-up and adoption of OGC standards in Europe. Since 2006, he is Business Development Manager at Esri with the specific remit of strengthening the relationship with the European Commission and other European Community agencies and bodies.

Barbara Ryan



Barbara J. Ryan is Secretariat Director of the intergovernmental Group on Earth Observations (GEO) located in Geneva, Switzerland. In this capacity, she leads the Secretariat in coordinating the activities of nearly 90 Member States and 50 Participating Organizations who are striving to integrate Earth observations so that informed decisions can be made across nine Societal Benefit Areas including agriculture, biodiversity, climate, ecosystems, energy, disasters, health, water and weather. Before assuming this position in July 2012, she was the Director of the World Meteorological Organization (WMO) Space Programme. She had responsibility for the space-based component of the WMO Global Observing System (GOS), coordinated space-based assets to meet the needs of WMO Members in the topical areas of weather, water, climate and related natural disasters, and also served as the technical focal point for WMO's activities with GEO. Before joining WMO in October 2008, she was the Associate Director for Geography at the U.S. Geological Survey (USGS) in Reston, Virginia where she had responsibility for the Landsat, remote sensing, geography and civilian mapping programs of the agency. It was under her leadership that implementation of the Landsat data policy was reformed to release all data over the internet at no additional cost to the user -- an action that has resulted in the release of more than 9 million Landsat scenes to date. As the 2007 Chair of the international Committee on Earth Observation Satellites (CEOS) she led the space-agency response to the Global Climate Observing System (GCOS) satellite requirements for sustained measurement of the GCOS Essential Climate Variables (ECVs). She holds a Bachelor's degree in Geology from the State University of New York at Cortland, a Master's degree in Geography from the University of Denver, and a Master's degree in Civil Engineering from Stanford University.

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Franco Siccardi



Franco Siccardi is the president of CIMA Research Foundation and Past Professor of Civil Engineering at the University of Genoa. He is an expert in methods for reducing the effects of natural hazards - especially flooding - through weather forecasting, observing networks and satellite sensors. –

Sergey Soloviev Medal of the European Geophysical Society of the year 2000 for the outstanding scientific contributions in the area of understanding and mitigation of natural hazards impact. From 1995 to 2001 and from 2006 to present appointed by the Office of the Prime Minister of Italy as member of the National Committee for Extreme Risks.

Presently coordinator of hydrometeo risk section of the committee. Since 1986 to 2005 leader of the research area on “Strategies for the Mitigation of Natural Hazards Effects” of the Italian Research Group for the Prevention of Hydrogeological Hazards. From 2004 to 2011 principal investigator of the Opera Project, the Italian Space Agency research and demonstration program for the use of EO data in risk assessment and flood predictions. Since 2011: member of the OCSE expert group on the Global Risk Modeling initiative. Up to 2007 Chairman of Business Consortium COS (OT) Technology for the Earth Observation from Space. Since 2007 President of the Research Foundation Centre for Environmental Modeling (CIMA).

Alan Smart



Alan Smart is a Principal Consultant and the Marketing Director at ACIL Allen. He consults in economics, policy and strategy in the energy, water and infrastructure sectors. Alan has undertaken projects on the value of geospatial information in Australia, New Zealand and the United Kingdom. He is undertaking similar projects in Australia and the Middle East. He is the immediate past Chair of the Spatial Information Business Association and is a Member of the Board of the Tasmanian Economic Regulator. Alan is qualified in

Engineering and Economics.

Mary Ann Stewart



Mary Ann Stewart is principal for Stewart Engineering LLC. She formed her company in 2002 to provide business development, research and analysis services to the geospatial community. Her geospatial research projects include the Geospatial Information Technology Association’s ROI/Business Case project, the Federal Geospatial Data Consortium’s CAP Grant projects to the States, and Return on Investment (ROI) case studies of geospatial projects funded by GeoConnections, a Canadian Federal organization. Other business activities include consulting services in the area of data acquisition and conversion for utilities, business development for small firms in the Federal marketplace, and market research for the utility information technology market.

Before starting a small business, Ms. Stewart was manager of data acquisition for an investor-owned gas and electric utility, UtiliCorp/Aquila. She also provided financial and environmental analysis supporting Aquila Merchant Services’ development of gas turbine power plants. Her work with geospatial technology began upon joining the US Environmental Protection Agency’s Air Headquarters office in 1990, where she worked with 3D GIS and scientific

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visualization displays associated with air dispersion modelling. She later created a GIS and visualization group for Midwest Research Institute (now MRI Global), where activities grew to include groundwater modelling and environmental assessments.

Kenji Takeda



Dr Kenji Takeda is Solutions Architect and Technical Manager for the [Microsoft Research Connections EMEA team](#). He has extensive experience in Cloud Computing, High Performance and High Productivity Computing, Data-intensive Science, Scientific Workflows, Scholarly Communication, Engineering and Educational Outreach. He has a passion for developing novel computational approaches to tackle fundamental and applied problems in science and engineering.

He was previously Co-Director of the Microsoft Institute for High Performance Computing, and Senior Lecturer in Aeronautics, at the [University of Southampton](#), UK. There he worked with leading high value manufacturing companies such as Airbus, AgustaWestland, BAE Systems, Rolls-Royce and Formula One teams, to develop state-of-the-art capability for improving science and engineering processes. He also worked in the areas of aerodynamics, aeroacoustics and flight simulation.

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Attachment 2 – list of participants.

First Name	Last Name	Organization	e-mail address
Saif	Alali	Sharjah GIS Center UAE Univ of	se.alali@sgc.gov.ae
Suzie	Allard	Tennessee	sallard@utk.edu
Christian	Ansorge	UBA (AT)	christian.ansorge@umweltbundesamt.at
David	Arthurs	HAL Univ of New	darthurs@hal.ca
Richard	Bernknopf	Mexico Assoc of Dutch	rbern@unm.edu
Marjan	Bevelander	Provinces	mbevelander@ipo.nl
Ray	Boguslawski	EC-JRC ICES	ray@boguslawski.freemove.co.uk
Bob	Bishop	Foundation Serv.Pub.de	bbishop001@hotmail.com
Vincent	Bombaerts	Wallonie	vincent.bombaerts@spw.wallonie.be
Geoffrey	Bowker	UC Irvine Wageningen-UR	gbowker@uci.edu
Jandirk	Bulens	Alterra	jandirk.bulens@wur.nl
Cristina	Capineri	U Sienna	cristina.capineri@unisi.it
Carlo	Cipolloni	ISPRA Danish Geodata	carlo.cipolloni@isprambiente.it
Tina Svan	Colding	Agency	Tisha@gst.dk
Giuseppe	Conti	Trlogis ConsultingWhere	giuseppe.conti@trilogis.it
Andrew	Coote	e	andrew.coote@consultingwhere.com
Max	Craglia	EC-JRC GA-Office of	massimo.craglia@jrc.ec.europa.eu
Shane	Crossman	spatial policy	shane.crossman@net.gov.au
Hugo	de Groof	EC/DGENV Assoc of Dutch	hugo.de-groof@ec.europa.eu
Arianne	de Mon	Provinces	adman@ipo.nl
Marc	de Vries	Greenland Danish Geodata	info@devriesmarc.nl
Dorthe	Drauschke	Agency	dbl@gst.dk
Virginia	Estevez	ECDC (Sweden)	virginia.estevez@ecdc.europa.eu
Astrid	Feichtner	SDI Bavaria	astrid.feichtner@lug.bayern.de
Anders	Foureaux	Swedish EPA	anders.foureaux@naturvardsverket.se
Heinrich	Geerling	SIG3D, TWGPF	geerling@geerling.de
Erwin	Goor	VITO	erwin.goor@vito.be
Albert	Grela	SPW-DIG	albert@grela.be
Ken	Harkin	Sparx Systems GeoConnections	kharkin@sparxsystems.com
David	Harper	CA	david.harper@nrcan.gc.ca
Christian	Hickel	TU Darmstadt Ministry of	hickel@geod.tu-darmstadt.de
Dag	Hogvard	Environment	dag.hogvard@md.dep.no
Claire	Jolly	OECD	claire.jolly@oecd.org
Francisco	Leon	Univ Sapienza	francisco.leon@uniroma2.it

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Margareta Roberto Ulla	Lindquist Lucchi Kronberg	Lantmateniet Esri GST Denmark	margareta.lindquist@lm.se rlucchi@esri.com ukm@gst.dk Giacomo Martirano <g.martirano@epsilon-italia.it>
Giacomo	Martirano	smeSpire Gen Statistic Office Poland CIMA	m.migacz@stat.gov.pl
Mirostaw	Migacz	Foundation Polish Geological Institute CNR-IIA CSI Piemonte Google CVZK J&FE J&FE Esri CNR-IIA GeoConnections CA HUNAGI INSPIRE NL GEO TU Darmstadt SDI Coord. Office Germany	aurelie.moulins@cimafoundation.org tomasz.nalecz@pgi.gov.pl nativi@iia.cnr.it antonello.navaretta@csi.it eparsons@google.com eva.pauknerova@cvzk.cz jsp@sprintmail.com jay.pearlman@jandfent.com gpichler@esri.com pirrone@iia.cnr.it denis.poliquin@nrca.gc.ca gabor.remetey@gmail.com inspire@gbo-provincies.nl bryan@geosec.org schnitzer@geod.tu-darmstadt.de martin.seiler@bkg.bund.de
Aurelie	Moulins		
Tomasz Stefano Antonello Ed Eva Francoise Jay Gunther Nicola	Nalecz Nativi Navaretta Parsons Pauknerova Pearlman Pearlman Pichler Pirrone		
Denis Gabor Vloer? Barbara Benjamin	Poliquin Remetey-Fulopp? Rutten Ryan Schnitzer		
Martin Mohammed	Seiler Shahrani		
Franco Alan Spyridon	Siccardi Smart Spyratos	GCS CIMA Foundation ACILAllen EC-JRC MA Stewart Engineering Microsoft Research AS Regio CIMA Foundation Slovak Environ. Agency Geonovum SADL- K.U. Leuven SADL- K.U. Leuven Slovene Envir Agency	m.alshahrani@gcs.gov.sa franco.siccardi@cimafoundation.org a.smart@acilallen.com.au spyridonspratos@jrc.ec.europa.eu mastewart@sunflower.com kenjitak@microsoft.com mati.tee@regio.ee stefania.traverso@cimafoundation.org martin.tuchyna@gmail.com r.vandavelde@geonovum.nl danny.vandenbroucke@sadl.kuleuven.be glenn.Vancanwenberghe@sadl.kuleuven.be aversic@gov.si
Mary Ann	Stewart		
Kenji Mati	Takeda Tee		
Stefania	Traverso		
Martin Rob	Tuchyna van de Velde		
Danny Glenn	Van den Broucke Vancanwenbergh e		
Ales	Versic		

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