The role of (geo)-ICT tools in the implementation of European policies for sustainable development: an experiment with the European Landscape Convention

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Summary

Democratic standards in implementation of European Policies are heterogeneous. This generates difficulties in achieving key objectives for Europe, including sustainable development. One such policy area is that of landscape. The European Landscape Convention (ELC) seeks to raise awareness of landscape, and increase public and stakeholder inputs to discussions and decisions about its planning and management. (Geo)-ICT tools have potential to deliver to the aims of the ELC in different ways, by different types of stakeholders (e.g. schools, public or practitioners). A series of competitions is being run across Europe to explore novel and imaginative ways of communicating issues relating to landscapes. The steps towards the running of these competitions is presented, and the findings from reviews of policies and best practice in inclusive landscape management, planning and protection discussed, identifying the types of roles of (geo)-ICT tools.

1. Introduction

Scientific evidence suggests that the European public is poorly informed about policies for sustainable development in Europe (e.g. Jordan and Adelle, 2012), which then inhibits participation in the implementation of such policies. An example of such a policy is the European Landscape Convention (ELC) (Council of Europe, 2000). The key scientific (Conrad et al., 2011), political (Dower, 2008) and governance (Scott, 2011) actors have not managed to translate effectively the principles that underpin this policy instrument into operational actions or strategic pathways for social interventions. Further knowledge is needed to help link scientific theory on landscape planning, management and protection to individual or collective actions over landscapes.

Key international policy agreements and conventions for sustainable development approved over the latest 20 years point to the importance of improving mechanisms for public participation, education, cooperation and raising awareness amongst the general public. Key steps include the Brundtland Commission report (WCED, 1987), United Nations 'Rio Earth Summit' (1992) and Local Agenda 21, and the Aarhus Declaration on access to information and public participation in decision-making (European Commission, 1998). UNESCO in its

decade for education for sustainable development (2005-2014) stated that "… education for sustainable development must continue to highlight the importance of addressing the issues of natural resources (water, energy, agriculture, biodiversity) as part of the broader agenda of sustainable development and to raise the level of environmental literacy".

Theoretical and academic efforts have advanced knowledge and understanding of the potential and constraints for engagement and participation in policy processes for sustainable development. Seminal in these efforts is the definition by Arnstein (1969) of a multi-level participatory classification. This comprises eight levels of involvement clustered under categories of non-participation, tokenism, and citizen power. This ladder has been adopted and adapted under different participation processes (e.g. Dorcey et al., 1994; Carver, 2001; Ball, 2002; UNDP, 2008). It is widely acknowledged that the degree of impact of public participation on decision making processes is dependent upon the level of involvement of the public, which falls into three main levels: information, consultation and collaboration.

It is also clear that the exchange of knowledge is a two way process, and therefore that sustainable development necessitates enhancing the education and awareness of stakeholders. This can be achieved through types of engagement which are suited to local circumstances, and may stretch across a range of levels of participation. Materials are being developed for knowledge exchange, which are designed to aid engagement, leading to communications with target audiences (Miller et al., 2013). Such materials are developed with the aims of:

1. Increasing accessibility of outputs from research, including results, tools and methodologies, in a format and language tailored to different types of stakeholder.
2. Providing mechanisms for feedback and inputs from each target audiences to highlight areas where knowledge, assessment, or tools are lacking, and to ensure people in research, policy, industry and the wider public have opportunities to interact and discuss key issues.
3. Awareness of key messages amongst those benefitting from participatory activities.
4. Building capacity amongst target audiences to undertake their developing business needs and social aspirations.

To enable extension of the nature of public participation, prospective roles for ICT tools in landscape management, planning and protection have been identified (e.g. Council of Europe, 2006; Council of Europe, 2008; Munoz-Rojas et al., 2013a; Zelenika and Pierce, 2013). Advances have been made in approaches to key aspects of landscape intervention such as awareness raising (Pedroli and Van Mansvelt, 2006; Miller et al., 2013), education (Pedroli and Van Mansvelt, 2006; Gomez-Zotano and Riesco Chueca, 2010; Castiglioni, 2012; Sarlov-Herlin, 2012), innovation (de Montmollin, 2006; Jones et al., 2007; Klinar, 2013), and public participation (Prieur and Durousseau, 2006; Jones, 2007; Jones and Stenseke, 2007; Scott, 2011). Furthermore, it is now widely acknowledged that spatially or geographically oriented (geo-) ICT tools have potential for increasing understanding of the importance and impacts of policies on people's daily lives and actions. Consequently, it is important to recognize the suitability of these types of tools to facilitate citizens to participate more actively in the implementation and success of policy objectives and targets through their daily actions and attitudes (Miller et al., 2013).

However, their potential is unfulfilled in many areas of policy, landscape being one example. Conversely, and although it is not explicitly proposed in the ELC, authors emphasise the importance of making better use of ICT tools to improve standards of sustainable development for European landscapes (Miller et al., 2013). For example, Bertrand de

Montmollin (2006) proposed a set of tools (ICT and others) that can potentially help achieve key objectives and aspirations for sustainable development set by the ELC (Council of Europe, 2006). Drawing on examples from selected European countries, de Montmollin (2006) grouped these tools into different types, all of which are well suited to implementation on ICT platforms. To be useful for different types of stakeholders, he classified the tools according to their nature, capacities and potential uses. This resulted in distinctions between participatory tools, tools for raising awareness and training and technical tools.

Based on aims of the Aarhus Declaration of access to justice in environmental matters (European Union, 1998), it is clear that the potential for using ICT tools with respect to the aims of the ELC should be tempered by recognition of the importance of responsibilities associated with decision-making and education. Sheppard (2005) provides a Code of Ethics for visualization that outlines the importance of factors such as authenticity when using such tools in communicating issues such as land use or climate change. ICT tools and visualisation in particular, have been used increasingly as part of information, consultation, and collaboration in relation to issues of global significance. This includes issues such as building scenarios on climate change (Sheppard et al., 2013) and assessing effects in landscapes (Schroth et al., 2011; Donaldson-Selby et al., 2012).The functions of tools identified by de Montmollin (2006) can be informed by the types of guidelines provided by Sheppard (2005).

This paper outlines the results obtained in testing (Geo)-ICT tools aimed at making the ELC popular through challenge, learning, innovation and cooperation. By (geo)-ICT tools we consider those ICT tools in which spatial or geographical dimensions of information are core to the tool's functional and operational configuration. Here, we describe the main methods used in the E-CLIC project ("Making European Policy Popular through Challenge, Learning, Innovation, Cooperation: An experiment on the Landscape Convention"), and the initial results relating to the use of (Geo)-ICT-Tools in improving the social understanding and implementation of public policies with a focus on landscapes. The study aims to contribute to implementation of the ELC by providing challenges, tools and solutions developed with landscape end-users.

2. Methodology

The E-CLIC project has participants from countries across Europe (Greece, Spain, UK, Germany, Hungary, Estonia and Slovenia), representing different stages in, or forms of implementation of the ELC. These include early signatories to the Convention (e.g. UK) and others yet to ratify and implement, such as Germany and Estonia.

The project is structured in three main stages. The first includes a series of reviews of policy issues pertaining to landscapes in different countries, ICT tools, and case studies of good practice in delivering the aims of the ELC. The second stage consists in the identification of landscape-related learning outcomes. Last, in the third stage a series of competitions across Europe are run in which ICT tools are used to address landscape challenges, ending with a conference in Estonia in 2015.

In reviewing policy and best practice in relation to landscape planning and management, examples have been identified from the activities of European Members States in delivering to the ELC. This has also enabled the definition of "landscape challenges" across a range of regions and stakeholders, the creation of a database of best practice examples for guidance on the implementation of the ELC (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-

best-practice-library/), and a report on policy issues (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-elc-issues-review-report/). The diversity in national and regional landscape management and policy making is both a key asset and a hurdle in relation to implementation of the ELC.

A review was completed of (Geo)-ICT tools which can be used as learning tools by different stakeholders for implementation of the ELC principles and actions. In this project, ICT resources are taken to include different combinations of hardware, software and data. Tools can result from different configurations of tools for use with desktop (PC, Mac, Linux), mobile (different operating systems), or more specialist media (e.g. virtual landscape theatres). They may facilitate forms of use such as formal and informal types of engagement, individual and group forums, game-based learning, text and image based, and 2D or multi-dimensional structures.

Examples of these tools have been compiled in a library of (geo)-ICT-tools that is accessible online (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-library-of-ict-resources/). To complement this library, a report was produced that discusses the role of (geo)-ICT tools in implementing the ELC through awareness raising, education, innovation and cooperation (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-library-of-ict-resources/).

Detailed learning objectives and outcomes have been defined in relation to landscape policy, with reference to each of the three target groups defined for the project. The learning methodology is underpinned by the principles of 'learning by dialogue' and 'learning by playing'. Guidelines provided by the European Qualifications Framework (EQF) for Life-Long Learning (http://ec.europa.eu/education_culture) have been used, with information drawn on knowledge components, skills and competences (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-learning-objectives-outline-report/).

The application of (geo)-ICT-based tools is being tested by the target audience groups through a series of national and international competitions in which a landscape challenge is selected by participating individuals or teams, and ICT tools used to provide a solution and present it to a public audience. The challenges draw on lessons learnt through the analyses of policy issues, best practices and landscape learning objectives.

The competitions (www.e-clicproject.eu/en/e-clic-competitions/) run between February and May 2014, covering challenges selected for the UK, Greece, Estonia, Spain, Slovenia and Germany. An international competition is open to participants from all other European countries. The winners of national competitions will be decided in national conferences in each of the partner countries during 2014, and will participate in an International Conference to be held in Estonia in 2015.

The outputs will include the results of the set of all competition entries, and the library of (geo)-ICT tools, and will take the form of a Landscape Learning Package. This package will be freely available and published in all the national languages of the partner countries.

3. Results

The findings from the policy review (Munoz-Rojas et al., 2013b) show that landscape policies across Europe are heterogeneous, with a strong difference in the degree to which they embed stakeholders in the decision-making process. The opportunity and nature of participation at different stages in national and regional decision-making processes provides a context for the use of (geo) ICT tools in each country and region.

From the review of case studies (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-best-practice-library/) it is clear that despite a limited use of (geo)-ICT tools in raising public participation is prevalent, there is a notable increase in the use of aerial imagery, reflecting its increased availability online.

Reviewing the types of (geo)-ICT tools that are useful for improving the understanding and implementation of the ELC, allowed the identification of a wide range of tools which have been tested or used in research applications, or more widely. These include gaming engines, web-based maps and online map editors, 2d and 3d computer aided drafting software and visualisation software, image editors, augmented reality applications, smartphones, desktop and mobile GIS, modelling applications, landscape modelling tools, and 3D viewers (www.e-clicproject.eu/en/learning-resources/%E2%80%B4-library-of-ict-resources/).

Pilot tests were conducted for a subset of tools and three different target groups (template for these pilot exercises at www.e-clicproject.eu/en/learning-resources/%E2%80%B4-library-of-ict-resources/). A summary of the findings follows:

Hungary Pilot tests focused on checking the viability and appropriateness of the tools based on feedback from members of the three target groups. Two students proposed additional tools including Waze (a social media navigation system), Pinterest (useful for sharing landscape images), and Photoshop and other image modification software. These tools enable the creation and modification of images for the representation or modelling of landscapes. Two landscape professionals (landscape architect and lecturer) proposed inclusion of Google Street View and Nemetsketch. A school teacher also suggested the inclusion of Google Street View and Sketch Up as optional tools, and a landscape planner reported how she employed Google Earth/Google Maps to identify threats to local landscapes.

Slovenia The relevance of ICT tools was considered by members of the public, school pupils, university students and practitioners. Google Sketch Up was identified as user friendly by (four) school pupils, and (six) members of the public suggested use of Sketch up Pro. University students and practitioners reported back on a range of tools including: Rhino (ten responses, all from landscape architecture students, noting the ease of use of this tool), 3DS Max (six responses, all highlighting its multi-functionality), Auto-CAD and Google Maps (each with three responses), and Blender, Maya and Cinema 4D (1 response for each).

Greece School students in Greece identified the use of Google Earth for the identification of landscape features which are significant to their daily lives. Such features included derelict industrial installations, mineral extraction sites, playgrounds, peri-urban forests and archaeological sites.

Further consultations in Greece and Scotland provided feedback that social media-related tools would be popular with school students.

The final version of the ICT library and includes a categorization of the (geo)-ICT tools https://docs.google.com/file/d/0B2bTVdRrYngtMzNYTFVTNG5SLW8/edit) as follows:

i. **End-users,** including schools and young learners (14 tools), universities and colleges (32 tools), and general public and local communities (16 tools). The appropriateness of the tools for use by each of the target groups was based upon the skills, knowledge and understanding that had been defined for each group in the landscape learning outcome report (Munoz-Rojas et al., 2014). Some tools may be appropriate for use by two or more target groups (e.g. Wikitude).

ii. **Description,** including the following categories of tools: games, web-based maps of the world, mapping editors, visualization software, 2D/3D computer aided modelling, social networking, image editors, game authoring, smartphone/digital cameras, augmented reality SDK and applications, Desktop and Mobile GIS, modellers, 3D CAD and modelling, landscape modellers, height-field editors, 2D/3D computer aided drafting, 3D X3D and 3D open-flight viewers. Depending upon the skills and knowledge required to use these tools, and their accessibility, some will be suitable for only a certain type of end-users (e.g. GIS used by university students and professionals). Conversely, open-source game-based tools might be used by any of the three types of end-users.

iii. **Applications** include game-based learning, visualizing, exploring/navigating the world, editing/adding own map data, 3d modelling and animation, sharing images and notes, photo/image retouching, geo-tagged game authoring, word-processing, multimedia presentations, exploring people's environments, creating organizing and analysing geographic information, collecting data, GIS data processing, architecture/ landscape design, 3D landscape modelling and visualization, viewing XD3 presentations and viewing high performance open-flights.

iv. **Operating systems**, including widely distributed ones such as Windows and OS, and others which require more specialised technical knowledge and skills by the end-user, such as Linux, or even others where only access to a certain technological device (e.g. Blackberry or i-PAD/i-POD) might permit their use.

v. **Cost**, with tools listed including free and open source, licences or purchases. The library was intended at providing mainly open-source tools, however, tools are available under a wide range of agreements which can vary between user groups (e.g. no cost to the individual, paid for by an organisation, and costs varying by type of organisation).

Web links are provided for each tool in the ICT library to assist in obtaining relevant support of examples of its application and, if necessary, for its downloaded or purchase.

The purpose of the ICT-library is to provide with information on potential for use by anyone interested in either participating in the E-CLIC landscape competitions, or more generally in the fate and dynamics of their daily landscapes. Consequently, this information source is being maintained with plans for enabling its expansion by anyone potentially interested in the use of ICT-tools for the improvement of landscapes.

In defining learning objectives or outcomes (Munoz-Rojas et al., 2014), the diverse we identified the knowledge, skills and understanding/competences which were relevant for each of the three target groups of the E-CLIC competitions (universities and colleges, secondary schools and the general public). The learning capacities, objectives, competences and interests differ between these target groups, and change according to stages in the life-long learning process. However, there are commonalities and shared aims amongst all groups, which include the objectives to learn to read the landscape, and to raise awareness of its importance in people's lives.

Based on the findings from the different reviews of policy, case studies, learning objectives, and (geo)-ICT tools, the three generic challenges defined for the project were translated into specific challenges to be addressed under each of the national competitions to be held in Greece, Estonia, Germany, Spain, Scotland and Slovenia.

The three generic E-CLIC project challenges are to:

- better understand the main characteristics and components of landscapes that define their distinctiveness
- propose solutions to deal with pressures placed on landscapes
- facilitate and promote active public involvement in landscape change decision making using ICT tools.

The specific challenges defined for the set of competitions include issues of common interest but in a local context (e.g. energy security), covering rural and urban environments, and scope to consider issues at different geographic scales. The types of issues being addressed are:

- improving urban, peri-urban, mining and industrial degraded landscapes (Estonia, Greece, Slovenia, Spain, international)
- adding value to marginal (e.g. deep rural) landscapes (Estonia, Slovenia)
- improving participation in the management of (various types of) landscapes (Greece)
- mediating in landscape conflicts and related hot-spots (e.g. renewable energy in coastal and peri-urban areas) (Greece, UK, Spain, international)
- planning for landscapes in integrated and sustainable ways (e.g. rural-urban connections) (Slovenia, UK, international)
- understanding landscape character and its historic evolution (UK)
- making best use of outstanding and singular landscapes (Slovenia)

The challenge to extend public participation which underpins both the E-CLIC project and the ELC is at the core of these landscape competitions. It is required that they demonstrate how the use of (geo)-ICT tools can deliver to any of the types of participation identified by Arnstein (1969), and support learning and cooperation.

4. Conclusions

The objectives and aims of the E-CLIC project mainly relate to enabling European citizens to intervene in the resolution of landscape-related challenges through the employment of ICT-tools. The project addresses three different target groups, namely secondary school pupils, universities and college students, and the general public. The project is ultimately aimed at facilitating the implementation of the European Landscape Convention through the promotion of challenge, learning, innovation and cooperation.

Drawing from the analysis of policy issues, best-practice case studies and ICT-tools, the requirements and guidelines provided by the European Qualifications Framework for the design of educational processes and programmes were adapted to the concrete objectives of the E-CLIC project and the European Landscape Convention.

Results to date of the E-CLIC project highlight the low level of use of (Geo)-ICT Tools in raising awareness, and in enhancing education and cooperation in promoting the importance of landscapes and the ELC. However, they also indicate to (geo)-ICT tools as an invaluable asset for implementation of the ELC. These tools are particularly important in their capacity to assist in extending public participation, and in developing novel approaches to learning, innovation and cooperation in the implementation of European policies for sustainable developments.

It is anticipated that the landscape competitions will stimulate participants to develop imaginative approaches to the use of (geo)-ICT tools. Added benefits could accrue from the differences in the approaches taken between each target group, and in each country. It is expected that the process will encourage wider landscape awareness amongst all the target groups, and networks of shared interests, as well as advancing the potential of the tools developed or used.

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References

ARNSTEIN, S. (1969) A ladder of citizen participation. Journal of the American Institute of Planners, 35 (4):216-224

BALL, J. (2002) Towards a methodology for mapping regions for sustainability using PPGIS. Progress in Planning 58: 81-140.

CARVER, S. (2001) Participation and geographical information: a position paper. ESF-NSF Workshop on access to Geographic Information and participatory approaches using Geographic Information, Spoleto.

CASTIGLIONI B. (2012) Education on landscape for cChildren, in Council of Europe, 2012. Landscape facets. Reflections and proposals for the implementation of the European Landscape Convention: 217-264. (Strasbourg: Council of Europe Publishing: 217-264)

CONRAD, E., CHRISTIE, M. AND I. FAZEY. 2011. Is research keeping up with changes in landscape policy? A review of the literature. *Journal of Environmental Management* 92,

2097-2108.
COUNCIL OF EUROPE (2000) European Landscape Convention. CETS No.: 176. Florence, Italy. 20/10/2000.
COUNCIL OF EUROPE (2006) Landscape and Sustainable Development: Challenges of the European
Landscape Convention. Strasbourg: Council of Europe Publishing.
COUNCIL OF EUROPE (2008) Guidelines for the Implementation of the European Landscape Convention Strasbourg: Council of Europe Publishing.
DE MONTMOLLIN B (2006) Landscape and innovative tools, in Council of Europe, 2006. Landscape and Sustainable Development: Challenges of the European Landscape Convention: 83-93. (Strasbourg: Council of Europe Publishing).
DONALDSON-SELBY, G., WANG, C., MILLER, D.R., HORNE, P., CASTELLAZZI, M., BROWN, I., MORRICE, J. & ODE-SANG, A. (2012) Testing public preferences for future land uses and landscapes. Proceedings of GIS Research UK, University of Lancaster, 11-13 April, 2012.
DORCEY, A.H.J., DONEY, L., RUEGGEBERG, H. (1994) Public involvement in government decision-making: choosing the right model. Victoria BC Round Table on Environment and the Economy.
DOWER, M. (2008) Seventh meeting of the Council of Europe Workshops for the implementation of the European Landscape Convention, Piestany, Slovakia, 24th-25th April 2008 (Opening keynote address).
EUROPEAN COMMISSION (1998) The Aarhus Convention. http://ec.europa.eu/environment/aarhus/
GOMEZ ZOTANO J., RIESCO CHUECA P. (2010) Landscape learning and teaching: Innovations in the context of the European Landscape Convention. In: Proceedings of INTED 2010 Conference. International Technology, Education and Development Conference. Valencia (Spain). 8th-10th of March, 2010. International Association for Technology, Education and Development (IATED). Valencia: 4703-4714.
JONES M. (2007) The European Landscape Convention and the question of public participation. *Landscape Research* 32(5): 613–633.
JONES M., STENSEKE M. (2007) The European Landscape Convention: Challenges of Participation. Landscape Series 13, Springer-Verlag. Berlin, ISBN: 12: 9789048199310.
JORDAN, A.J. AND C. ADELLE. (ed.) (2012) Environmental Policy in the European Union: Contexts, Actors and Policy Dynamics (3ed). Earthscan: London and Sterling, VA. www.routledge.com/books/details/9781849714693/
MILLER, D., MUNOZ-ROJAS, J. MORRICE, J. DONALDSON-SELBY, G. HORNE, P & WANG, C. (2013) Deliverable 7 (E-CLIC): Review of ICT tools for the implementation of the ELC through awareness raising, education and innovation. www.e-clicproject.eu/en/learning-resources/%E2%80%B4-library-of-ict-resources/
MUÑOZ-ROJAS J., MILLER D.R., MORRICE J., WANG C., DONALDSON-SELBY G., AALDERS I.H., HORNE P. & PAPAGEORGIOU, F. (2013a) Building a methodology and tools to make the European Landscape Convention popular through challenge, learning, innovation and cooperation. In: B Perdoli, B,. & P. Berzak (Eds.). Changing European Landscapes: Landscape Ecology, Local to Global. Collaborative Research for the European Landscape Convention, IALE 2013 European Congress, Manchester, 9-12 September 2013.
MUNOZ-ROJAS, J., MILLER, D., MORRICE, J., DONALDSON-SELBY, G., HORNE, P. & WANG, C. (2013b) Deliverable 4 (E-CLIC):. Review report of landscape related policy issues. www.e-clicproject.eu/en/learning-resources/%E2%80%B4-elc-issues-review-report/
MUNOZ-ROJAS, J. MILLER, D. MORRICE, J. DONALDSON-SELBY, G. HORNE, P & WANG, C. (2014) Deliverable 6 (E-CLIC):.Learning Objectives Outline Report. www.e-clicproject.eu/en/learning-resources/%E2%80%B4-learning-objectives-outline-report/
PAPAGEORGIOU F., BELL S., MILLER D., KUN Z., BRUNS D., MAHNE L., NOGUERA J. & TSEMPERLIDOU, M. (2012) MAKING EUROPEAN POLICY POPULAR THOUGH CHALLENGE, LEARNING, INNOVATION AND COOPERATION: AN EXPERIMENT WITH THE EUROPEAN LANDSCAPE CONVENTION/E-CLIC (PROJECT PROPOSAL),

93PP.
PEDROLI, B. PINTO-CORREIA, T. & CORNISH, P. (2006) Landscape-What's in it? Trends in European landscape science and priority themes for concerted research. *Journal of Landscape Ecology* 21, Issue 3, 421-430.
PEDROLI B., VAN MANSVELT J.D. (2006) Landscape and awareness raising, training and education. Landscape and Sustainable Development: Challenges of the European Landscape Convention. 119-140. (Strasbourg: Council of Europe Publishing: 119-140.
PRIEUR M., DUROUSSEAU S. (2006) Landscape and public participation. Landscape and Sustainable Development: Challenges of the European Landscape Convention: 165-206. (Strasbourg: Council of Europe Publishing: 165-206).
SARLOV-HERLIN I. (2012) Training of landscape architects. Landscape facets. Reflections and Proposals for the Implementation of the European Landscape Convention: 269-287. (Strasbourg: Council of Europe Publishing: 269-287).
SCOTT, A. (2011) Beyond the conventional: Meeting the challenges of landscape governance within the European Landscape Convention? *Journal of Environmental Management* 92, 10, 2754-2762.
SHEPPARD, S.R.J. (2005) Validity, reliability, and ethics in visualization. Visualization in landscape and environmental planning: Technology and Applications. Ian Bishop and Eckart Lange (eds.), Chapter 5, pp 70-97, Taylor and Francis, London.
SHEPPARD, S. R. J., SHAW, A., FLANDERS, D., BURCH, S. & SCHROTH, O. (2013) Bringing Climate Change Science to the Landscape Level: Canadian Experience in Using Landscape Visualisation Within Participatory Processes for Community Planning. In B. Fu & K. B. Jones (Eds.), Landscape Ecology for Sustainable Environment and Culture (pp. 121–143). Dordrecht: Springer Netherlands. doi:10.1007/978-94-007-6530-6
SCHROTH, O., WISSEN, U., LANGE, E. & SCHMID, W. A. (2011) VisuLands – A multiple case study of landscape visualization as a tool for participation. *Landscape Journal*, 30 (1): 53-71.
UNITED NATIONS (1992) Rio Declaration on Environment and Development. Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, A/CONF.151/26 (Vol. 1).
UNDP (2008) Participation Nation. Reconnecting Citizens to the Public Realm. www.scribd.com/search-documents?query=participation+citizen+involvement
WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT (WCED) (1987), Our Common Future. (Brundtland Report) Report of United Nations Commission.
ZELENIKA I., PEARCE J.M. (2013) The Internet and ICTs as Tools and Catalysts for Sustainable Development: Innovation for 21st Century, Information Development, SAGE Publications, 29(3): 217-232.

Biography

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