Platform of Local Authorities and Communicators Engaged in Science

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THE PLACES TOOLKIT FOR THE IMPACT ASSESSMENT OF

SCIENCE COMMUNICATION INITIATIVES AND POLICIES

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PRESENTATION

This document has been created for the purpose of serving as an instrument for the measure of the impact of initiatives and policies within the area of science communication and scientific culture in general (SCIP: Science Communication Initiatives and Policies). The toolkit is part of the European project PLACES (Platform of Local Authorities and Communicators Engaged in Science) whose main goal is to offer to a wide and diverse community of actors a common platform to structure their science communication activities, at a city/regional level (www.openplaces.eu)

This document has been created by an independent scientific committee composed of a group of 28 researchers from diverse backgrounds all currently specialised in the study of Science in Society. The formation of this committee, whose members span across almost all of Europe, has been centred on the task of developing a toolkit to carry out a series of case studies whose results will be made public at the end of 2013.

The instruments in this toolkit have been tested in a series of 6 pilot studies in various European nations. Results from these pilots have been analysed in order to revise and adjust sections of the toolkit. Further modifications have been made to this version of the toolkit based on suggestions obtained through feedback interviews (see acknowledgments on page 3 for names of participants) with members of 7 European organizations pertaining to The European Network of Science Centres and Museums (ECSITE); The European Science Events Association (EUSEA); and The European Regions Research and Innovations Network (ERRIN). The results of these first tasks, as well as the toolkit itself, will serve to assist in the development of future guides and recommendations for the European Commission and those responsible for carrying out initiatives in the field of communication and scientific culture.

The toolkit is composed of two parts. The first is centred around a reflection on the necessity to make collective instruments available for the analysis of the impact of SCIP in Europe. It also raises some of the main limitations and challenges that these types of studies are subject to, as well as a literature review on the topic (further detail on this can be found in Annex 1). The second part summarizes the structure and methodology used for the purposes of the Impact Assessment tasks of the PLACES project. Rational for the chosen methodology is also given with the aim of guaranteeing maximum data quality, representativeness, and efficiency. This section also includes the questionnaires that were used, the key questions used in the semi-structured interviews, and the guides for the focus groups.

The questionnaires and instruments presented in this toolkit are not strictly intended to evaluate the results and or effects of SCIPs in participants, or organisations but instead are intended for broader application in the study of the collective effects of SCIPs. This toolkit is also designed to be used both by specialists and non specialists.

The toolkit takes an operation look at the impact of SCIPs within **three dimensions**: impact on the public (citizens), impact on the political sphere (the local and regional dimension), and the impact on the actors involved in the SCIPs themselves. Each of these three dimensions is divided into **three levels** based on the agent that is responsible for the SCIP: the level of museums and science centres, the level of science events, and the level of cities of scientific culture (or science cities).

Schema of the three dimensions and three levels (3x3) used in the study of the impact of the SCIPs

	Science Centres and Museums	Science Events	Science Cities
Public			
Political Sphere (local/regional/cities)			
Actors			

This triple dimension/level (3x3) approach has helped us design instruments that are better suited to each case. Fundamentally, the instruments include surveys/questionnaires, semi-structured interviews, focus groups as well as analyses of institutional sources. Observational studies have been ruled out for the purposes of the PLACES project. Aside from their advantages in social science, their use in the project was unfeasible due to the extensive nature of the project (the large number of case studies and participating countries).

Once a consensus is reached for the design of the operational schema, instruments, and concrete questions, specific cases to be studied will be selected. One or more instruments will then be selected for each case.

Case studies in the PLACES project aim to sow the seed for the study of the social impact of SCIPs at the local/regional level. It is our hope that this work will go on to gain more depth in the future as a result of further research and case studies. We encourage other researchers (including those pertaining to universities and research centres as well as the very staff members of the organisations responsible for the SCIPs) to use this toolkit partially or in full, selecting and adapting its elements for their particular needs.

The scientific committee responsible for Impact Assessment within the PLACES Project

Barcelona, March 2012

PART I. IMPACT ASSESSMENT OF SCIENCE COMMUNICATION INITIATIVES AND POLICIES (SCIP)

THE PLACES PROJECT

The main goal of PLACES (Platform of Local Authorities and Communicators Engaged in Science), a four-year European project, is to offer to a wide and diverse community of actors a common platform to structure their science communication activities, at city/regional level. The PLACES project aims to contribute to the creation of instruments that allow for the study of the impact of initiatives and policies related to science communication (SCIP). All of this contributes to the definition of the concept of "Cities of Scientific Culture".

The project is based on three fundamental elements:

- **City Partnerships** will foster functional interactions, between local stakeholders to develop effective, science communication policies. City Partnerships arise from science communication and institutions forming alliances with local policymakers. There, are currently 67 City Partnerships in PLACES representing, 27 European countries. These cooperative relationships will yield Local Action Plans, targeting science communication policies in European cities and regions. City Partnerships will also grow to involve media, nongovernmental, organizations, universities, research institutions, companies, and more.
- **Local Action Plans (LAPs)** will target key challenges in cities, using scientific problem-solving. LAPs are strategic visions that will inform science communication policy at the local level for many years to come. Developments of LAPs are led by City Partnerships and they address science and technology-related issues, relevant to their respective city or region. This is why citizen, consultation is also a key step in drafting LAPs.
- **Pilot Activities** will test innovative approaches to communicate science-based solutions in cities. Pilot Activities will be developed in connection with Local, Action Plans, to test innovative practices on how to address controversial or problematic local issues in a way that actively involves citizens.

THE STUDY OF SCIP's IMPACT: CHALLENGES, LIMITATIONS AND LITERATURE REVIEW

For decades, throughout all of Europe, considerable efforts have been dedicated to science communication as well as to general ¨Science Communication Initiatives and Policies¨ (or SCIP). We are not stating that these efforts have been excessive (nor that they have been sufficient), we simply wish to highlight the sum of human and economic resources dedicated to the communication of science and when one considers an entire nation- or the whole of Europe, this represents a large entity whose impact needs to be considered.

It is only logical that all SCIP should implement processes of evaluation and impact assessment if we are truly seeking to advance and improve this area without wasted efforts and undesirable effects.

Evaluation is not a question of current trend, although some view it as something being forced on all fields, including that of science communication. Knowing the impact that a visit to a science museum has on its visitors, or the effects of a policy aimed to promote science is something that is highly necessary if one truly believes in the importance of said museum or policy. The study of the results and impact of SCIP should help us gain knowledge about its value and also about its weaknesses. However, beyond evaluation of the individual results and effects of the SCIPs, it is also important to initiate research that allows us to investigate the effects of those SCIPs within a broader spectrum: with respect to a given population, a geographic area (a city or region), a group of actors, or a long time. This is precisely what is meant when we speak of the measurement or assessment of ¨impact¨.

What is the social impact of this collaborative effort in science communication? This is a recurring question among researchers in the field of ¨Science in Society¨ (SiS), politicians and the communicators themselves. Due to the various limitations placed on this type of research, this question is a difficult one to answer.

Challenges and limitations

One of the main limitations that often hinders this type of research is that the line between evaluation and impact assessment (as well as the limit between outcomes and impacts) is not

precise. Jackson[1], for example, distinguishes between outcomes and impacts. Outcomes refer to changes in the behaviour, skills or attitudes of participants, while impacts are community-wide benefits whether in social or economic terms. Garnett[2] also refers to impacts in a wider sense, finding that the majority of studies on impact analyse it within a personal dimension (87%), while there are few who analyse it on a social dimension (9%) and even less that analyse it on an economic dimension (4%). None of the studies included in Garnett's revision investigated impact on the political arena. Although current researchers have a general idea of the differences between outcomes and impacts, it is not easy to establish a clear line between them.

The fact that SCIPs can produce multiple effects is another factor that complicates their study. All research has its limitations (in terms of economic and human resources, time dedication, etc.) and the effects that could be measured are far too numerous to attempt to include them all. For example, we could differentiate between personal, social, economic and political impacts. However, within these we could analyse a limitless number of effects such as learning (knowledge, understanding, skills), emotional impact, attitudes, engagement, participation in science, staff acquisition of skills, financial impact on the science communication organizations, engagement of scientists in SCIP, visibility of the scientific community, reputation and trust, scientific vocations, jobs created, direct and indirect incomes, etc. Therefore, one of the first tasks of the investigation is to determine which effects are to be measured.

Another complicated issue associated with the study of SCIP impact assessment is that it is critical to interpret findings cautiously and modestly. Before results can be interpreted, one should (at minimum) consider the following 10 factors:

1. **External circumstances** capable of influencing the observed results; for example, if a given society increases its knowledge about the issue of climate change after an exhibit has been held on the theme, we cannot simply attribute the observed effects in the society to the presence of the exhibit without also considering external factors (such as citizens' direct observation of phenomena related to climate change).

[1] Jackson A. 2004. Evaluation Toolkit for the Voluntary and Community Arts. http://alturl.com/rd4zu

[2] Garnett R. The Impact of Science Centers/Museums on their Surrounding Communities: Summary Report 2001. Available at: http://alturl.com/py59g

2. **The role of others** in the observed impact. Following from the previous example, when interpreting the results of the exhibit on climate change, one should also consider the effects of all other possible agents (for example the media coverage or educational programs that may be being carried simultaneously).

3. **The summative effects**. Each SCIP has a limited impact on a society or group of individuals however, the summative effects of these individual effects must be considered. These effects might be produced over time or over extended geography. For example, we can ask if the impact of SCIPs in Europe is considered the sum of the effects in each country or in each city.

4. **Comparison with other activities**. Before concrete conclusions regarding the effects of SCIPs can be reached, it would be ideal to provide data on other initiatives and policies that may not formally belong to the realm of science in order to find out if the observed observations pertain to the area that we are investigating, or something more generic. For example, comparing the effects of a science festival with those of a music festival, or a science museum with an art museum. Although these practices may be challenging to devise, they could assist to better interpret the results.

5. **SCIP are very diverse in nature and are carried out by a vast array of agents.** Within the context of PLACES, we focus primarily on three agents responsible for SCIP:

    a. **science centres**
    b. **science events organisers** and
    c. agents responsible for public policies (local and regional governments), we also call them **"science cities" or "cities of scientific culture"**

6. **Difficult access to relevant literature**. Not all relevant literature is found in academic databases. Some documents about science museums and science events have been published as working reports and/or as part of web site contents, therefore database searches often turn up empty.

7. **Unequal distribution of published research**. The 3 SCIP agents (science centres, science events and science cities) are unequally represented in the literature. Up until now, most of the documents published refer to science centres, there is not much literature that treats science events and studies on scientific culture policies are scarce. On the other hand, Further, research on science communicators have for most part been confined to the very same geographical areas in which those activities emerged and developed professionally: USA, UK, Canada, Germany, France, Italy, Australia, and a few

other countries. It has been all too tempting to extrapolate from the findings of those studies in the absence of systematically collected material from other cultural zones.

8. **Evaluator-evaluee relationship**. It is important to keep in mind that in the field of SCIPs, evaluations are not always independent. In fact, it is often considered that depending on the nature of the relationship between the evaluator and the evaluee, there are 3 possible types of situations a) i*nternal evaluation:* the evaluation is being carried out by the personnel from the same entity or institution that is running the activity; b) e*xternal evaluation:* a consultant is contracted to carry out the evaluation; and c) a*cademic research:* Academic researchers carry out a study on their own initiative. The main advantage to carrying out an external evaluation is that it tends to be somewhat more objective and generally, it is carried out by professional researchers. An internal evaluation's main advantage (in addition to its economic feasibility) is that there is often greater knowledge of some details that could affect the study that may not be visible from an outsider's perspective. There may also be greater motivation for collaboration on behalf of the organisation's staff.
9. **Disciplines**. Academic researchers that participate in this line of research come from different disciplines (science communication, science education, sociology, social psychology, science research policy, and others).
10. **Methods and tools**. Very diverse methods are used. Frequent debates over the use and validity of various methods are often evident in publications. Generally, we differentiate between quantitative methodologies (indicators are normally included here) and qualitative methodologies.

Literature Review

A literature review on the effects of SCIP was conducted prior to the creation of this toolkit. **Annex 1** presents some studies that have served as references for the PLACES Project. The list of references has been divided into 5 sections.

The first section includes studies that do not directly pertain to the area of SCIPs but that may be considered valuable for their study. Several studies in this section investigate informal learning in environments such as art museums, zoos and nature parks. Many of the studies

included in this section may serve as valuable resources for these types of institutions by providing useful suggestions for different types of learning activities as well as tools and suggestions to assist in the measure of the impact of those learning activities.

The second section includes studies on the general area of SCIPs. Various studies take a look at the wide range of good practices carried out by various SCIPs as well as some of the particular challenges that organisers of these activities often face. Numerous studies included in this section mention the need for more longitudinal evaluation studies of SCIPs and a few of them make reference to the differences that exist across Europe in each Nation's evaluation of their SCIPs.

The third section includes examples of some of the numerous studies published on the effects produced on visitors (particularly in terms of learning, knowledge, emotional impact, long term impact, engagement, etc.). Many of these studies provide evidence on how science centres and museums promote different types of learning. Likewise, this section of literature provides an abundance of evidence on how science centres and museums build trust and understanding between the public and the scientific community. A couple highly focused studies in this section centre on the evaluation of public engagement activities such as public debates on scientific issues. Studies of this nature tend to highlight the overall need for scientists and organisations to be clear about their goals when attempting to perform public engagement activities.

The fourth section includes some of the few studies that looked at effects on other actors (as opposed to visitors) such as the scientific community, staff at the given organisations, etc. Several studies examine correlations between scientist's participation in dissemination activities and their scientific productivity while others look at the different ways that the public communication of science has on the awakening of scientific vocation.

The fifth and final section includes studies which focus on policy and the local and economical impacts of SCIPs (these types of studies are perhaps the scarcest). Some of the references provided here are analyses of various science culture activities carried out across Europe. These studies include tools and recommendations to help governments to develop science policies that attract the general public's attention to science issues, while other references in this section provide analyses of some of the policies themselves.

PART II.

THE “PLACES” IMPACT ASSESSMENT TOOL: CONCEPTS, METHODS AND INSTRUMENTS

BASIC CONCEPTS

One of the characteristics of research in the field of Science in Society is the frequent proposal of new terms used to design the elements of the study or to refer to phenomena observed throughout its course. While some proposals are well received among researchers in the field and become rapidly incorporated, the use of others is controversial and perhaps they are only applied in very particular sectors. There are also terms that are never even discussed and are therefore not used even in small sectors. The reasons for the little consensus regarding terminology in this field are diverse: the multidisciplinary background of researchers (sociologists, communicators, educators, cultural agents, natural sciences researchers, etc.), The diversity of the organisations that initiate or carry out the study (universities and research centres, science museums, communication departments, etc.) and the language and individual cultures of the researchers results in studies that are local in nature.

For the purposes of the project, a consensus was reached for the operational definition of some key concepts involved in the study: scientific culture, science museum/science centre, science event, science city or city of scientific culture. Due to the fact that this has affected the interpretation of our results, this should be kept in mind for future investigations carried out by other researchers or members of this very scientific committee.

Scientific culture

There is an abundance of definitions for this concept. Up until now, it has been mainly used in francophone countries (literally translated from French *culture scientifique*). There are those who use this term to emphasize the affirmation that science is indeed culture: if there is a humanistic or a literary or a musical culture, there must also be a scientific culture.

Another meaning to the idea of scientific culture was proposed by Godin and Gingras as follows: "Scientific and technological culture is the expression of all the modes through which individuals and society appropriate science and technology" (Godin and Gingras,

2000)[3]. According to these authors, the common point of the various approaches to the concept of scientific culture lies in the (individual and social) *appropriation* of science, which occurs through three modes (learning mode, implication mode and socio-organizational mode). This meaning need not differentiate between competence and participation in the study of the relationship between science and society, as it encompasses both.

Scientific culture (or science culture) also refers to, as agreed by the Scientific Committee responsible for this toolkit, the presence of science in public life, public affairs and public discourses.

Science event

In the White Book "Science Communication Events in Europe"[4] produced by the European Science Events Association (EUSEA), the concept is introduced in the following way:

> "*Since spring time 2001 in Göteborg, a group of people, who organise something like science weeks, science festivals or science days, determined that it is time to put together ideas, guidelines, recommendations on how to organise such "Science Communication Events (SCE)", as these events were called."*

According to the text, the term science event encompasses a whole group of diverse activities ("something like science weeks, science festivals or science days").

A deeper analysis exists on the various types of initiatives of this nature and it points out that although these initiatives are diverse there are also shared elements between them. The White Book mentions that some diverse SE share common goals and objectives:

- *The most widely recognized objective of a science communication event is to "raise public awareness of science". This is either explicitly said or implied in the presentations of all of the Events' purpose and philosophy.*

[3] Godin B and Gingras Y (2000). What is scientific and technological culture and how is it measured? A multidimensional model. *Public Understand. Sci.* 9:43.

[4] EUSEA. WHITE BOOK on Science Communication Events in Europe www.euscea.org/www.euscea.org/AboutEUSCEA/NewsAndMeetings.html

- *The next most important objectives are "to promote the dialogue between science and society" and "to encourage young people into science".*
- *The notion of "scientific culture" is mentioned in some Science Communication Events' purpose statements. The idea is to communicate and discuss not only the results of scientific work but also the way science is carried out as a wider concept. This is also something that is supported in the European Union's objectives. (In this case it seems that the term scientific culture refers to more than the simple explication of scientific facts and also the scientific process itself)*
- *The most commonly used expressions of objectives imply that a Science Communication Event exists in order to market science positively. The general idea is to increase the status and attraction of scientific work and to recognize scientific results. Even though there are plenty of meeting-places and efforts to increase the dialogue between science and society, the principal idea is not to criticize or scrutinize the science itself, or to present alternative findings in other respects than as a counter-weight to the scientific results.*

The term "science event" (SE) is often used in lieu of the longer term "science communication event" (SCE). Even though the field of science communication continues to broaden, for the moment a precise definition of what does or does not constitute an SE does not exist. For this reason, the toolkit uses the EUSEA's White Book as a reference for determining what the objectives of SEs should be.

Science museum/science centre

The terms Science Museum or Science Centre is not precisely defined either. However, a comprehensive definition of these can be found in the "Internal Regulations" of ECSITE, the European Network of Science Centres and Museums (adopted by the General Assembly 2011)[5]. Section 3.1.2 of this document explains what the requirements are to be considered a full member of ECSITE, among others:

- *Reach real people and offer them real science*
- *Provide opportunities for people to directly engage with science*
- *Provide their participants with an experience based on 'experiential and participatory learning'*
- *Offer people an empowering experience*

[5] ECSITE (European Network of Science Centres and Museums). Internal Regulations, May 2011. www.ecsite.eu/sites/default/files/ECSITE_Intern_Regul_FINAL_0.pdf

- *Have 'public engagement in science' at the heart of their mission*
- *Are committed to including everyone as a participant regardless of age, gender, sexual orientation, religion, ethnicity, ability or political affiliation*
- *Adhere to the principles of 'good practice' in the field*

As can be seen, the objectives described in the ECSITE and EUSEA documents are very similar. Despite this, the scientific committee responsible for this toolkit would like to point out two main differences between them:

a. Museums and centres are a permanent part of a city whereas events come and go.
b. When visiting a museum, the public goes to it whereas (some) science events can go to the public: people are able to attend a science event in their very neighbourhood or even on their own street.

Science cities or cities of scientific culture

Cities have increasingly and intensively appeared, become or been promoted as natural cradles for the realization of the new economies or societies mostly based on science, technology and innovation. As such they are labelled as Science Cities; Knowledge Cities; Creative Cities; or sometimes Cities of Scientific Culture. While sometimes these terms are used in an interchangeable way, one can recognize subtle differences. The named "science cities" (for instance cities that are part of the UK Science Cities network, launched in 2000) promote prosperity from science, developing skills, businesses, research and resources. Cities are promoted as knowledge based centres of excellence. For instance, Newcastle, one of the cities of this British network, defined its mission as a science city as follows: "to promote scientific excellence, create and support innovative high-growth businesses, and engage the local community so that everyone can become part of our city's continued scientific achievement"[6]. The declaration of Magdeburg[7] in 2006 endorsed a similar view adding, among its goals, the concept of science culture as engagement and branding: "to foster a science culture whereby citizens are involved in decision making and help promote a strong regional identity" and "to use the science culture to promote the cities nationally and internationally". ESCITY, the European network of cities of scientific culture, focused its mission in the cultural

[6] www.newcastlesciencecity.com/

[7] www.sciencecities.eu/fileadmin/dokumente/Declaration_of_Magdeburg_-_final_version.pdf

value of science ("raising the profile of science as an integral part of our culture") and proposed a "lobby effort to influence the cultural agendas of local and regional governments"[8].

Science city can also be understood as the creation of city in which scientific research, high-tech industry and high-quality living are all brought together in an organised relationship (Castells and Hall, 1994)[9]; or as a new settlement which is generally planned and built by governments, aiming to generate scientific excellence and synergistic research activities by concentrating a critical mass of research organisations and scientists within a high-quality urban space (Benneworth, 2008)[10].

One of the objectives of the PLACES project is to define the concept of a "city of scientific culture" and a group of researchers and other agents (science communicators, politicians, etc.) is working on this definition. As results from this group are not yet available, the Scientific Committee responsible for the Impact Assessment on this same project, PLACES, has adopted the following operational definition:

> *A City of Scientific Culture is one in which science has a strong public presence and/or notable efforts are being made to strengthen that presence. The presence of science may be indicated through public attitudes to science and the levels of attention to science centres, popular science events and publications, media science and public engagement initiatives. The efforts being made to strengthen that presence could be recognised on the existence of local policies and programmes (funding programs, communication programs, etc.) explicitly directed to this goal.*

[8] www.escity.org/

[9] Castells, M. and Hall, P. (1994) *Technopoles of the World: The Making of the 21st Century Industrial Complexes.* Routledge, London.

[10] CURDS (2008) *Newcastle: A Science City in Action: Linking Science and the City* [Online]. Available at: http://www.staff.ncl.ac.uk/p.s.benneworth/sciencecity.pdf

STRUCTURE

This toolkit is not strictly intended to evaluate the results and or effects of SCIPs in participants or organisations but instead is intended for broader application in the study of the collective effects of SCIPs. The toolkit takes an operational look at the impact of SCIPs using a **3x3 Schema (Table 1)**, with:

- **Three dimensions**: impact on the public (individual citizens), on the political sphere (regional/local/cities), and on the actors involved in the SCIPs themselves (see **Table 2** for a list of main actors).
- **Three levels**, based on the agent that is responsible for the SCIP: museums and science centres science events, and cities of scientific culture (or science cities).

Table 1. Schema of the three dimensions and three levels (3X3) for the study of the impact of SCIPs

	Science Centres and Museums	Science Events	Science Cities
Public			
Political Sphere (local/regional/cities)			
Actors			

Table 2. Main actors involved in SCIP

- Individual scientists (including amateur scientists)
- Science institutions, including specialised departments (Universities, research organisations, academies,)
- Schools (teachers, students, parents)
- Media and journalists
- Politics and public administration
- Companies, industry
- Third sector: Civil society organisations (Foundations, clubs, NGOs), Scientific associations, Professional societies (Royal society, some foundations).

POTENTIAL AREAS OF IMPACT OF SCIP

Since we cannot analyse every possible effect of SCIP, for our project we have selected the ones considered to be the most relevant and representative. It should be kept in mind that while we attempted to consider a wide range of possible interests, naturally, our decision to look at these particular impacts is unavoidably subjective

On public

The main effects that SCIPs can have on citizens who are exposed to them include:

- **Immediate impact** on: learning of key concepts, understanding principles, attitudes towards S&T, attitudes towards the science centre or science event, motivation, inspiration, interest in following S&T news/events/innovations, beliefs about controversial issues, self-esteem, confidence
- **Long term effects** on: citizenship, consumerism, intellectual curiosity (memorable experiences, changes in behaviour, and participation in public events).

PLACES project is particularly focused in cities, and because of that we will also be interested in consider on a particular way the **impact of SCIP on the public perception of the notion of "science city"** (see Basic Concepts Chapter, p. 14), and the influence of a science city on the citizens' everyday life.

On political sphere (regional/local/cities)

- **Socio Economic Impacts:** sources of income, local tourism, new jobs, new forms of public/private interaction, new investments in infrastructure
- **Impacts on Cultural Identity and Quality of Life**: media attention, public participation, cultural identity
- **Impacts on Policies:** overall added-value of a local "Culture of Science and Technology"; involvement and role of local/regional authorities, scientists, experts and citizens; new partnerships

- **Impacts on Education. School visits (**for example to festivals or science events), involvement of scientific laboratories in public science communication activities (for instance, open doors), new formative courses, new educational material

On actors

Potential areas of impact include: career enhancement, competitiveness, learning/getting feedback about public response to research + raising new research topics and questions, learning about scientific expertise, enhancing learning opportunities for pupils, enhancing quality teaching and teachers, self reflection + context awareness, acquiring communication skills , enhance qualification for reporting on science, networking between actors of different categories, economic benefits (including marketing/sales), positive feedback and motivation, creating and using relevant expertise , increase public acceptance of their research area, prestige and visibility / public image, recruitment of researchers and other staff, recruitment of students , more weight for scientific topics, involvement / commitment for public science communication, advocacy, others.

INSTRUMENT SELECTION

In general terms it can be said that social scientists use quantitative and qualitative methods for data gathering[11]. Quantitative methods represent data numerically, while qualitative methods use descriptions and texts (or images, in some cases). A survey is normally considered a quantitative method, particularly when it contains closed questions. Other quantitative methods in the field of SCIP could include institutional data about the number of visitors, budget, jobs created by the SCIP, etc. Examples of qualitative methods are interviews, focus groups, and observation. The following list presents **instruments or study modules** that have been selected to analyze each level of impact. Decisions have taken into account both adequacy of the method as well as practical considerations related to the available resources within the framework of this project.

Table 3. List of study modules (or instruments)

Study modules to analyze the impact on the public

- **Module A1**: Semi-structured interviews with visitors (including module for repeated visitors about long-term impact)
- **Module A2**: Standardized survey of visitors
- **Module A3**: Focus group with (ordinary) citizens

Study modules to analyze the impact on the political sphere

- **Module B1**: Semi-structured interviews with observers/stakeholders (at science center/event and at city level)
- **Module B2**: Document analysis

Study modules to analyze the impact on actors

- **Module C1**: Semi-structured interviews with relevant actors (at science center/event level)
- **Module C2**: Focus group with relevant actors (at science center/event level)
- **Module C3**: Focus group with relevant actors (at city level)

[11] Neuman, W. L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches* (7th Ed). Boston: Allyn & Bacon, cop. ISBN: 9780205615964

Table 4 shows the information above in an alternative way, following our 3x3 schema. This table also shows the **minimum recommended "n" for each box and instrument**. In other words, at least how many people will be interviewed or how many focus groups will be performed at each box. For the analysis of a particular case, for instance a science museum or a science city, the researcher in charge should ideally use more than one instrument. On page 33 a full description of instruments (or modules) is provided.

Table 4. 3x3 schema and instruments used in the study of the impact of the SCIPs

	Science Centres and Museums	Science Events	Science Cities
Public	Institutional Sources about Visitors (documents, website, information from organizer) Semi-structured interviews with visitors (including module for repeated visitors about long-term impact): **MODULE A1 (n≥ 5 people)** Standardized survey of visitors: **MODULE A2 (n=200 people)**	Institutional Sources about Visitors (documents, website, information from organizer) Semi-structured interviews with visitors (including module for repeated visitors about long-term impact): **MODULE A1 (n≥ 5 people)** Standardized survey of visitors: **MODULE A2 (n=200 people)**	Focus group with (ordinary) citizens: **MODULE A3 (n=2 focus groups, 4-8 people per group)**
Policy Sphere	Semi-structured interviews with observers or stakeholders: **MODULE B1 (n≥ 5 people)**	Semi-structured interviews with observers or stakeholders: **MODULE B1 (n≥ 5 people)**	Semi-structured interviews with observers or stakeholders: **MODULE B1 (n≥ 5 people)** Document analysis: **MODULE B2**
Actors	Semi-structured interviews with relevant actors: **MODULE C1 (n≥ 5 people)** Or alternatively, focus groups with relevant actors: **MODULE C2 (n=1 focus group, 4-8 people per group)**	Semi-structured interviews with relevant actors: **MODULE C1 (n≥ 5 people)** Or alternatively, focus groups with relevant actors: **MODULE C2 (n=1 focus group, 4-8 people per group)**	Focus groups with relevant actors: **MODULE C3 (n=1 focus group, 4-8 people per group)** Or alternatively, semi-structured interviews with relevant actors: **MODULE C1 (n≥ 5 people)**

METHODOLOGICAL CONSIDERATIONS

SEMI-STRUCTURED INTERVIEWS

General considerations for interviews with visitors, stakeholders, or actors

We will carry out long interviews (about one hour) that are often called "semi-directive" or “semi-structured”. Within this method the interviewer follows a common interview guide directing how the questions are posed. The interviewee is then allowed to answer each question extensively.

The structure of the interview guide is important. It is often compared to a funnel as it begins with fairly wide general questions that do not require very personal answers, progressively focusing on more specific points. This approach allows the interviewer and interviewee to break the ice and feel more comfortable with each other.

While the interview should follow this progression, it is not in fact a problem if the interviewee spontaneously picks up a question that was planned later on in the interview. One should simply make sure to come back later on to the questions that were skipped. If on the other hand the interviewee overly digresses from the topic, they may need to be brought back to it. One should be careful however not to miss an important point that we hadn't expected to find! The interviewer should avoid asking their research questions directly and should always consider responses from the point of view of the interviewee.

A face-to-face interview is preferred over a telephone interview and even more so to an interview by mail because it allows the interviewer to adapt to the situation more subtly. It also leads to more dynamic exchanges.

The interviewer has two main tasks: First, he/she should encourage the interviewee to talk openly about his/her perceptions, beliefs, attitudes, goals and experiences, offering supporting feedback such as "how interesting", "how that?" or "could you elaborate this a little further"

etc.. Second, he/she should make sure that the talk remains focused on the topics of the interview guideline. This focusing of the interview topic should be done in a cautious and smooth way. Generally, the interview should be non-directive. I.e. a typical question should encourage the interviewee to explain and elaborate the topics in his/her own words and not just to utter consent or dissent to statements of the interviewer. It is also a good idea to ask for evidence for or examples. Furthermore, it is necessary to use the respondents' own words and perspectives, not our as analysts. E.g., we should avoid the term "impact" or "effect" but rather use more vague and everyday words and phrases such as "What did you/your institution get out of your involvement in..." or "Did you benefit in some way from your involvement in...?".

If possible, the interview should be recorded with a digital recorder and a good microphone (both very important for quality). You can also use a laptop with a microphone and recording software such as Audacity. In both cases, please make sure to check, test and become used to your equipment before you begin with your interviews. The recording device option is much easier and reliable than the laptop option.

In case the interviewee refuses to be recorded or if you feel you will miss "sensitive" information, you can take detailed notes and go over them immediately after the interview to complete them.

[Audio files should be kept as project documentation].

FOCUS GROUPS

Focus groups are collective semi-directive interviews that should be used in cases where individual points of view are less important than group dynamics. These dynamics may for instance lead to the crystallisation of oppositions or the expression of shared, "politically correct" opinions. They may also be used projectively to "play" with ideas, to explore more imaginary dimensions of a question (using pictures or word associations for example). The interviewer becomes a moderator. His/her main task is to structure the discussion and to make sure that the discussion focuses on the pre-defined topic. Furthermore, it is his/her task to make sure that everybody participates in the discussion.

When forming it, it is extremely important to consort people that have similar capacities for public discussion. These capacities are strongly related to level of education and social status, and somewhat less so to age and gender.

A guide is needed to structure the discussion. It is not very different from that of an individual interview but it should be adapted to what people will say in a group situation. A "game" can be useful to start off with, to break the ice. It has to be carefully chosen to fit the type of people in the group. Word associations can be a good choice, on a fairly general topic, with questions like: "What word comes to mind when I say science?" then "What word comes to mind when I say [name of the city]?"

A focus group should be planned for about 2 hours of time. A room has to be provided and some basic catering (coffee, mineral water, cookies).

Focus groups should be recorded digitally and with a good microphone. In spite of this it is often difficult to sort out who is talking and what is being said when several people talk at once! The focus group can also be filmed although that may make people less comfortable. A good solution is to have an "observer" outside the discussion circle taking notes. The interviewer is in fact a facilitator for the discussion however, it is not an easy job. It requires experience and certainly does not leave time to take notes. A debriefing should be planned immediately after the focus group.

<u>The choice between focus groups and individual interviews:</u>

It is important to clarify the reasons for choosing one method over another.

Focus groups allow for the build-up of a collective discussion on the topic of interest. This tends to lead to entrenched positions that may exacerbate oppositions between group members. It can also encourage the expression of what is considered "common knowledge" or "politically correct" positions within a profession or a sub-group. This can be very useful information for the interviewer to pick up on.

On the other hand, individual interviews will allow for more subtle positions to be expressed- these may be somewhat deviant from the standard point of view. They also allow the expression of more confidential information or opinions. They are generally preferable for high-level decision-makers.

Another factor affecting the choice of method is participant availability. In the case of higher-level policy makers, busy agendas make it difficult to make several people's schedules coincide. This is a strong practical argument for individual interviews!

Finally some decision-makers may appreciate having their opinions listened to personally rather than being mixed into a group!

Common points for interviews and focus groups

It is always essential to always put oneself in the interviewees' shoes! Direct research questions should not be asked. Instead questions should be framed so that they are made pertinent to them. Policy-makers (or anyone else for that matter) should not be interviewed by untrained students. The interviewer must be well aware of the local situation and, be comfortable in the interview situation in order to serve as a legitimate partner for the person being interviewed. The last point is particularly true for policy-makers.

STANDARIZED SURVEYS

Surveys are used when quantitative information is needed about topics or situations shared by a large number of people. The important point is to question whether we really need fairly precise quantitative information concerning the population under study (e.g. who visits a museum?) or whether we need to understand the way people think and feel about a topic or an experience such as a museum visit. In the former case we use survey methods, in the latter interview or ethnographic methods are often preferable.

The sample of people to be surveyed needs to be representative (i.e. represent a fair picture of the population under study). The best way to achieve this is to select people by chance for the survey (random sample). The sample also needs to be sufficiently large in order to keep the statistical error low when inferring from the sample to the total population under study. The size of the statistical error is inversely related to the square root of the sample size. I.e. increasing the sample size by a factor of 4 (e.g. from 100 to 400) will cut the statistical error to halve. To give a rough idea about the size of the statistical error – here is a simplified example: If 50% of the sample say "yes" and the other 50% say "no" to a question, the "confidence intervals" of these percentages will be 50% ± 10% (n=100) and 50% ± 5% (n=400). I.e. it is quite likely (95%) that the true percentage in the total population is within these intervals.

Representativeness of the sample is equally important as sample size. A representative sample is a fair image of the population in terms of age, gender, family size, social or cultural origins or any other characteristic that could be important. If the sample is not representative, results of the survey will be systematically biased. Attention must be paid to the differences in the way the population of visitors is spread over the day, week, seasons, holidays, etc. Besides a poor sampling procedure non-responses can lead to lack of representativeness. This is because the non-responses are not evenly distributed over the different categories of people. For example, busy people or families with impatient children may be more reluctant to participate in a survey. Complete control of this problem is not possible, but one should try hard to convince people selected for the survey to answer the questionnaire rather than simply skipping them and picking the next person.

In comparative research, such as we are conducting in the PLACES project, the questionnaires should essentially be the same for each country. In order for them to be comparable, translations should be precise and fairly literal. Nevertheless, it is important to keep in mind

that translation can introduce artifacts that should be watched out for in any analysis across diverse countries.

Questionnaires can be carried out face-to-face by an interviewer, this is ideal but quite time-consuming. They can also be self-administered in written form; however, this may be a problem for less literate members of the population.

Running a survey over a short time and to a small sample is not the ideal. On the contrary, museums and festival organizers should be encouraged to set up long term research, if they don't already have them.

Surveys of visitors at science centres and science events

There is quite a developed field of what is termed 'Visitor Studies', which is concerned with evaluating exhibitions, museums, heritage sites and other related activities[12]. While some of this literature is relevant for us, our project is not so much concerned with evaluating the site itself but instead using it to access visitors and citizens interested in science. Therefore, this description of "methodological aspects" focuses simply on pertinent issues for carrying out a survey in a museum or science event from the point of view of data quality, representativeness and efficiency.

Survey design and administration

- **Survey instrument and data collection mode**

In the framework of the PLACES impact assessment, each investigator has limited resources for the collection of data. **Face to face methods are proposed for gaining participants in our chosen site(s).** This essentially means approaching individuals somewhere onsite and asking them to take part in our study.

[12] see www.tandf.co.uk/journals/titles/10645578.asp

Several options for data collection mode seem most useful for us.

1. Interviewer approaches and recruits participants and asks them to complete themselves a paper-and-pencil questionnaire, dropping it in a box or returning to the interviewer when finished.
2. Interviewer approaches and recruits participants and carries out a face to face standardized interview using a paper questionnaire form.
3. Interviewer approaches and recruits participants and carries out a face to face standardized interview entering responses electronically, directly into a laptop

In practice, as long as we design a questionnaire that can be self-completed or administered face to face (f2f), then **it is proposed that individual investigators could choose one or more data collection mode options as they wish**.

- **Eligibility: whom are we interested in?**

If we wish to ask people questions about science cities, we need to decide who is eligible to enter our sample. Do we want to exclude those museum visitors who live outside the region where the research site is located? Many visitors to science parks and museums will be temporary visitors to the area, with foreign tourists making up a fair proportion, depending on the city in question and its popularity as a tourist destination. For instance, at the London Science Museum, foreign visitors account for 25% of attendance and only just over half of visitors live in London.

As it has been decided that the focus of the studies will not be on young people or children, the appropriate minimum age for a respondent to be eligible for inclusion must also be decided. 16 years is probably sensible.

It is proposed that the interview begin with some screener questions designed to determine eligibility on the basis of age and whatever residency criteria is deemed appropriate.

- **Sampling strategy**

In this project we cannot gain a representative sample of citizens in our respective science cities. We can, however, aspire to reasonable representativeness of the museum visitor (or event participant) population in question. The sampling problem can be thought of in very much the same way as an exit-poll conducted to predict the outcome of elections by speaking

to citizens at polling stations after casting their vote. The idea is to obtain a representative sample of visitors by using some systematic method for selecting respondents in a particular location. The usual approach is to approach every n^{th} person that walks past a particular point, where n is a number that will yield the desired sampling fraction. For instance, if we think that there are 1000 visitors to the location on a day that we wish to collect data and furthermore we want a sample of 50 respondents (a sampling fraction of 5%), we would need to gain an interview from every 20^{th} visitor.

- **Time and day**

There are several complexities involved. Firstly, we can increase the representativeness of our sample to take account of the fact that different types of visitor that might attend on different days of the week. For instance, retired persons are more likely to visit on a weekday while family groups may be more likely to attend on the weekend. Similarly, some types of people are more likely to visit in the morning, while others may be more likely to attend in the afternoon. In order to take this into account we can construct time strata within which to collect samples. That is to say, we make sure that we collect data within each of the different time/day periods that we think are relevant to capturing different types of visitor. In practice, it is proposed **that we collect data on at least one weekday, morning and afternoon, and one weekend day, morning and afternoon. Date and time should be recorded.**

- **Selecting individuals from groups**

We need to decide how to deal with selecting individuals from groups (for instance, a family group). Strictly speaking it should not be left to the groups members to decide as the types of people that would offer to complete the survey may be different from those less likely to volunteer. Hence we need some form of random selection mechanism. **The proposal is that we use the last-birthday selection procedure**. When the interviewer approaches a group of people, he/she will say something like: “In order for our results to be scientifically valid, I need to randomly pick someone from your group to interview. Of the people in your group who are 16 or older, who most recently celebrated their birthday?”

- **Location of interviewer(s)**

In order for our sample to be representative, each visitor must have a known and non-zero probability of being selected. The exit is the most obvious place, but if there is more than one, then we will have to collect samples at all the exits – if we think there are systematic reasons why one exit might be chosen over another. Some science events take place in open spaces, without an exit. **It is proposed that each investigator decides about the exact location of interviews based on local knowledge of the institution and its topography.**

- **Non-response and refusals**

Some people approached for an interview will refuse to participate. This could be for a variety of reasons. If the reasons for refusal are correlated to our survey estimates of interest then our sample may be biased. **It is proposed that the interviewer takes note of the gender of the refuser along with the reason given for non-cooperation.** It is probably the best we can do, along with trying our best to persuade people to take part.

- **Sample size**

In general, samples should be as large as is necessary for the required precision of estimates. Any smaller and estimates will be too inaccurate to provide meaningful information, any larger and the data collection becomes more costly than necessary. In our situation, we should use some heuristics to arrive at a practical number of interviews per study. Based on statistical considerations about the required number of cases for certain analyses we propose a minimum sample size of 200 for each study.

Summary of proposals for survey

1. We use face to face methods for gaining participants in our chosen site(s)
2. Individual investigators could choose one or more data collection mode options as
3. We start the interview with some screener questions designed to determine eligibility on the basis of age and residency criteria
4. We collect data on at least one weekday, morning and afternoon, and one weekend day, morning and afternoon (take note of data and time)
5. We use the last-birthday selection procedure for sampling from groups

6. Each investigator decides about the exact location of interviews based on local knowledge of the chosen institution and its topography (preferably the exit)
7. Record the gender of the refusers along with the reason given for non-cooperation
8. A minimum sample size of 200 should be obtained in each study

STUDY MODULES (OR INSTRUMENTS) IN DETAIL

PUBLIC

Institutional Sources

Basic information about the "case" (Documents, website, information from organizer)

The collection of information on SCIP is unevenly distributed. Large museums and science centres are accustomed to collecting different types of data on a systematic basis (much of this data could be considered useful indicators). However this practice has not yet been extended to smaller institutions or those with limited staff. There is even more inconsistency related to data collection on science events. Statistics on visitors (age, occupation, number of attendees, etc.) are not always collected because events may be held in open areas where entrance is often free.

Information concerning visitors to science centres and museums serves as valuable indicators which can help to assess their social and cognitive impact. Data concerning the number of visitors must take into account fluctuations depending on the time of year and day of the week. Obtaining this precise information is quite easy as almost all science centres and museums collect such data, mostly based on the number of tickets sold. However, it is considerably more difficult to obtain detailed information about the visitors concerning aspects such as: gender, age, level of education, type of participation (individual or collective), place of residence (urban vs. rural or distance from the city centre) and whether or not it is their first visit.

If the science centre or museum, or the science event organizer, does not have such data available the easiest (and relatively economic way to collect it) would be to prepare small-sized forms, which can be distributed to visitors when they enter the centre. They could then put the completed forms in special boxes located nearby. It would also be important to make the visitors aware of the purpose for collecting this information. This could be stated on the forms or on the boxes intended for the collection of the forms. This method of collecting information would provide the researcher with reasonable certainty that data was obtained from the majority of visitors on a given day. In case the interviewer could use an electronic reader, forms would be structured in an appropriate way to facilitate its use. The issue of when and how long these activities should be carried out need to be considered in each particular case. It is intended that the information collected from a given sample could be generalised to all the visitors of the centre. A good source for data of this nature is the European project *2Ways, Communicating Life Science Research*[13].

Other data sources to consider are the various online resources provided by the organisations responsible for the SCIPs. It is possible to obtain this type of information through the following means: 1) soliciting data directly from the organisation, 2) referring to the organisation's website (or other online resource such as blogs, Facebook profile, Twitter account, Youtube channel, etc.) or 3) analysing their websites through various analytic web tools (such as Google Analytics, Wordpress.com Stats, or Yahoo! Web Analytics).

[13] http://www.twoways.eu/Web/FinalEvent/Documents.aspx?Type=0

MODULE A1:

Semi-structured interviews with visitors, immediately after visit

The following grid for semi-structured interviews should be interpreted as guidelines. For technical details on how to conduct semi-structured interviews please refer to Methodological Considerations Chapter (p.25).

Important note: Please retain the general term 'science and technology' throughout the interview scheme only in the case that the museum or science centre you are using covers a broad spectrum of science and technology topics. If the museum or science centre you are collecting data from has a very specific scope please replace the term 'science and technology' with a more specific relevant term or rephrase questions accordingly.

SCIENCE CENTER OR SCIENCE EVENT'S IMMEDIATE IMPACT

Questions to visitors of science centres/museums immediately after their visit about learning of key concepts, understanding principles, attitudes towards S&T, attitudes towards the science centre, motivation, inspiration, interest in following S&T news/events/innovations, beliefs about controversial issues, self-esteem, confidence.

1. Why did you choose to visit this museum / science centre in particular [fill in the name of the science centre]?

2. What in particular did you like or dislike and why?

3. If you think about other cultural but also scientific institutions / activities in this city / region – what do you think is the significance of this museum / science centre [fill in the name of the science centre] in comparison to these? Why do you think this museum / science centre is [fill in the name of the science centre] important for the city / region?

4. How is the science exhibited in this science centre/ museum relevant to you personally? Could you provide me with some examples from your everyday life where the science presented here has played a role / was of relevance to you?

5. Would you feel more confident discussing scientific issues as a result of your visit to the science centre/museum? (Do you feel more informed about the material presented by the science centre/ museum to the point where it gives you more confidence?)

[The following question may be included in cases where the opinion on more general issues related to S&T are of interest]

6. In your opinion, how important is science for the development of society? What are the main benefits and or problems?

SCIENCE CENTER OR SCIENCE EVENT'S LONG TERM IMPACT

(applicable only if it is not the first visit for a visitor)

Questions to past visitors with regards to long term effects (memorable experiences, changes in behaviour and participation in public events). What we are looking for is long - term changes observed between two consecutive visits (at least six months apart). By past visitors we mean recurrent visitors or visitors who have come to the museum at least two times.

Potential respondents need to be asked 'Is this your first visit?' If the answer is no, then the second question needs to be asked 'how long ago was your last visit'. In order to be recruited at least six month should have passed between the first (or last) and the current visit.

[Citizenship]

1. Since your last visit(s) at the museum /science centre have you been more involved in S&T policy related events (e.g. volunteer in the organization of relevant events, demonstrate) in your city? (compare with the situation prior to the visit).

2. Since your last visit(s) at the museum / science centre have you followed news stories about science and technology in the media more closely?

[Intellectual curiosity]

3. Have your visit(s) to the museum/ science centre prompted you to think, discuss or search for more information about about science and technology issues?

[Other]

4. What were your expectations (with regards to content, the format, etc.) of this museum / science centre [fill in the name of the science centre]?

5. What has been the most memorable experience for you as a visitor of this museum?

6. If you now compare this museum / science centre [fill in the name of the science centre] with other possible places where one could engage with science – how would you appraise this? What are the strengths and weaknesses of this science centre /museum in your

opinion [fill in the name of the science centre] compared to others you have been to? (allow respondents to express themselves freely according to their own criteria).

7. Why do you think this museum / science centre is [fill in the name of the science centre important for the city/ region?

[The following section may be included as part of the interview in cases where this type of impact is relevant.]

[Consumerism]

8. Since your last visit(s) at the museum / science centre have you bought more products related to topics of the exhibition? (e.g. organic, biodegradable/ eco-friendly, non-genetically modified, etc).

MODULE A2:

Standardised survey of visitors

Aim: measuring the impact of SCIP(s) on public (Personal Impact). Level: science museum/centre and science event visitors. Note that all sections of this survey may not be relevant to a given case. Sections may be administered separately along with the final demographic section and it is recommended that questions be modified as needed to suit the particular case. For further technical details on how to conduct standardized survey of visitors please refer to Methodological Considerations Chapter (p.24).

[Immediate impact]

1. How often have you visited [NAME OF EXHIBIT/MUSEUM/EVENT ETC] it in the past 12 months?

Once
Twice
3-5 times
6 or more times
Never visited before
Don't know

2. Who, if anyone, are you with today? [CODE ALL THAT APPLY]

Went alone
Family
Friend/s
Fellow student/s
Other
Don't know

3. [IF VISITED BEFORE] On your last visit, did you go with any of the following? [CODE ALL THAT APPLY]

Went alone
Family
Friend/s
Fellow student/s
Other
Don't know

4. **How interesting [do / did] you find visiting this/a science museum/centre/event compared with visiting an art gallery/a cultural event?**

A lot more interesting
A little more interesting
About the same
A little less interesting
A lot less interesting

5. **How would you compare your experience of learning about science during your visit to [NAME OF SCIENCE CENTRE/MUSEUM/EVENT] to that of learning about science in school?**

A lot more interesting
A little more interesting
About the same
A little less interesting
A lot less interesting

6. **Would you say that your last visit to [name of science centre/museum/event] has made you feel more confident (at ease) discussing scientific issues? [SPECIFIC TO THE EXHIBITION/WHAT YOU HAVE SEEN]**

Much more confident
A little more confident
Neither more or less confident
A little less confident
Much less confident

Longer term effects [NOT APPLICABLE IF IT IS THE VISITOR'S FIRST VISIT TO THE SCIENCE CENTRE/MUSEUM]

[Science citizenship]

7. **Following your last visit to [name of science centre/museum/event] did you go looking/search for more information on science and technology?**

Yes
No
Don't know

8. **If yes, how did you search for that information? (CHOOSE UP TO THREE SOURCES)**

Internet
Science books
Science journals

Science documentaries
Lecture/talk
Exhibition
Discussion with experts
Discussion with friends
Discussion with family
Government agency
Magazine
Newspaper
Television
Other (please specify)
Don't remember

[General attitudes and beliefs about science and scientists]

I am now going to read out some statements about science and technology. For each statement, could you please say how much you agree or disagree.

9. Science and technology will make our lives easier, healthier, and more comfortable
10. It is important to know about science in my daily life

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

I am now going to read some statements about scientists. Could you please tell me the extent to which you agree or disagree with each of the following:

11. Before scientific findings are published, other scientists have to check them
12. It's normal for scientists to disagree
13. Scientists should listen more to what ordinary people think
14. It is common for scientists to adjust their findings to suit their funders interests

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

[Science city impact and awareness [ASSUMING SCIENCE CENTRE/MUSEUM/EVENT IS LOCATED IN A SCIENCE CITY[14]]]

15. Have you ever heard the term ¨science city¨ or ¨city of scientific culture¨?

Yes
No
Not sure

16. [IF R. HAS HEARD...] In your own words, could you please tell me what the term science city/ city of scientific culture suggests to you? [RECORD VERBATIM]

……
……
……
……
……
…….

17. Did you know that [NAME OF CITY] is considered a city of scientific culture/science city or has officially declared itself as such?

Yes
No
Not sure

18. [IF YES] How did you find out?

Newspaper
Magazines
TV
Friends/family
School/college/university
Your workplace
Local government announcement/public meeting
Thinktank
Event honouring/celebrating that, e.g. science festival
Other (please specify):
Can't remember

Please say how much you agree or disagree with 7the following statements:

19. I think [NAME OF SCIENCE CENTRE/MUSEUM/EVENT] plays an important part in the cultural life of [name of city]
20. I think [NAME OF SCIENCE CENTRE/MUSEUM/EVENT] plays an important part in the economic development of [NAME OF SCIENCE CITY]
21. I think [NAME OF SCIENCE CENTRE/MUSEUM/EVENT] is an important symbol of [name of science city]

[14] Please see p.17 of this document for information on science cities.

22. I think [NAME OF SCIENCE CENTRE/MUSEUM/EVENT] is one of the main tourist attractions in [name of science city]

Strongly agree
Agree
Neither agree nor disagree
Disagree
Strongly disagree

[Questions specific to particular science exhibit/museum/event/city [these can be generated locally]].

23. EXAMPLE: [Do/did] you know about the new University Science Park at Pebble Mill that's being built at present?

Yes
No

24. [IF NO, THEN GIVE SPECIFIC DESCRIPTION OF LATEST DEVELOPMENTS IN CITY]
25. How important do you think this new development will be to the city's economy/economic growth?

Very important
Fairly important
Neither important nor unimportant
Not very important
Not at all important
Don't know

26. What about to the city's prestige/name?

Very important
Fairly important
Neither important nor unimportant
Not very important
Not at all important
Don't know

[The following section may be included as part of the standardized survey in cases where this type of impact is relevant.]

[Impact on consumer behavior]

27. Following your last visit to [NAME OF SCIENCE CENTRE/MUSEUM/EVENT] did you buy more products related to the exhibition or event(s), i.e. biodegradable/eco-friendly, organic, non-genetically modified, etc.?

Yes
No
Don't know

28. Did you start paying more attention to labels on the products you buy?

No, not at all
Yes, sometimes now
Yes, most of the time now
Yes, always now
Neither agree nor disagree
Disagree
Strongly disagree
Don't know

29. Have you stopped buying any products?

Yes (please specify what)
No

[Final demographics section]

SELECT STANDARD QUESTIONS FOR PARTICULAR COUNTRY:
SEX
AGE (AT LAST BIRTHDAY):
CITY AND COUNTRY OF RESIDENCE:
ETHNICITY
EDUCATION LEVEL – HIGHEST QUALIFICATION
What is your current or, if not working now, your last MAIN job?
[CLASSIFICATION OR OPEN CODE AS DESIRED].

MODULE A3:

Focus group with (ordinary) citizens

SCIENCE CITY'S PERCEPTION AND IMPACT

Here you will find the main questions that will serve as guidelines for conducting a focus group, but for a more detailed description of this technique please refer to Methodological Considerations Chapter (p.25). If after the first question it is apparent that respondents do not know about the concept of a science city, then the moderators should use elements of the definition of 'science city' described above on Basic Concepts Chapter (p. 19) in order to explain it to the participants.

[Theme 1 - perception about the notion of science city]

1A. What comes to mind when you think of the word 'science city' or 'city of scientific culture´?

Spontaneous reactions
Probe:
Definitions of a science city given by the respondents
Naming of some science cities respondents know of
Positive or negative connotations of science cities

1B. Do you know whether this city [name of city] is a science city? If yes, why do you think it is a science city?

Spontaneous reactions
Probe:
Science events / festivals
Other activities that have to do with science and science communication

1C. Are there any symbols you know of that successfully present your city as a science city?

Probe:
University
Science museums

Science centres

1D . **How do you think a particular museum or science event contributes to the notion of the science city or city of scientific culture?** ***[In the case that there is no spontaneous reaction, give an example of a museum or science event]***

Spontaneous reactions
Justifications

[Theme 2 - Influence of a science city on the citizens' everyday life]

[Note that If the respondent does not consider the city a science city or city of scientific culture, questions should be structured conditionally i.e. in the case that X city were a science city….]

2A. **Do you think that living in a science city keeps up or has preserved your educational level? If yes, in what way?**

Spontaneous reactions
Justifications
Examples

2B. **Do you think that it has influenced your choice of profession? If yes, in what way?**

Spontaneous reactions

2C. **Does being a science city citizen affect your daily life? If yes, in what way?**

Spontaneous reactions

2D. **Do you know if there any activities that could be considered part of a science city strategy in [name of city]? Do you participate? Have you ever brought friends or family to these activities? If not, would you be willing to?**

Spontaneous reactions
Rating scale

POLITICAL SPHERE (REGIONAL/LOCAL/CITIES)

This part of the research for the case studies makes use of two principal instruments or tools for research, semi-structured interviews and document analysis. In the framework of PLACES project it was also the possibility to conduct focus groups either to replace or to complement the other tools, but always keeping in mind that output of these case studies needs to be meaningfully comparable across Europe.

MODULE B1:

Semi-structured interviews with observers/stakeholders (at science centre, science event and science city level)

We are interested in the views of our selected interviewees in their role as **privileged observers or stakeholders in the process.** In other words, what they think about the impact of SCIPs (science communication initiatives and policies) on the political sphere and the city itself. It is important to differentiate module from **Module C1** which is focused on the analysis of the impact of such SCIPs on the interviewees themselves.

STAKEHOLDERS TO BE INTERVIEWED

Decisions about who to contact and interview need to be based on local knowledge of each case. A minimum of 5 interviews is considered necessary for each case and a greater number is recommended. All teams should motivate their choice of interviewees in writing, that is to say, why were these people chosen? As the aim is to assess impacts on a political institutional level the teams would preferably go for interviews with stakeholders, as privileged observers for any given case study, from the following categories:

- Local or regional authorities and administration
- Local research institutions
- Local educational establishments, including schools and universities
- Local culture industry (museum, centers, events, etc.)
- Local industry or businesses

- Civil Society Organisations
- Media
- Other, please motivate.

GUIDELINES FOR SEMI-STRUCTURED INTERVIEWS

The following grid for semi-structured interviews should be interpreted as guidelines and at times the discussions will stray and that might give us some very valuable insights and material for our study. However, it is imperative to at least impose the structure and logic of the grid on all interviews as we should keep in mind that in the end we will want to compare the findings from the interviews conducting within any given case studies with the findings from all the countries. That is quite a challenge for comparative qualitative research. All interviews should be carefully recorded but for further technical details on how to conduct semi structured interviews please refer to Methodological Considerations Chapter (p.25).

Dear “interesting observer X”, thank you so much for taking the time to participate in our research, your views and experiences are invaluable for this European Project.

Broadly speaking we are interested in your views on four broad categories of impacts of Science Communication Initiative and Policies in (name of city): Social and economic impacts, possible impacts on quality of life, impacts on policies and impacts on education. On the one hand we are interested in your experience and judgements about what has happened in (name of city) until now, on the other hand we are also very interested in knowing more about how you think things will develop in the future, for example from now until 2020.

We can begin our discussion by talking about the broad category of Social and Economic Impacts of SCIP in (name of city). We have a set of questions that are being asked across Europe so shall we just start?

[Policy]

I would like to ask you a few questions about the impact of SCIPs (Science Communication initiatives and policies in (name of city).

1A) First of all, in your view, what would be the **overall added-value** of a local "Culture of Science and Technology" or "Scientific culture"

- Will that be the same or will it be different in the future?

1B) What role has been played by **local/regional authorities** in the process of fostering a culture of science and technology in (name of city)?

- Do you think that will change in the future?

1C) How about Science Communication, science museums or science events?

1D) Can you think of an example where the **public really had a voice in final decision** about science and technology related issues in (name of city)?

1E) Have any **new partnerships** emerged between local institutions or businesses in the context of Science Communication activities, can you think of an example in (name of city)?

- Any ideas about how that might evolve in the future?

1F) What, in your view, would be **the most effective policies** to put in place in (the relevant place) to foster culture of science and technology?

1G) **Other,** do let the interviewees tell you all that they think is relevant.

[Quality of life]

Now let us turn to the issue of possible impacts of SCIPs (science communication initiatives and policies) on the quality of life in (name of city)

2A) What about **public participation**? What about engaging the local residents in debates or discussion about science and technology related issues that are of relevance, for example

regarding the environment, waste or energy? Would you say that this has been the case because of SC activities in (the relevant place).

- If, relevant, what have been the outcomes of public participation exercises in (the relevant place)
- Do you think that in the future we will see more or perhaps less of public participation exercise in (the relevant place)?

2B) In your view, have science communication activities had an **impact on the media** (local media, social networks etc) has anything changed? Do you think that the local media have become more sensitive to science and technology?

- In your view, will be media become more or less attentive or sensitive to these issues in the future?

2C) What do you think, have science communication activities in any way impact the **cultural identity** of (the relevant place)?

- Do you think that residents feel that they belong to an innovation society?
- Do you think they feel more a part of a local tradition of science and technology now?
- Do you think that this will change in the future?

2D) **Other**, please let the interviewees tell you about all other cultural impacts that they can think off.

[Social and economic impacts]

3A) What are some of the main economic impacts SCIPs at the local level? Have SCIPs brought in any new **sources of income**, (these might be grants or sponsorships, sale of books, posters, etc. or perhaps money has been lost)

- If applicable, where did new income come from
- What do you think will happen in the future, for example between now and 2020?

3B) What **financial support measures** have been effective to further "Cultures of Science and Technology" in (the relevant places).

- What do you think will be the most effective financial support measures in the future?

3C) Have Science Communication activities lead to any increase in **local tourism**?

- Do you think it will do so in the future?

3D) Have any **new jobs** been created through science communication activities in (the relevant place)?

- Do you think these kind of activities will create new jobs in the future?

3E) Have any **new forms of public/private interaction** come about through science communication activities and events? (for example between public universities or schools and industry in the area)

- In your view, how will public/private interaction in this field evolve in the future?

3F) What about investments in infrastructure, for example new buildings or services, has that been the case in (the relevant place)?

- Do you think there will be **new investments in infrastructure** in the future?

3G) **Other**, please let the interviewees tell you about all other possible social and economic impacts that they can think of.

[Education]

Finally, I would like to ask you a few questions about the impact of science in society on education in (the relevant place).

4A) Have science in society activities in (the relevant place) lead to any **new courses**? New university courses, life-long learning initiatives or something of that kind?

- Do you think that will happen in the future?

4B) Have scientific **laboratories** or technological **firms opened their doors to the public**?

- How did that go?
- Do you think this will change in the future?

4C) Has there been an increase in **school visits,** for example to festivals or science events to compliment the curriculum?

- Do you think this will change in the future?

4D) Has any new **educational material**, dvds, shows, games or something of that kind been produced through science in society or science communication activities in (the relevant places)

4E) **Other**, again please let your interviewees tell you all that they think is relevant.

Now we have covered most of the issues that I wanted to discuss with you, do you think we have left any important topics out of our discussion today? (Please collect)

Finally, remember to thank interviewees for their time and underline again that by giving the interview they have made a very valuable contribution to a major European researcher project on Local Cultures of Science and Technology.

MODULE B2:

Document analysis

Two types of document are of interest in this analysis:

- Type 1: Those that set out plans, proposals and objectives for science in society / scientific culture initiatives and policies at city or regional level
- Type 2: Those that present the results of previous evaluations of or commentaries on science in society / scientific culture initiatives and policies

In both cases, the analysis begins with a document search, focused in **Type 1** on **establishing if there are written policies on science in society / scientific culture published by the city or regional authorities in question**. If so, where are they found? (In print? On the web? Both?).

We set out below how web searches can be used to find documents that explicitly mention science culture or similar terms or that detail the city's or region's support for institutions and programs promoting science culture.

Note, however, that there may be policies that primarily concern 'green' issues, transport or healthcare but that contain substantial science culture (e.g, public engagement) elements. These sections of those documents should be included in the analysis. Note also, there may be policies of individual political parties or other major civil society organisations concerning science in society in the city or region in question. These documents could also be included, taking care to record the relevant affiliations.

a) **Basic data** should be recorded on the length, authorship and target audience (stated or implied) of the policy documents and on the timescale and budget (if stated) for the programs outlined.

b) Further content analysis should record the **target groups** for participation in the program outlined and the presence, absence and relative weight in the documents of

- social and economic objectives, e.g. tourism, infrastructure, jobs
- quality of life objectives, e.g. sustainability, community wellbeing, community participation, lifestyle
- policy and partnership objectives, e.g. aimed-for involvement of researchers, expert and citizens, administrative structure changes
- educational objectives, e.g. involvement with schools, promotion of lifelong learning, promotion of research institutions' public engagement

For demonstration purposes, we analyzed city web sites to investigate their activity in the field of scientific culture. These searches focused on the activity of the city council, i.e. the administrating body of the city. They sought information on activities, institutions, policies, etc. related to science culture that are initiated or supported by a given city. They could be museums or science centres, science festivals, policy statements, etc.

Here is a check-list of steps for such searches:

- Go to official city website
- See if "science" appears on a first level
- Otherwise explore "culture" and pages concerning "museums", "festivals" and such institutions and activities
- Search for the word "science" on the site as a whole (with its search tool)
- Do a general search for "[name of city] + culture + scientific / science"
- Check whether the city funds all the events or institutions you find
- Keep record of web sites, etc.

For Type 2 **Documents about previous evaluations and commentaries on science in society/scientific culture**. The analysis should be conducted according to the same criteria as policy documents, asking what do these evaluations and commentaries say about the

achievement of stated objectives such as those mentioned I policy statements, programs, initiatives, etc.

The boundaries of the search are less clearly defined than for policy documents. Any formal evaluations are of particular interest. Where these exist, it should be recorded whether they are self-evaluations or independent evaluations, by whom or on whose behalf they were conducted and how widely they were made available.

In the absence of such evaluations the search could extend to commentaries by the mass media or published in the media on science in society initiatives in the relevant city or region.

In both cases, the document search can be supported in the interviews with policy-makers: they should be asked if policy documents have been produced, if evaluations have been commissioned and if media commentaries have been published.

ACTORS

Module C1:
Semi-structured interviews with relevant actors
(case studies "science centres" and "science events")

In this module, individual interviews with the **most important actors** (or representatives of these actors in the case of institutional actors) should be conducted. If several actors of the same type were involved in the case (e.g. a group of scientists) interviews should be conducted with a representative member of that actor type. The main goal of these interviews is to measure the impact that participating in the event has caused on the actor him/herself.

Selection of interviewees

Based on general knowledge of the case gathered in the preparation of the case study, the most important actors from the list of actors (see Table 2, p. 20) should be selected. There are interview guidelines for each possible type of actor. The prospective interviewees have to be contacted and asked to agree to an interview.

Interviewing

The interviews should be structured into two parts (see guidelines below): First, the interviewee should have a chance to describe his/her involvement in the case under investigation from his/her own perspective and describing how he/she became involved and how and in which role he/she was involved. This part gives useful context for the further more focused questions and also serves to let the interviewee recall the event. The second part should then focus on possible impacts of his/her involvement on himself/herself.

All interviews should be carefully recorded but for further technical details on how to conduct semi structured interviews please refer to Methodological Considerations Chapter (p.25).

Analysis

Ideally, the analysis of the interviews should be based on transcripts of the audio recording. Given the limited resources for each case study and the straightforward goals of the analysis, taking notes while listening to the audio recording might be sufficient, however. The analysis should focus on the explicit and implicit comments of the interviewee of how he/she or the institution they represent were affected (e.g. acquired skills and new insights, had benefits for their work, made useful contacts etc., see on p.75 or p. 22 for a list of potential areas of Impact or effects on actors). Indicators for such effects could be the self-reporting of the interviewee, but also information about follow-up activities or consequences of the interviewee's involvement in the case.

The analysis should thus result in a selective, structured summary of the interview. It should identify the impact dimensions mentioned by the interviewee and the interviewees' description of the kind of impact, the size of the impact in the respondents own words. The analysis should also include the required context information (e.g. about the interviewees role in the case) necessary to understand why this impact has occurred and why it is important to the interviewee. If the interviewee mentions that a particular kind of impact has not occurred, this should also go into the analysis.

Reporting

The analyses of the semi-structured interviews with actors will be a section in the case study report. It should consist of a verbal description of the impacts on the relevant actors structured by actor and impact type.

Scientists

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your involvement in <event>/ cooperation with <centre>. Perhaps you could start telling me how you became involved.

Follow-up questions

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for you. Is there something you got out of it for yourself?

[Learning/getting feedback about public response to research + raising new research topics and questions]

Your involvement in <case> certainly contributed to the visitors' better understanding of science or science-related issues. However, did you yourself also learn something by the interactions with visitors or got some ideas that are relevant for your work and - if yes - what did you learn?

Optional follow-up questions:

- Did you learn something relevant about "the public"?
- Can you remember what you learned and how?
- What about your research?
- Any ideas that crossed your mind when talking to laypeople that might lead to an interesting research question or some other advance of your research?

[Acquiring communication skills]

Starting question: Talking to laypeople about a subject is probably quite different from talking to colleagues about the same subject. What experiences did you make when you talked to the visitors of <case>?

Optional follow-up questions:

- Was it difficult for you to talk to the visitors?

IF YES:

- What was difficult?
- What did you learn about how to communicate with laypeople about science from your experience?

- What skills are you still lacking for communication about science with the general public?
- Have you received some training for public communication?

[Networking between actors of different categories]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?
- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Creating and using relevant expertise]

Starting question: Apart from explaining research and disseminating knowledge, do you remember talking with people about issues or problems, and offer - or receive yourself - advise or useful information related to those problems?

Optional follow-up question:

- What kind of problem were you discussing with people?
- Did the visitors that you talked to have some useful information to offer that contributed to your own understanding of an issue or problem?
- Can you explain that in more detail?

[Advocacy]

Starting question: Could you please explain to me the reasons and motives why you participated in the <case>?

Optional follow-up questions:

- In your interactions with the visitors, did you try to convince them of something? Of what?
- How did the visitors react to your attempts to persuade them?
- Do you remember talks where you were successful in your goal to persuade your dialogue partners?

Science institutions representatives

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your institution's involvement in <case>. Perhaps you could start telling me how you became involved.

Follow-up questions

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget, money or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for your institution. Is there something you got out of it?

[Prestige and visibility/public image]

Starting question: Has your public visibility and image changed by your involvement in <case>?

Optional follow-up question:

- In which way?
- How can you be sure? Any evidence for that?

[Competitiveness]

Starting question: In which way was the competitiveness of your institution affected by your involvement in <case>?

Optional follow-up questions:

- Recruitment of researchers and other staff?
- Recruitment of students?
- Economic benefits?

[Increase public acceptance of their research area]

Starting question: Do you have any problems with public acceptance of your institutions or its research?

Optional follow-up question:

- Are there any consequences from your collaboration with <case>?
- Do you have any evidence for that?

[Advocacy]

Starting question: To what extent has your institution’s involvement in <case> allowed you to share the institutions aims and intentions with the wider public?

Optional follow-up question:

- Did you have a particular aim with your participation in <case>?
- Evidence that you succeeded to convince the public?

[Getting feedback about public response to research + new research topics and questions]

Starting question: What did your institution learn in the cooperation with <case>?

Optional follow-up questions:

- Feedback about the public's response to your research?
- Ideas about new research topics?
- Opportunity to think about the institution's place in society?

[Networking between actors of different categories]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?
- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Positive feedback and motivation]

Starting question: How is your institution's involvement in <case> assessed within your institution?

Optional follow-up question:

- Would your institution participate again in such activities or has this been a deterrent experience?
- On what factors is this assessment based?
- Within your institutions - who is rating the experience positively und who critical?

Schools (assumed interview with a teacher as representative of the institution)

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your school's involvement in <case>. Perhaps you could start telling me how you became involved.

Follow-up questions:

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget, money or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for your school. Is there something you got out of it?

[Enhancing learning opportunities for students]

Starting question: In which way has your school's involvement in <case> enhanced learning opportunities for your students?

Follow-up questions:

- How many students were involved?
- What is different from “every day” teaching?
- Has the quality of the teaching improved? In which respect?
- Any evidence or examples?

[Competitiveness]

Starting question: In which way was the competitiveness of your school affected by your involvement in <case>?

Optional follow-up questions:

- Recruitment of teachers?
- Recruitment of students?
- Economic benefits?

[Networking between actors]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?
- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Positive feedback and motivation]

Starting question: How is your involvement in <case> assessed within your school?

Optional follow-up question:

- Would your institution participate again in such activities or has this been a deterrent experience?
- On what factors is this assessment based?
- Within your school - who is rating the experience positively und who critical?

[Career enhancement]

Starting question: At the end of this interview I would like to ask about the consequences of your school's involvement in <case> for yourself. Which advantages and disadvantages did you yourself have by your schools involvement?

Optional follow-up questions:

- Consequence for your image and status within the school?
- Any ideas about moving jobs or doing something else?

Media/journalists (assumed interview with a journalist as **co-organiser** – not just reporter)

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your or your media organization involvement in <case>. Perhaps you could start telling me how you became involved.

Follow-up questions:

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget, money or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for you or your media organization. Is there something you got out of it?

[Competitiveness]

Starting question: Your involvement in <case>, did this lead to advantages or disadvantages relative to colleagues who were not involved?

Optional follow-up questions:

- Which advantages or disadvantages?
- And your newspaper (or program or website), will it profit from your involvement (or reporting) relative to competing media or is there not such an effect?

[Acquiring communication skills & enhance qualification for reporting on science]

Starting question: Did you personally profit from your involvement in <case> by acquiring new skills or qualifications?

Optional follow-up questions:

- What did you learn?
- How will this affect your work?

[Networking between actors]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?
- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Prestige and visibility / public image]

Starting question: In which way did your involvement affect your personal public image and reputation or that of your media organization?

Optional follow-up question:

- Any evidence?

[More weight for scientific topics]

Starting question: What is the weight your organization gives to scientific topics in their coverage in terms of air time/space or resources?

Optional follow-up questions:

- Has this weight changed by <case>?
- How? - Any organizational changes as a consequence of <case> (new reporters, new freelancers, modified structure of the editorial office etc.)?
- Why (or why not)?

[Involvement / commitment for public science communication]

Starting question: Looking back, how do you think today about your involvement in the <case>?

Optional follow-up question:

- Are you planning to do similar things in the future or has this experience put you off?

[Career enhancement]

Starting question: Do you expect any effects of your involvement in <case> on your professional career?

Optional follow-up questions:

- Which effects?

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your and your institution's involvement in <case>. Perhaps you could start telling me how you became involved.

Follow-up questions

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget, money or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for your institution. Is there something you got out of it?

[Competitiveness]

Starting question: In which way was the competitiveness of your institution (or yourself) affected by your involvement in <case>?

Optional follow-up questions:

- Political advantages over competitors?
- Impact on public image?

[Image of research]

Starting question: Your involvement in <case> - did it have any consequence for how you think about science, scientific institutions or a particular research field?

Optional follow-up questions:

- What did change?
- What caused this change?
- Does this change have any consequence for your decisions?

[Learning about scientific expertise]

Starting question: Was there anything you learnt from science during your involvement in <case> that might be useful for your policy-making?

Optional follow-up questions:

- What did you learn?
- In which way does it affect your policy?

[Networking between actors]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?

- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Involvement / commitment for public science communication]

Starting question: Looking back, how do you think today about your involvement in the <case>?

Optional follow-up question:

- Are you planning to do similar things in the future or has this experience put you off?

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your company's involvement in <case>. Perhaps you could start telling me how you became involved.

Follow-up questions

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget, money or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for your company. Is there something you got out of it?

[Competitiveness]

Starting question: In which way was the competitiveness of your company affected by your involvement in <case>?

Optional follow-up questions:

- Impact on public image?
- Economic advantages over competitors? Marketing?
- Recruitment of researchers and other staff?

[Getting feedback about public response to R & D]

Starting question: Did you have a chance to inform about your own R & D activities in the <event>?

Optional follow-up questions (IF YES):

- What was the public's response?
- Was the feedback useful for your? E.g., did you learn about concerns of the public?
- Will this feedback have any consequence, for example for your public communication activities?

[Networking between actors]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?
- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Advocacy]

Starting question: To what extent has your company's involvement in <case> allowed you to share the company's aims and intentions with the wider public?

Optional follow-up question:

- Did you have a particular aim with your participation in <case>?
- Evidence that you succeeded to convince the public?

[Involvement / commitment for public science communication]

Starting question: Looking back, how do you think today about your involvement in the <case>?

Optional follow-up question:

- Are you planning to do similar things in the future or has this experience put you off?

Part 1: The interviewee's involvement in the case

At the beginning of our talk I would ask you to explain to me your and your institution's involvement in <case>. Perhaps you could start telling me how you became involved.

Follow-up questions

- Why did you become involved? What were your motives?
- What was your role in the event? How did you contribute?
- What kind of efforts and investments in terms of time budget, money or other did you make?

Part 2: Impacts

I would now like to learn in more depth about what your involvement meant for you and your institution. Is there something you got out of it?

[Advocacy]

Starting question: To what extent has your institution's involvement in <case> allowed you to share the institutions aims and intentions with the wider public?

Optional follow-up question:

- Did you have a particular aim with your participation in <case>?
- Evidence that you succeeded to convince the public?

[Getting feedback about public response]

Starting question: Did you have a chance to inform about your own activities in the <event>?

Optional follow-up questions (IF YES):

- What was the public's response?
- Was the feedback useful for your? E.g., did you learn about concerns of the public?
- Will this feedback have any consequence, for example for your public communication activities?

[Networking between actors]

Starting question: Apart from the general public, with whom did you collaborate or otherwise interact during preparation and implementation of <case>?

Optional follow-up questions:

- Did you know these people already or did you make new contacts?
- Are the contacts you were able to make or intensify useful for you?
- In what respect are they useful?
- Did you make any plans for further co-operations beyond the <case>?

[Competitiveness]

Starting question: In which way was the competitiveness of your institution affected by your involvement in <case>?

Optional follow-up questions:

- Impact on public image?
- Economic advantages – sponsors, donations?
- Recruitment of new members?

[Involvement / commitment for public science communication]

Starting question: Looking back, how do you think today about your involvement in the <case>?

Optional follow-up question:

- Are you planning to do similar things in the future or has this experience put you off?

Module C2:

Focus group with relevant actors

(case studies "science centres" and "science events")

Here is the specific guideline to conduct the focus group corresponding to Module C2. For further technical details about this technique in the framework of PLACES project please refer to Methodological Considerations Chapter (p.25).

In this module, **one focus group** with 4-8 participants from the most important actors (or representatives of these actors in the case of institutional actors) should be conducted. If several actors of the same type were involved in the case (e.g. a group of scientists) one or two representative members of that actor type should be invited for the focus group. The main goal of this focus group is to measure the impact that participating in the event has caused on the actors represented in the focus group.

This module C2 is an alternative to conducting the semi-structured interviews of C1. However, the advantage of doing the semi-structured interviews of C1 rather than the focus group of C2 is, first, that the interviews will result in more detailed answers as respondents have more time to talk. Second, in most cases it will be easier to make individual appointments with several actors than a joint appointment with them. The main advantage of a focus group, different participants providing different views on the same subject, is not so important in this case as each participant would have to talk about impacts on himself/herself, and the other actors cannot reasonably add to that as they have no own experience about impacts on other actors.

For the purpose of identifying impacts on actors it may thus be preferable to use module C1 (individual interviews) rather than module C2 (focus group).

Selection of participants

Based on general knowledge of the case gathered in the preparation of the case study, the most important actors from the list of actors (see Table 2 on p.20) should be selected. The prospective participants have to be contacted and asked to agree to participate in the group.

Conducting the focus group

For the current case it seems useful to begin – after an introduction by the moderator – with a round of statements, giving each participant about 5 minutes **to talk about his/her response and the respective institution's response to participating** in the <case>.

After these statements the moderator should introduce the rather general question to stimulate the discussion: **"What has changed for you by your involvement in <case>?"** The moderator's task is then to structure the debate, and – if necessary – to introduce key words from the list of **potential areas or effects on actors** (see table below. Also found on p.22) in order to have the group think about a broad spectrum of possible effects. It is also advisable to pose the questions listed in Module C1 if they do not come up organically during the conversation.

Potential areas of impact include: career enhancement, competitiveness, learning/getting feedback about public response to research + raising new research topics and questions, learning about scientific expertise, enhancing learning opportunities for pupils, enhancing quality teaching and teachers, self reflection + context awareness, acquiring communication skills , enhance qualification for reporting on science, networking between actors of different categories, economic benefits (including marketing/sales), positive feedback and motivation, creating and using relevant expertise , increase public acceptance of their research area, prestige and visibility / public image, recruitment of researchers and other staff, recruitment of students , more weight for scientific topics, involvement / commitment for public science communication, advocacy, others.

Analysis

Ideally, the analysis of the focus group should be based on transcripts of the audio recording. It is less possible than in the case of individual interviews to do listening and summarizing in one step thus saving the need for transcription. As described in module C1, the analysis should focus on the explicit and implicit comments of the interviewee of how he/she or the institution they represent were affected (e.g. acquired skills and new insights, had benefits for their work, made useful contacts etc., see p. 75 or p. 22 for a list of potential areas of impact or effects on actors). Indicators for such effects could be the self-reporting of the participants, but also information about follow-up activities or consequences of the participants' involvement in the case.

The analysis should thus result in a selective, structured summary of the focus group. It should identify the impact dimensions mentioned by the participants and the participants' description of the kind of impact, the size of the impact in the speakers' own words. The analysis should also include the required context information (e.g. about the participants role in the case) necessary to understand why this impact has occurred and why it is important to the participant. If the participant mentions that a particular kind of impact has not occurred, this should also go into the analysis.

Reporting

The analysis of the focus group will be a section in the case study report. It should consist of a verbal description of the impacts on the relevant actors structured by actor and impact type.

Module C3:
Focus group with relevant actors
(case studies "science cities")

Here is the specific guideline to conduct the focus group corresponding to Module C3. For further technical details about this technique in the framework of PLACES project please refer to Methodological Considerations Chapter (p.25).

In this module, it would be ideal to conduct **at least two focus groups** with 4-8 participants each from the most important actors (or representatives in the case of institutional actors) should be conducted. If several actors of the same type were involved in the case (e.g. a group of scientists) one or two representative members of that actor type should be invited for the focus groups (preferable in different focus groups). The main goal of these focus groups is to **measure the impact that participating in the event has caused on the actors represented in the focus groups.**

Selection of participants

Based on general knowledge of the case gathered in the preparation of the case study, the most important actors from the list of actors (see Table 2, p. 19) should be selected. The prospective participants have to be contacted and asked to agree to participate in the groups. Since there are at least two focus groups in this module, the distribution of participants to groups should be considered carefully.

Conducting the focus group

For the current case it seems useful to begin – after an introduction by the moderator – with a round of statements, giving each participant about 5 minutes to talk about **his/her response and the respective institution's response to participating in the city of science initiative**.

After these statements the moderator should introduce the rather general question to stimulate the discussion: **"What has changed for you by your involvement in the city of science initiative?"** The moderator's task is then to structure the debate, and – if necessary – to introduce key words from the list of potential areas of impact or effects on actors (see p. 75 or p.22) in order to have the group think about a broad spectrum of possible effects.

Analysis

Ideally, the analysis of the focus groups should be based on transcripts of the audio recording. It is less possible than in the case of individual interviews to do listening and summarizing in one step thus saving the need for transcription. As described in module C1 and C2, the analysis should focus on the explicit and implicit comments of the interviewee of how he/she or the institution they represent were affected (e.g. acquired skills and new insights, had benefits for their work, made useful contacts etc., see p.75 or p.22 for a list of potential areas of impact or effects on actors). Indicators for such effects could be the self-reporting of the participants, but also information about follow-up activities or consequences of the participants' involvement in the case.

The analysis should thus result in a selective, structured summary of the focus groups. It should identify the impact dimensions mentioned by the participants and the participants' description of the kind of impact, the size of the impact in the speakers' own words. The analysis should also include the required context information (e.g. about the participants role in the case) necessary to understand why this impact has occurred and why it is important to the participant. If the participant mentions that a particular kind of impact has not occurred, this should also go into the analysis.

Reporting

The analysis of the focus group will be a section in the case study report. It should consist of a verbal description of the impacts on the relevant actors structured by actor and impact type.

ANNEX 1. LITERATURE REVIEW

The brief texts that accompany each of these titles are not in fact summaries of these, strictly speaking, however, they explain the methodology used as well as who was responsible for carrying out and or initiating the study.

Studies that have served as references for the Impact Assessment of SCIP in the framework of the PLACES Project. The list of references has been divided into 5 sections. The first section includes studies that do not directly pertain to the area of SCIPs but that may be considered valuable for their study (for example, methodological papers, articles about the impact or evaluation of art museums and libraries, manuals describing good practices, etc.). The second section includes studies on the general area of SCIPs. The third group includes examples of some of the numerous studies published on the effects produced on visitors (particularly in terms of learning, knowledge, emotional impact, long term impact, engagement, etc.). The fourth group includes some of the few studies that looked at effects on other actors (as opposed to visitors) such as the scientific community, staff at the given organisations, etc. The fifth and final group includes studies which focus on policy and the local impact of SCIPs (these types of studies are perhaps the scarcest).

GROUP 1. General Literature and Resources Not Related With SCIP

- **Visitor Studies: Theory, Research and Practice Published By: Routledge. Print ISSN: 1064-5578. Online ISSN: 1934-7715. Available at http://visitorstudies.org/News/2/57/Visitor-Studies-Theory-Research-and-Practice-Archive/d,vsa-detail.** Formerly "Visitor Studies Today", it is the journal of the Visitor Studies Association (http://visitorstudies.org). *Visitor Studies* is a bi-annual, peer-reviewed journal that publishes high-quality articles, focusing on visitor research, visitor studies, evaluation studies, and research methodologies. The Journal also covers subjects related to museums and out-of-school learning environments, such as zoos, nature centres, visitor centres, historic sites, parks and other informal learning settings.
- **Visitor Studies Association (2008). Evaluator Competencies for Professional Development Available at http://visitorstudies.org/uploads/documents/Evaluator-Competencies.pdf.** As the journal Visitor Studies, this document was elaborated by the Visitor Studies Association. In this case, the work was done in part thanks to a grant from the Informal Science Education

Program of the National Science Foundation to plan a Continuing Education Program for Mid-Career (Practicing) Professionals in informal learning research and evaluation. This document was created to practicing professionals to plan their continuing professional development in visitor studies. It was designed to facilitate life-long learning for all visitor studies professionals by providing suggestions for learning activities in five competencies: Competency A) Principles and Practices of Visitor Studies; Competency B) Principles and Practices of Informal Learning Environments; Competency C) Knowledge of and Practices with Social Science Research and Evaluation Methods and Analysis; Competency D) Business Practices, Project Planning, and Resource Management; and Competency E) Professional Commitment

- **Matarasso, F. (1997) Use or ornament? The Social Impact of the Participation in the Arts. *Comedia.* Available at: http://alturl.com/ksqwe.** This report offers an account of the evidence found of social impacts arising from participation in the arts, and of some of the methods used in the research. It is one of the first large-scale attempts, in the UK at least, to come to grips with these issues and the intention is not to give definitive answers but to ask the questions more clearly. The study is primarily targeted at policy makers in the arts and social fields. It is focused on areas of impact which relate to broad public policy objectives and methods which are workable in everyday use. It uses simple evaluation models and forms of evidence which provide acceptable guidance for public policy development and planning.

- **Inspiring Learning. An Improvement framework for museums, libraries and archives. Available at: http://alturl.com/4dufw.** The Inspiring Learning Framework has been developed by the Museums, Libraries and Archives Council (MLA) in the UK. Inspiring Learning is a self-help tool to enable museums, libraries and archives to develop their learning offer. In particular, the Inspiring Learning Framework helps museums, libraries and archives to capture and evidence their impact by identifying generic learning and social outcomes for individuals and community. It provides tools and resources to help researchers and institutions: clarify the aims and outcomes of the activity they are going to evaluate, decide which generic learning or social outcome they should focus on to measure those aims, and it provides suggestions for which methods and tools should be use for the evaluation.

- **Jackson A. (2004). Evaluation Toolkit for the Voluntary and Community Arts. *Annabel Jackson Associates*. November 2004. Available at: http://alturl.com/rd4zu.** This evaluation toolkit was written in 2004 to help voluntary and community arts organisations in Northern Ireland to evaluate outcomes and impact. It also has recommendation for the Arts Council. This toolkit aims to increase the consistency of evaluation work so that individual arts organisations can better understand and explain their effects, but also so that the entire sector can make a stronger case to the Government. The toolkit is the first stage in a larger process that will a) see evaluation extended to all sectors of the arts, and b) will evaluate the impact of arts organisations' work on audiences as well as participants.

- **Wharton, C., DeBruin, T. & McManis & Monsalve Associates. (2005). Institute of Museum and Library Services, Museum Data Collection Report and Analysis. Available at: http://alturl.com/gjug6.** Complete, reliable data about museums are essential for the development of good policies. These policies will inform federal support for museums, help institute good museum planning and practice, and inform the public about the place and value of museums in their lives and in their communities. "Facts About Museums," an Institute of Museum and Library Services (IMLS) report (U.S.), was completed in 1998. With the reauthorization of the Museum and Library Services Act in September 2003, the IMLS was charged with increased analysis of museum and library trends and needs. Unlike the research process for the 1998 IMLS report, the preparation of this new report relied extensively on the Internet for identifying sources of information. Furthermore, McManis Associates concluded early on that in addition to systematically collected quantitative data, the report could benefit from the inclusion of qualitative data regarding museums (case studies, strategic plans, benchmarking, and best practices research). McManis Associates reviewed data from 490 sources, selecting 246 citations for inclusion in this report.

- **Arts Council England. (2006). Providing the best. Guidance for artists and arts organisations on assessing the quality of activities provided for children and young people. Available at:**

http://alturl.com/amfji. "Providing the best" is a best practices guide that defines the characteristics of high quality activities provided by artists and arts organisations when working for and with children and young people. The characteristics and their prompt questions provide a framework for assessing and assuring this work. The guidance was developed initially by an Arts Council England project team who were responsible for Children, young people and the arts strategy. The group attempted to define the characteristics of a high quality experience in the arts for children and young people. Once these characteristics had been agreed, a set of prompt questions was tested with over 150 artists and arts organisations around the country. The guidance was piloted by young people, artists and arts organisations from a variety of art forms and settings, who further refined it and provided the examples for each characteristic.

- **Generic Social Outcomes Indicator Bank For museums, libraries and archives. (2009). Available at: http://alturl.com/on2p3.** The Generic Social Outcomes (GSOs) is a toolkit which outlines ways in which museums, libraries and archives impact on social and community themes. This national (UK) GSO framework was developed as a combination of: a 'bottom up' process of developing the framework with practitioners, staff from regional agencies and MLA's Learning and Access team and as a 'top down' process of aligning the sector's potential social contribution with key drivers of government policy – through consultation with external bodies (e.g. IDeA, Audit Commission, DCMS) and a review of relevant policy documents. In 2008 MLA North East and the North East Regional Museums Hub commissioned CHE Associates to design and develop an indicator bank, which would support sector staff to use the GSO framework in planning, delivery and evaluation of services. This Indicator Bank, for GSOs, has been developed to provide practical guidance to practitioners, grounded in real practice and which will: Inform the planning process, inform the review and evaluation process, and enable museums to capture the difference they make to people's lives in terms of stronger, safer communities, health and well-being and strengthening public life.

- **Moussouri, T. (2002). A Context for the Development of Learning Outcomes in Museums, Libraries and Archives. (Prepared for the Learning Impact Research Project Team Research Centre for Museums and Galleries, University of Leicester). Available at: http://alturl.com/g4ier.** The Research Centre for Museums and Galleries in the Department of Museum Studies at the University of Leicester was commissioned by *Resource*: the Council for Museums, Archives and Libraries to research ways of defining and assessing the learning outcomes in museums, archives and libraries. The study involved an extensive literature review on learning outcomes, and a series of consultations with specialists. Initial ideas and assumptions about learning outcomes were tested by carrying out a small-scale MLA user study involving interviews in different locations.

- **Hooper-Greenhill, E. Dodd, J., Gibson, L., Phillips, M., Jones, C. & Sullivan, E. (2002-2005). What did you learn at the museum today? *Research Centre for Museums and Galleries* available at: http://alturl.com/w53iu.** This research was commissioned by MLA from the Research Centre for Museums and Galleries (RCMG) in the Department of Museum Studies at the University of Leicester. The purpose of the research was to explore the impact of *Renaissance* (The MLA's programme to transform England's regional museums) funding for museum education. As an extension of earlier research done in 2003, questionnaires and focus groups were conducted with school teachers and students who had recently visited a museum. In addition, three in-depth school case studies were also carried out. Questionnaires were also given to museum education staff to obtain views of the impact of *Renaissance* funding on their work and seminars were later held with them to review the purposes and findings of the research. All museums from the previous study were revisited along with new ones which were added to the present study. Although this paper does not specifically deal with science museums, it looks at the impact on learning following school visits to museums.

- **Watson, S., Dodd, J. & Jones, C. (2007). Engage, Learn, Achieve. The impact of museum visits on the attainment of secondary pupils in the East of England 2006-2007. *Research Centre for Museums and Galleries*. Available at: http://alturl.com/adeu6.** Renaissance East of England (The MLA´s programme to transform England's regional museums) and Museums, Libraries and

Archives Council East of England (MLA East of England) commissioned this research from the Research Centre for Museums and Galleries (RCMG) at the University of Leicester to investigate the impact that museums in the East of England region have on the attainment of secondary-age students completing an assessed piece of work as a result of their museum visit. This exploratory research gives a 'snapshot' of the impact of a museum visits on student attainment in the East of England region based on an assessed piece of work completed after a museum visit. Through quantitative and qualitative research it also investigates the attitudes of students and teachers towards museum visits and the learning that takes place there. Evidence obtained from this study adds to the understanding of the impact that museums can have on the attainment of secondary-age students.

- **Choi, A. S., Ritchie, B. W., Papandrea, F. & Bennett, J. (2010). Economic valuation of cultural heritage sites: A choice modelling approach, Tourism Management*, Elsevierft, 31*, 213-220 DOI: 10.1016/j.tourman.2009.02.014**. This paper contributes to the knowledge on the economic valuation of cultural heritage sites through a national choice modelling study of Old Parliament House, Australia. Managerial and policy implications are discussed. The ¨choice modelling¨ approach involved the use of mailed public surveys that presented questions as ¨choice sets¨ where one option had to be chosen from several alternatives. This paper aimed to provide useful information for both policy makers and managers of cultural institutions. For policy makers, the research provides a measure of the extent to which policies supporting cultural heritage sites are consistent with community expectations. For managers of cultural heritage sites, the research provides empirical guidance on the relative value that the wider community helping them make more informed decisions on programs and activities that better reflect community expectations.
- **Anholdt, Simon. (2010). Places-identity, image and reputation. Hampshire, Palgrave Macmillan.** The author used a place-branding hexagon as a guide. Its six points represent the six natural' channels of communication for most places, and are labelled: tourism, culture, policy, people, brands and investment and recruitment. One interesting point for the research focused on local and regional dimensions is his schema about effects in places identity: (Strategy + Substance - Symbolic actions = Anonymity); (Strategy – Substance + Symbolic actions = Propaganda); (Strategy – Substance - Symbolic actions = Spin); and (Substance – Strategy + Symbolic actions = Incoherence).

GROUP 2. General Literature about Evaluation and Impact of SCIP

- **Beetlestone J.G, Johnson C.H, Quin M., White H. (1998). The Science Centre Movement: contexts, practice, next challenges. 1998. *Public Understanding of Science,* (7), (1), 5-22.** As the science centre movement expands worldwide, the time seems ripe to stimulate an informed debate cantered on the purpose, practices, and achievements of science centres, together with the challenges they face in the next decade. The first section focuses on current practice, drawing dimensions from artifact to education, from didactic to empowering, from tutti-frutti to story line, from museum to Disney. The second section deals with the diversity of contexts within which science centres operate. The third section looks to the future, identifying funding gaps, the need for longitudinal evaluation studies, and the challenge of new information technologies.
- **Gascoigne. T, Metcalfe J. (2001). Report: The Evaluation of National Programs of Science Awareness*. Science Communication, 23, 66-76* DOI: 10.1177/1075547001023001007.** Most countries have national programs to increase the public awareness and understanding of science. How do we know if these programs achieve their aims? Are they evaluated, and if so, what methods are used? This report looks at the way the Australian Science and Technology

Awareness Program has been evaluated and comments on the limitations of methods used. It proposes a simple five-point model for evaluation.

- **Garnett R. The Impact of Science Centres/Museums on their Surrounding Communities: Summary Report 2001. Available at: http://alturl.com/py59g.** In response to an invitation from Dr Per-Edvin Persson to full members of ASTC and ECSITE, an initial group of thirteen science centres decided to fund the research project. The Steering Committee identified three main aims for the project. 1) To collect and collate reports and studies on the roles played by science centres in their communities. 2) To summarize and present these studies in a useful and accessible way. 3) To identify gaps in current knowledge on the impact of science centres. To acquire these studies the author sent emails to science centres and museums in science centre networks (ASTC, ECSITE, ASTEN and ASPAC) requesting copies of published and unpublished reports relating to the impact of their institutions on their surrounding communities. The final database contained over 180 entries.
    - The **Personal impact** of a science centre is defined as the change that occurs in an individual as a result of his/her contact with a science centre. It includes factors such as: science learning, changed attitudes to science, social experience, career directions formed, increased professional expertise and personal enjoyment.
    - The **Societal impact** of a science centre is defined as the effect that a science centre has on groups of people, organizations, and on the built and natural environment. Examples of societal impact are: Local/regional/international tourism, Community leisure activities, Youth employment , Community partnerships, Volunteer schemes, Local clubs and societies, Urban redevelopment, Environmental restoration and Infrastructure: roads, parking, transport.
    - The **Political impact** of a science centre is defined as its influence on government policies and priorities. It is its impact on all levels of Government.
    - The **Economic impact** of a science centre is defined as the direct and indirect effect it has on employment and the local economy. It includes measures such as: Income brought into the science centre from visitors, Income brought into community by visitors, Science centre expenditure and Job creation for staff and outside providers.

- **European Network of Science Centres and Museums (ECSITE) UK, The Impact of Science and Discovery Centres A review of world wide studies. (2008). Available at: http://alturl.com/5s5qu.** It follows the previous work (Garnett, 2001). This review summarises and highlights research focused on the impact of science and technology museums, and a variety of science centres, (referred to collectively as Science & Discovery Centres). Comparable evidence from the informal learning sector as a whole including the arts, heritage and cultural sectors has also been included, where relevant. The review specifically pays attention to research evidences that support how Science & Discovery Centres help create memorable learning experiences which can have a lasting impact on attitudes and behaviour, increase visitors' knowledge and understanding of science; promote trust and understanding between the public and the scientific community and, have an economic impact.

- **Edwards C. (2004). Evaluating European Public Awareness of Science Initiatives: A Review of the Literature. *Science Communication*. *25,3:*260-271. DOI: 10.1177/1075547003262651.** This review will consider how far public-awareness-of-science initiatives (PASIs), have succeeded. How much evaluation is taking place, and what patterns of success does it reveal? Work with the European Network of Science Communication Teachers (ENSCOT) enabled a review of reports for initiatives in European Union countries. Initial findings are that many PASIs are not formally written up and fewer are evaluated against their aims. The evidence also suggests differences between countries. This review considers how evaluation could improve future initiatives in Europe and beyond. As the authors said, evidence discussed in this review has been sourced through reports and other published documentation, as well as from some materials in production.

- **Rowe G. and Frewer L.J. (2004). Evaluating Public-Participation Exercises: A Research Agenda *Science Technology Human Values. (29), 4,* 512-556 DOI: 10.1177/0162243903259197.** The concept of public participation is one of growing interest in the UK and elsewhere, with a commensurate growth in mechanisms to enable this. The merits of participation, however, are

difficult to ascertain, as there are relatively few cases in which the effectiveness of participation exercises have been studied in a structured (as opposed to highly subjective) manner. This seems to stem largely from uncertainty in the research community as to how to conduct evaluations. In this article, one agenda for conducting evaluation research that might lead to the systematic acquisition of knowledge is presented. This agenda identifies the importance of defining effectiveness and of operationalizing one's definition (i.e., developing appropriate measurement instruments and processes). The article includes analysis of the nature of past evaluations, discussion of potential difficulties in the enactment of the proposed agenda, and discussion of some potential solutions.

- **Report of International Indicators of Science and the Public. Workshop -5 and 6 November 2007. Convened by: Dr Martin Bauer (London School of Economics), Dr Rajesh Shukla (National Centre for Applied Economic Research, Delhi), and Dr Nick Allum, (University of Surrey). Available at: http://alturl.com/7ghdn.** The Royal Society hosted in 2007 a two day workshop (held as part of the Society's Science in Society programme) to bring together an invited group of world experts to compare international indicators of public engagement with science and pioneer a new research agenda for the future of this line of research. The workshop aimed to take stock of longitudinal data sources (surveys and other data streams) on indicators of public engagement with science, including literacy, attitudes, interest, perceptions, mobilisation and other engagement indicators; to present evidence of changes over time in public engagement with science; to discuss the strengths and weaknesses of existing sets of indicators in serving as 'cultural indicators' in a global comparison; and to present new concepts and avenues for the construction of such indicators, including alternative data streams. Results may provide information to governments, national institutions and organisations involved in shaping science policy and creating programmes of public engagement.
- **Royal Society Workshop 5/6 November 2007. International Indicators of Science and the Public, Technical Summary of the Proceedings. Bauer, M.W., Shukla, R. & Allum, N. Available at: http://alturl.com/rr3yj.** This document is a technical summary of the proceedings that took place during the aforementioned November 2007 Royal Society workshop (see above for more details). It makes reference to some specific discussions that took place among the various participants during the workshop and it suggests several topics that may deserve specific focus in the future within the larger agenda of mapping the societal conversation about science.

GROUP 3. SCIP's effects on visitors

- **Anderson,D., Piscitelli, B., Weier, K., Everett, M. & Tayler, C.*(2002.)* Children's Museum Experiences: Identifying Powerful Mediators of Learning. *Curator, 45,* 213-231.** This article reports on a study of young children and the nature of their learning through museum experiences. This study was part of a larger, multi-faceted investigation of young children's interactive and informal learning in museums undertaken by the QUT Museums Collaborative (QUTMC)), a three-year research project funded by the Australian Research Council, museum partners, and the Queensland University of Technology (QUT). The study investigated learning in four different museum environments (a natural and social history museum, an art gallery, a science centre, and a hybrid art-social history museum), as seen through the eyes of four to seven year old children. At the conclusion of a ten week multi-visit museum program, interviews were conducted with children to probe the saliency of their experiences, and the ways in which they came to understand the museums they visited. The study suggests means by which museum educators can integrate and mediate child-based socio-cultural strategies into their programs for young children.

- **Alfonso, S.A. & Gilbert, J.K. (2007). Educational value of different types of exhibits in an interactive science and technology centre. *Wiley InterScience 91,* 968-987 DOI 10.1002/sce.20220.** Prior research has shown that improving learning in science and technology centres requires knowing not only what people learn but also how they learn it therefore the purpose of the study was to document how the design of an exhibit affects visitors´ understanding of its target. Particularly: What short-term understanding resulted when different subtypes of interactive exhibits were used (i.e., "exemplars of phenomena" and "analogy based")? What factors affected that understanding? How did visitors evaluate the exhibits that they used? The research took place at the "Pavilhão do Conhecimento" (Pavilion of Knowledge), in Lisbon, Portugal. Visitors (either alone or in groups) were observed during their interaction with selected exhibits and interviewed immediately afterwards to determine what type of learning took place after exposure to different exhibits. Results of the study may provide useful information to exhibit designers interested in considering factors that may affect the educative value of their exhibits.

- **Neresini F., Dimopoulos K., Kallfass M., and Peters, H.P. (2009). Exploring a Black Box: Cross-National Study of Visit Effects on Visitors to Large Physics Research Centres in Europe. Science Communication. 30 (4):506-533. DOI: 10.1177/1075547009332650.** This article addresses the problem of understanding the effects of public visits to large physics research laboratories. Results from a cross-national quantitative study of 3,301 visitors to four large physics research centres in Europe focus on short-term learning and motivational effects. The authors collected data from these visitors before and after visiting the centres as part of a research project funded by the European Union. This project, INside the Big Black Box (IN3B), aimed to perform a systematic analysis of core aspects of visit programs/ ¨open day¨ initiatives by empirically analyzing and comparing visit data from national and international physics research centres in four European countries: DESY, Hamburg, Germany; DEMOKRITOS, Athens, Greece; LNGS, National Laboratory of Gran Sasso, L'Aquila, Italy; and CERN, Geneva, Switzerland/France. This study drew on the aforementioned research to address visitors' knowledge, image, and attitudes of the research centres prior to and after having visiting them. Additionally, it also looked at whether these visits motivated scientific vocation.

- **Stevenson, J. (1991). The long-term impact of interactive exhibits. *International Journal of Science Education, 13, (*5), 521-531.** This study (supported by the London Science Museum and the Commonwealth Institute) investigated the outcomes of a museum visit by conducting a long-term study of visitors. The investigator used on-site questionnaires, written questionnaires and a final interview to explore visitors´ memories about their museum visit. The study focuses on the Launch Pad gallery which is part of interactive science centre in London's Science Museum. The main aim of the study was to determine whether Launch Pad had a clear effect on its visitors during their visit and if it had any lasting effects or produced memorable experiences for them.

- **Anderson, D. (2003). Visitors' Long-term Memories of World Expositions. *Curator: The museum Journal, 46(4),*401-420 DOI: 10.1111/j.2151-6952.2003.tb00106.x.** This study (funded by the University of British Columbia) investigated the nature and character of visitors' long-term memories associated with their experiences at large-scale exhibitions. The study focused on visitors' memories of two global exhibitions: World Expo 86, hosted in Vancouver, Canada in 1986; and World Expo 88, hosted in Brisbane, Australia in 1988.The long-term memories of visitors who attended either Expo 86 or Expo 88, were probed through in-depth face-to-face interviews. The key objectives of the study were to: broaden current understandings of the extent of visitors' long-term memories associated with these kinds of large-scale exhibitions, provide insights about the themes and character of the memories visitors hold of these events, and provide insights that could be useful for museum staff and exhibition developers to reflect on as they consider their current and future exhibitions.

- **Rowe, G., Horlick-Jones, T., Walls, J., & Nick, P. (2005). Difficulties in evaluating public engagement initiatives: reflections on an evaluation of the UK initiatives: reflections on an evaluation of the UK GM Nation? Public debate about transgenic crops *Public Understanding of Science, 14,* 331–352.** This study aims to highlight some of the problems likely to be encountered when evaluating a public engagement activity. It treats difficulties encountered

during the evaluation of the GM Nation? Public debate on the possible commercialization of transgenic crops, which took place in Britain in 2003. It focuses on difficulties involved with valid and reliable data collection through observations and participant questionnaires at such an event. The difficulties encountered are concerned with both theoretical/normative (how one should evaluate) and practical (how one does evaluate) issues. The study suggests a number of possible solutions to these evaluation difficulties. Work reported in this paper was partly supported by the Programme on Understanding Risk funded by the Leverhulme Trust and partly supported through two grants from the Economic and Social Research Council including one from the Science in Society program.

- **Rowe, G., Horlick-Jones, T., Walls, J., Poortinga, W., & Pidgeon, N.F. (2008). Analysis of a normative framework for evaluating public engagement exercises: reliability, validity and limitations. *Public Understanding of Science, 17,* 419-441.** In this study (supported by the Programme on Understanding Risk and the Leverhulme Trust), one normative framework for evaluating engagement processes is considered. The data used in this paper are drawn from an evaluation of the *GM Nation?* Public debate, a major government-sponsored public engagement exercise that took place in the UK in 2003. One of its main objectives was to gather information about public views on genetically modified (GM) food and crops in order to inform UK government decision-making regarding the potential future commercialization of the technology. The present study focused on one component of the *GM Nation?* Public debate: a series of six major open meetings. Participants were broken up into a large number of smaller groups, engaged in discussion, and finally participant moderators of the different groups presented their own summaries to the group at large. Participants then completed the organizers' feedback questionnaire regarding views on GM foods and crops, as well as other questionnaires used in this study. A multi-method approach using qualitative and quantitative methods was adopted for the evaluation. This involved the use of participant questionnaires, structured observation, ethnographic techniques, in-depth interviews (with Steering Board members and other key stakeholders), media and document analysis, and a major survey of public opinion. The study does not aim to exhaustively cover all appropriate criteria by which engagement exercises ought to be evaluated but instead, it gives suggestions on how to improve the framework.

- **Powell, M. C., & Colin, M. (2008). Meaningful Citizen Engagement in Science and Technology: What Would it Really Take? *Science Communication, 30,* 126-136.** This article argues a need for academics and governments attempting to "engage in engagement" to be clear about their goals and desired outcomes, and to consider whether or not the processes they facilitate are likely to meet these ends. Specifically: what are the goals—explicit and implicit—of institutionally sponsored projects that aim to engage lay citizens in science and technology? Are those exercises likely to meet their goals? What kinds of processes could nurture more meaningful engagement, what are the barriers to this kind of engagement, and how might these barriers be overcome? Based on the authors´ experiences at a nanotechnology conference that included a "public forum", this article explores these questions and provides recommendations for more meaningful engagement of citizens.

- **Davies, S., McCallie, E., Simonsson, E., Lehr, J.L., & Duensing, S. (2009). Discussing dialogue: perspectives on the value of science dialogue events that do not inform policy. *Public Understanding of Science, 18,* 338-353.** This analysis aims to look at ¨dialogue events¨ that do not inform policy. The purpose of this is to display several perspectives on the value of non-policy dialogue on science as sites of individual or small-scale learning, rather than institutional learning through social processes. It also aims to open up a discussion about these non policy-informing events by arguing that there are further ways to understand and frame them. The analysis draws on different literatures and seeks to make use of specialists´ expertise within its discussion, in order to display these perspectives. The material used is based partially upon work supported by the National Science Foundation under a grant to the Centre for Informal Learning and Schools and its primary focus is based on literature regarding dialogue events at the London Science Museum's Dana Centre that were not documented for the purposes of informing policy.

- **Entradas, M., Miller, S., Peters, H.P. (2011). Preaching to the converted? An analysis of the UK public for space exploration. Public Understanding of Science, OnlineFirst, published on July 26, 2011, as doi:10.1177/0963662511411255.** This article presents the results of a survey carried out at two space outreach events in the UK aimed at characterising "the public for space exploration" and measuring public support for space exploration. Attitude towards space exploration and policy preferences were used as measures of public support. The sample involved 744 respondents and was mainly composed of adults between 25 and 45 years old, with men slightly over-represented compared with women. Findings revealed that males appeared to be stronger supporters than females – men had a more positive attitude towards space exploration and stronger space policy preferences. Because mixed groups tend to come together to such events we argue that male respondents would be more likely to be part of the "attentive" and "interested" public who come to outreach activities and bring a less interested public with them.

GROUP 4. SCIP's effects on other actors

- **Groff, A., Lockhart, D., Ogden, J., & Dickering, L.D. (2009). An exploratory investigation of the effect of working in an environmentally themed facility on the conservation-related knowledge, attitudes and behavior of staff. *Environmental Education Research, 11,* 371 — 387.** A two-part exploratory qualitative study was conducted to investigate the impact of working at Disney's Animal Kingdom on staff knowledge, attitudes, and behaviour related to animals and their conservation. The study was carried out by contacting the current staff of DAK (Disney´s Animal Kingdom) to gain a broad conceptual understanding of the nature and magnitude of potential impacts, as well as to highlight indicators that might be useful when attempting to experimentally investigate impact. The focus of the study was: does working in an environmentally themed facility such as DAK positively influence the conservation-related knowledge, attitudes and behaviour of staff? It also wanted to investigate staff's prior understanding, interests, attitudes, concerns and actions regarding wildlife and wild places, and how working at Disney's Animal Kingdom seems to influence them, explore what aspects of the job experience, training, and immersion appear to contribute to the observed impacts. The study also aims to provide useful information to DAK leaders, as well as to other free-choice learning institutions and organizations interested in exploring such questions.
- **Neresini, F. & Bucchi, M. (2010). Which indicators for the new public engagement activities? An exploratory study of European research institutions. *Public Understanding of Science, 20, (1)* 64-79.** This study focuses on the involvement of research institutions in public engagement and on defining appropriate indicators and standards in this area, particularly at the organizational level. The issues the study focuses on are: how can one recognize whether an institution makes its results and activities available to non-specialists in an accessible and transparent fashion? And, how can one assess the extent to which a research body is actually paying attention to its relationship with the public? An exploratory study at the European level was carried out on a sample of research institutions to address these and related issues; in particular, with regard to the question of whether the diffusion of public engagement activities has actually given rise to transformations in research institutions at the organizational level, incorporating the public engagement perspective into "routine" institutional activities. Additionally, the study aims to provide robust indicators of public engagement which could be useful for research institutions, policy makers and funding agencies, as well as for citizens. From a survey (sent by email and answered by research institutions) and an analysis of the research institutions' web sites the paper proposed 12 and 9 indicators, respectively. From these indicators, the paper developed two index (Absolute Rankinga and Relative Ranking) to compare research institutions.
- **Martin W. B. & Jensen, P. (2011). The mobilization of scientists for public engagement. *Public Understanding of Science, 20*, 3-11.** This analysis looks at public engagement activities (PE)

from the angle of the mobilization of scientists. It focuses on the following main questions: to what extent are scientists involved in PE activities? What proportion of scientists is being mobilized in this manner? And the depth in which the scientists are involved in the PE activity, (e.g. identifying the proportion of scientists involved in PE activities). The present analysis particularly focuses on five papers that ask these and other questions in very different and international contexts for EU research institutions and a global survey of scientists in different fields and countries. All papers investigate the intensity and type of scientists' PE activities. The analysis presents nine hypotheses that are under investigation in the aim of opening the field for further research on the mobilization of scientists for public engagement.

- **Stekolschik, G., Draghi, C., Adaszko, D. & Gallardo, S. (2010). Does the public communication of science influence scientific vocation? A national survey. *The Public Understanding of Science, 19,(5),* 625-637.** The purpose of this work was to determine if public communication of science and technology (PCST) has any influence on people's decision to become dedicated to scientific research. With funding provided by by Secretaría de Extensión, Graduados y Bienestar de la Facultad de Ciencias Exactas y Naturales of the Universidad de Buenos Aires, a national survey involving researchers from all disciplines was conducted in Argentina. It focused on the factors that affect scientific vocation and the decision to go into scientific research. The analysis also looks at the role that different manifestations of PCST (science books, press articles, audiovisual material, and activities such as visits to science museums) play in awakening the vocation for science.

GROUP 5. SCIP's local, economical effects and policies

- **Hagendijk, R. & Irwin, A. (2006). Public deliberation and governance: Engaging with science and technology in contemporary Europe. *Minerva, 44,* 167-184.** This paper draws upon case studies developed during the STAGE ('Science, Technology and Governance in Europe') project, sponsored by the European Commission. Qualitative case studies and country syntheses were prepared by a team of academic researchers, working across eight member states, drawing upon a broad range of expertise in the social sciences. Workshops and conferences were organized in the various countries studied to discuss local developments and the research being conducted. The case studies focused on three main areas: information and communication technologies, biotechnology, and the environment. Drawing on these studies, this analysis suggests a number of conclusions about the current ways in which the governance of science is undertaken in Europe, and the character and outcome of recent initiatives in deliberative governance. This paper does not attempt to synthesize the whole STAGE project, but instead highlights some key dimensions of the final report. A final report on this analysis was submitted to the European Commission, and the results were disseminated at a special Brussels workshop.
- **De Semir, V., Cáceres, J., and Coll, S. (2008). ESCITY, Europe Science and the City: Promoting Scientific Culture at local level. Available at: http://alturl.com/4y3bu.** This review is an analysis of science culture activities carried out in various EU countries, it was elaborated in the framework of ESCITY, a European project aimed to build a network of cities of scientific culture. The selected experiences were analysed because they were considered to provide an insight as to how to promote science culture at a local level. Information for each case is organised in a way that aims to make data useful for policy makers, focussing on practical matters and outlining the features of the specific contexts in which those experiences were developed. Besides the use of case studies, this guide includes a set of recommendations taken from the examples analysed, and aims to give tools and orientation to local and regional government to develop science policies to attract the general public's attention to science issues.

- **Gonçalves, M.E., and Castro, P. (2009). Local is beautiful? Governing science-society relations in Europe *Portuguese Journal of Social Science, 8,* 191-207.** The authors of this paper maintain that the EU has stated strategies to improve its legitimacy through the democratic implication of citizens in the knowledge society. Their study aims to answer the following questions with regards to this: to what extent are current EU and member states' policies translating these ambitions into practice? How significant has the shift been from the conception of science as objective knowledge to the conception of science as an open-ended process of research? And how far has the move from pedagogical to dialogical methods of producing and popularising science and technology gone? This paper provides a comparative review of policies in the field of the public understanding of science (PUS) in six EU member states, based on the results of OPUS (Optimising the Public Understanding of Science), a European-funded research project.

- **Mejlgaard, N. & Stares, S. (2010). Participation and competence as joint components in a cross-national analysis of scientific citizenship. *Public Understanding of Science, 19, (5*) 545-561**. As a step in towards the ¨democratic¨ turn towards active citizen participation in science in technology, this study uses latent class models to develop cross-national measures of competence and participation, and explore the relation between the two. The study suggests that the idea of a 'scientific citizenship' could be a useful integrative notion to bridge the divide between concerns about public participation and public competence. The study explores the empirical relationship between citizen competence and citizen participation, based on the most recent survey data on Europeans, Science and Technology.

- **Falk, J.H. & Needleham, M.D. (2011). Measuring the Impact of a Science Centre on Its Community. *Journal of Research in Science Teaching., 48,* 1-12.** This study (supported by the Noyce Foundation and California Science Centre) examined the impact of a single Science Centre (the California Science Centre) on science learning. It focused on two questions. First, who in Los Angeles (L.A.) has visited the California Science Centre and what factors best describe those who have and those who have not visited? Second, does visiting the California Science Centre impact public science understanding, attitudes, and behaviours and if so, in what ways? Longitudinal data were collected across multiple years through the use of random telephone surveys of L.A. county samples drawn from diverse communities. The research described in this article builds on two previous studies: a 1996 qualitative investigation conducted in shopping malls, libraries, and parks throughout greater L.A. and a 1997 telephone survey in greater L.A.

- **Groves, L. (2005). Assessing the Economic Impact of Science Centres on Their Local Communities. *Questacon-The National Science and Technology Foundation*. Available at: http://alturl.com/zsxx4.** This study focuses on the economic impacts of science centres on their local communities. It is the second phase of an international study funded by the Association of Science-Technology Centres (ASTC) and thirteen individual science centres. Part of this report introduces the topic of economic impact by including definitions of key terms, discussion of how economic impacts can be calculated—including a step-by-step guide to planning and carrying out an economic impact study—and a number of illustrative case studies. Another part of the report is devoted to presenting and analysing survey-based data from science centres and other institutions about their revenue and expenditure, their employees and their visitors. The project was guided by a steering committee consisting of the ASTC President and the executive directors of four of the regional network organisations: ASPAC, ASTC, ECSITE and Red-POP.