***Executive Summary***

PIER is a project aiming to engage the public on the Responsible Research and Innovation in society. The project has developed an exhibition through several participatory activities to involve stakeholders, researchers, politicians and the large public on the concrete achievements of the European Marine Scientific Research and Innovation today, enhancing the responsible approach in the implementation of research and highlighting its implications for the local development and for the improvement of the quality of life of citizens. The exhibition included different means of communication and participation such as hands-on exhibits, prototypes and demonstrators, videos and multimedia products; it was supported by public programs, which will use dialogue formats in order to engage the public in the RRI dimensions of science and technology.

The exhibition will be addressed to and implemented with the active participation of representatives of societal actors of the Research and Innovation processes: researchers, businesses, media, educators, civil society organizations and policy-makers as well as citizens.

In order to attract better the interest of the public, the beneficiary proposed to focus the exhibition on Marine Research which is a relevant theme for citizens of the Neapolitan region, as the Mediterranean Sea is a prior element of the natural environment to preserve and a source for the economic development. The topics tackled in ocean research are part of the key priorities of Horizon 2020 tackling societal challenges and citizens' concerns today in the European Research agenda.

The involvement of the public and experts was very intense since the early stages of the project, with workshops and focus groups, and helped us to outline the exhibition topics then divided in 6 thematic islands (Fishery and Aquaculture, Biodiversity, Energy from the Sea, Preventing Disasters, New Materials from the Sea, Safe Maritime Transportations) where visitors could learn about Responsible Research and Innovation and about the most innovative Marine Research projects.

Visitors' experience is enhanced by a multimedia application for mobile devices, downloadable at the entrance of the exhibition, that leads them along the way and encourages their engagement in the 6 topics. At the end of the exhibition visitors can create their own digital diary to be shared on social networks. So they can have fun while expressing their opinion on the research of tomorrow!

The exhibition has been opened during the Italian European Semester 2014 in November in order to give a greater relevance to the project by involving representatives and policy makers at the highest level, and to enhance the European dimension of the event and to reinforce its visibility.

## The project context: the new panorama for Research and innovation in Europe

The economic context has dramatically changed in Europe in these past years. A recession triggered by the 2008 financial crisis led to the adoption of stimulus packages to kick-start the economy. While slowly recovering from the downturn, Europe is now facing a public debt crisis and fears of a new recession. The key challenge is to stabilize the financial and economic system in the short term while also taking measures to create the economic opportunities of tomorrow.

Smart investment, notably in research and innovation, is vital in order to maintain high standards of living while dealing with pressing societal challenges such as climate change, an ageing population, or the move towards a more resource-efficient society.

The EU is renovating its research policy with a new vision for research and innovation responding to the dramatically changed economic environment. Research and innovation have therefore been placed at the centre of the Europe 2020 strategy to promote smart, sustainable and inclusive growth. It will also help to bridge the gap between research and the market by helping innovative enterprises develop their scientific and technological breakthroughs into viable products and services with real commercial potential. Within this policy context, the Commission's proposals for the post-2013 Union Budget reflect its ambition to invest in Europe's future, ensuring that every euro provides maximum benefit to European citizens.

Not by chance the priorities identified in Horizon 2020 by the European Union to address societal challenges shared by citizens in Europe and elsewhere are the following:

- Health, demographic change and wellbeing;
- Food security, sustainable agriculture, marine and maritime research and the bio-economy;
- Secure, clean and efficient energy;
- Smart, green and integrated transport;
- Climate action, resource efficiency and raw materials;
- Inclusive, innovative and secure societies.

## The project objectives: involving people on RRI

Therefore the subject of the PIER project, **Marine Responsible Research and Innovation,** identified as a relevant topic for Neapolitans citizens, will address some of these above priorities:

- use and overexploitation of marine resources;
- management of the coast and public leisure: beaches, tourism, fishing;
- safer maritime transportation;
- pollution of the previous industrial areas;
- new materials sea-friendly;
- individual responsible behaviours and engagement of citizens into research processes and public deliberation;

The new European research program will better integrate the connection between the scientific community and the society at large. This is the new framework of the **Responsible Research and**

**Innovation** (RRI) where societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes, with the values, needs and expectation of the European society. The challenge is the creation of a Research and Innovation policy driven by the needs of society and engaging all societal actors through inclusive participatory approaches. RRI has become a field of experimentation and innovation exploring six keys: **societal engagement, gender equality, science education, open access, ethics and governance**.

These **six key dimensions of the RRI** are integrated both in the "Sea Horizon" exhibition contents than in its process of development. They were highlighted when we presented research processes and results to the public and asked them to question themselves on the responsible dimension of research and innovation. Specific participatory practices (focus groups and scenario workshops) were used during the project in order to better integrate the dimensions of the RRI by involving experts and social actors in the development of the exhibition. We can summarise them for each of the key dimension as follow:

- the **engagement** of societal actors involved in Research and Development (researchers, civil society, industry and policy-makers), for the definition of the exhibition contents in the design of the contents of the exhibition. Moreover 7 characters will be interviewed and their opinions will be shown in the exhibition so that visitors can confront with them. ;
- the **gender dimension** was addressed by including a significant participation of women in the working groups (in reference to the efforts requested by the EC to achieve 40% of women representation in staff, committees and focus groups), and by presenting to the public the work of women scientists involved in research projects, enhancing the consequences for the improvement of the scientific quality and for the societal relevance of the produced knowledge, technology and innovation. Moreover the opinions of men and women stakeholders will occur through all the exhibitions.
- the science **education**, is an integral part of the project, because a large part of the public are represented by school groups. A specific workshop will be organized with teachers in order to integrate the RRI dimension in activities with schools. The objective is to improve the quality of formal and informal educational programs by encouraging teachers to move their teaching activities with students from the understanding of scientific phenomena to the cross fertilisation among disciplines and the questioning on responsible aspects of science, to develop a better scientific citizenship.
- the **ethical dimension**, which may relate to specific aspects such as responsibility towards the environment that surrounds us, of our fellow humans and animal species; all the projects displayed in the exhibition will be evaluated by their ethical dimension
- an **open access** to results and scientific publications on current research at the EU level are available both on the project website and on the mobile application that visitors can download here;
- the **governance**, including exhibition elements and events that invite visitors to say their opinion on specific issues, discussions, perspectives of urban development / regional but also national and supranational levels. Visitors opinions were collected through questionnaires, interviews and comments that visitors left in the exhibition

The specific topic of Marine Research has been chosen in order to better engage the public in the exhibition. To this effect the public will be involved in relevant questions related to responsible aspects of the Marine research: for instance how much personal behaviours can affect marine ecosystems, in terms of food selection, of waste disposal, on tourism activities, but also what people can do to improve the health

of the Ocean, how people can have their say on researches and policies related to the seas, how personal engagement can be strengthened, and how to get access to reliable scientific information and facts.

The project has developed an exhibition with a **participatory programme** to engage the large public on the concrete achievements of the European Scientific Research and Innovation today, enhancing the **responsible approach** and highlighting its implications for the territorial development and for the quality of life of citizens. The exhibition included **different means of communication** and participation such as hands-on exhibits, prototypes and demonstrators, videos and multimedia products; it will be supported by public programs, which will use **dialogue formats** in order to engage the public in the RRI dimensions of science and technology.

The exhibition is addressed to and implemented with representatives of **societal actors** of the Research and Innovation process of implementation: researchers, businesses, media, educators, civil society organizations and policy-makers as well as citizens, who will be involved in different times and formats during the project.

MAIN SCIENTIFIC RESULTS

The **main purpose** of the PIER project was the development of an interactive and innovative **exhibition on Marine Research,** named **"Sea Horizon",** to involve in a stimulating way the large public on the **Responsible Research and Innovation approach**, one of the core concepts linked to Horizon 2020.

In order to discuss the content of the exhibition, **a survey on the European funded researches** in the field of marine and ocean issues was firstly conducted between January and March 2014. Summaries and information regarding the projects funded under the 7th framework program were collected. A first list of projects was chosen following criteria: relevant with the RRI issues, carried out in the Mediterranean basin, attractive for our visitors and which could be easily displayed through hands on exhibits.

Projects were clustered in 5 categories (Communication, Environment, New technologies, Health, Fishery and Aquaculture) in order to simplify the experts' analysis, even if some projects overlap two or more categories.

Participation process to the development of the exhibition

The project promoted later an **innovative exhibition design process**, involving representatives of **societal actors** in different times of the project and formats of participation for the analysis of these projects and the definition of contents. In particular, the milestones of the participatory process for the conception and the design of the exhibition were represented by: the **European Expert Workshop** with experts in RRI, the **3 Focus Groups,** the **intermediate Scientific Advisory Board Meeting** and the Workshop with **school teachers of science subjects and facilitators.**

Once that a first selection of the current Ocean researches has been done and that the experts gave first indications on the exhibition topics three focus groups have been organised at the local level with stakeholders (institutions, fishermen, companies, associations and NGOs and citizens) directly involved in the marine related issues.

The aim of these focus groups was to get feedbacks and reactions from different actors – through participative methodologies – on the topics/researches selected, in order to collect the diverse, sometime diverging points of views of these stakeholders and integrate them in the exhibition.

These focus groups were held between Mid-April and Mid-May 2014 and involved three different categories of stakeholders, specifically:

- Focus Group I was targeted Citizens and NGOs (9 participants)
- Focus Group II was targeted Marine resources managers (12 participants)
- Focus Group III was targeted Institutions (9 participants)

In terms of methodology, each focus group was composed of three phases:

(1) First Phase - Individual engagement with the aim to understand what every participants is willing to do for the sea;
(2) Second Phase – Research in order to find, according to the participants, the most important problems related to the sea and to identify which priorities research should devote.
(3) Third Phase – Exhibition where participants were asked to imagine suggestions for an attracting exhibition on marine research.

The answers were particularly interesting, especially for the first two groups (citizens - NGOs and fishermen/restaurant managers). Specifically the first group underlined the need of increasing

personal engagement in preserving ocean habitats. In the third group, representative of institutions, participants told about their efforts in the control of habitats and preservation of traditions and small commercial activities.

As concerns to Research, the discussion was driven around the questions : How to participate to research? Which are priorities for research?

Answers of the three groups show how poor are the actions related to the control and protection of marine environment and marine related activities. Often research is confused with policy and funding, generating doubts about what research actually can do. The first two groups have often underlined how Institutions do not coordinate themselves in their actions, and this, together with the excessive impact of bureaucracy, creates delays and wasting of time and funds. Often lack of controls are seen as a primary reason for the emerging of bad practices. Bureaucracy is specially seen like a serious problem for managers and fishermen – who suffer from legal limitation in their business.

In no way participants realized that research could be important for approaching problems of the seas. They don't feel research can have an impact on the care, management and use of marine resources. It is also underlined that the trust in institutions and policy in general is quite low.

Research appears to be a "side" approach concerning the needs of the oceans – more important seem to be the control and management of marine resources and the improvement of level of education in citizens and stakeholders.

Finally participants of all three focus groups discussed: How to participate to research and which are priorities for research.

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This methodological approach has brought to a complete and integrated layout of the exhibition that respond to the three main goals of the project:

- to highlight and make visible and significant the RRI key dimensions of marine research
- to highlight the more significant examples from the European research and innovation projects in the exhibition;
- to have citizens' and stakeholders' express

In preparation of the First Exhibition Layout some important points were considered:

- there is a clear relationship between the different competencies of stakeholders (fishermen, companies, scientists, communities)
- multidisciplinarity is key when considering stakeholder involvement
- respect for the environment and attention to what we will leave our children will be one of the key elements of the exhibition
- there is a necessity to merge different interests and points of view to ensure that they are properly represented and showcased in the exhibition

Exhibition development and layout

The outcomes of the participatory process were presented in the intermediate Scientific Advisory Board held on 6th of June 2014, in Naples where the general workplan and the concept of the exhibition were discussed and approved. It was agreed to divide the exhibition into six thematic island, plus the introduction and feedback module, In particular the six topic selected for the exhibition were: 1) *Responsible Fishery and Aquaculture*; 2) *Prevention and Mitigation of Natural manmade catastrophes*; 3) *Habitats and Biodiversity*; 4) *Clean Energy from the seas*; 5) *New materials coming from marine organisms*; 6) *Safe sea transports for people and goods.*
Each of the six thematic "islands" will have several tools available to introduce research to visitors: hands on exhibits, some dialogue issues (in terms of opinions of seven different stakeholders included in our exhibition characters), information on the research projects, some prototypes or real objects that these projects realized, and the reference tags for the mobile app in order to collect visitors' opinions and point of views on the different RRI issues.

A tentative will be done to raise the RRI aspects in all items of the exhibition:

- the engagement of societal actors in the development of the contents: interviews, results from the projects, outcomes from the focus groups;
- the gender dimension not only by the usual quota but also looking at benefits of female engagement;
- the science education (through interactive hands-on exhibits)
- the ethical dimension as our responsibility towards the environment;
- the open access on current EU research: with examples of research projects and citizens' science;
- the governance, as visitors can leave their opinion.

In order to emphasize the six issues of RRI, two specific tools have been adopted in the development of the exhibition: a) a mobile app to be run by visitors during the visit; and b) a group of characters as reference for visitors.

These two tools aims to encourage visitors to question themselves during the visit of the exhibition about the six aspects of the RRI and to stimulate them to give their opinion and contribution to the topics tackled in marine research.

a) The first one being a mobile app, downloadable to visitors' smart phones at the entrance of the exhibition, that will establish a continuous dialogue with visitors asking questions and making visitors reflect how many RRI issues are included into the research exposed. They start by selecting an avatar more similar to them; then in each island, visitors will answer to some

questions that will appear on their mobile device as augmented reality (AR) when they point their smart phone on a picture or a text. If they reply to the questions, the answers will be automatically embodied into their own travel diary (for which they chose the graphic and the colour) so to get a feedback in every island. In this way the app is able to register visitors comments and to page them into a sort of travel diary that represents an ideal resume of their thoughts and impression regarding the exhibition topics and the RRI Issues raised by the texts, the video, the exhibits. At the end of the exhibition (in the Feedback Island) visitors can upload their diary and they will see the diary published on a screen. It will not be only a general feedback to the whole exhibition, but also a way to extend the visit beyond its physical boundaries. The travel diary can be in fact uploaded on social media and sent to friends and relatives.

b) The second tool is shaped in form of a group of visitors of seven "heroes" which is , conceived to make people reflect on marine research and RRI related issues. These seven characters – taken from real life – and stakeholders who will comment the topics in each islands and will encourage visitors to make their own opinion by confronting theirs with the characters' ones. These characters, as previously said, are based on real people who have been interviewed and filmed during the development of the exhibition. Frame of these interviews will be selected and can be heard through the mobile app, while the text panels will host just a synthesis of the characters' thoughts.

The 7 characters are:

- a 12 y.o. boy, curious and confident in science;
- a 16-17 y.o. teenager, she is positive through science and technology looking at a possible future science career.
- a 40-50 y.o. pragmatic not Italian business man, who thinks that rather to science we should care about doing things to save marine resources,
- a coast guard officer, female, who trust in science but need tools to intervene in the difficult situations she faces with and that research is maybe too slow to produce such tools;
- a fisherman, a curious person who tries to find answers between science and his empirical background. He's often skeptical, but able to change his mind.
- There are two more characters travelling in addition to these five ones, the commander and a female researcher. They are the pilots and storytellers, introducing and explaining the different aspects of the researches that the 5 heroes meet. All these persons are based and live in Naples, since we want to emphasize the local sea problems and opportunities, and they voluntarily accepted to be involved into the project.

The exhibition SEA HORIZON is structured in the eight different sections, including sis thematic islands:

- INTRODUCTION AREA

  In this section RRI are presented to visitors through practical examples and information given by videos and informative panels. The seven characters are introduced and information about the app are given. In addition, Mutual Mobilization Projects are presented through videos and scientific articles.

  The 3 Mutual Mobilization Projects (Marlisco, Sea for Society, GAP2) are introduced here in the multimedia support.

  RRI aspects: The aim of this section, beyond the instructions on how to visit the exhibition, is to show concrete examples of participation of public into research projects (the three MML projects foresee different moments of public engagement) and engagement of all actors in the processes of consultation and deliberation

- ISLAND 1: Responsible fishery and aquaculture

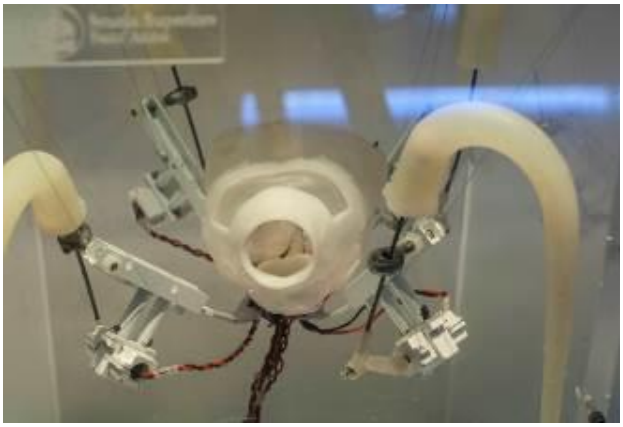
  This section is focused on responsible fishery. Videos and comments from the 7 characters give visitors an overview of the state of the art of fishery today. Main exhibits of this section are represented by the bioreactor for artificial algae production and the Digital Globe to show marine phenomena on a global scale (i.e. currents, storms, fishing routes, ocean satellite images). Furthermore, samples of food and cosmetics made from algae are provided.

  *RRI aspects: the aim of this island is to underline that research can help marine ecosystem to survive to overexploitation of resources and to show some concrete examples of gender oriented researches.*

- ISLAND 2: Prevention and mitigation of natural and manmade catastrophes

  The aim of this section is to present to visitors the disaster connected to the sea. An interactive exhibit is set to show a sonar simulation. Other exhibits are represented by an ant colony, reproducing ants social behaviour, and a robot device called Poseidron, based on bio-robotics research.

  *RRI aspects: The aim of this island is to make some innovative researches available for everyone and to talk about one of the most common fears that people have regarding technologies, i.e. the self organization of robots that escape from human control.*



- ISLAND 3: Clean energy from the seas

  This section introduces clean energy production from marine resources. An interactive exhibit shows how sea waves can produce energy. A model of Naples' bay seawall shows energy production from waves. In addition, two lab corners illustrate the process of Hydrogen generation from bacteria and the production of biofules from Diatomee cultivations.

  *RRI aspects: The aim of this island will be not only show alternative ways of getting energy, but also pose some questions to the visitors about possible side effect from tomorrow – are these clean energies really clean? Which are the new threats for environment (seabirds above all, in the case of wind-farms) but also the discharge of waste materials coming from the production of algae and bacteria.*

- ISLAND 4: Habitats and biodiversity

  In this section are set a microscope for the observation of different plankton species and models of different species of jellyfishes. In addition, it is set a robot device simulating an octopus, as a result of bio-robotics research.

  *RRI aspects: The aim of this island is to underline the role of citizens – both negative and positive – towards the environment. Important is the link to 2 examples of citizens science, where visitors can play the researcher's part and measure effectives data and phenomena to be passed to the scientific community. The idea is to show that research is not a closed field, but that can open to citizens and take advantage of the massive participation. Also the materials available from the European projects (games and educational activities for kids) will show how important is science education from the very first stages of school*



- ISLAND 5: New materials from marine organisms

  This section is focused on the recycle of marine waste to make innovative materials. Exhibits show: a robotic octopus arm for its behavior simulation, an Alginate pellets generator and examples of materials made by kitosan, mussels shells and algae.

  *RRI aspects: The aim of this island is to show those researches that can be ethical to environment – recycling waste materials and how different discipline can cooperate to obtain a multidisciplinary result. Also the concept of respect for the materials used in the research and production phases will be noted here. Education activities for students will be made available in this island.*

- ISLAND 6: Safe sea transports for people and goods

  The aim of this island is to present to visitors future marine transportation topics. The main exhibits set are: a model of a Light Autonomous Underwater Vehicle (LAUV), a model showing the system to detect undersea obstacles through drones and a system of modems explaining the internet of marine things. A video shows an interview to a female coastguard.


- FEEDBACK AREA

  In the last island, next to the exhibition exit, visitors through a touch screen can upload and share the diary of their visit. It's possible as well to see other visitors diaries profiles.

The communication and promotion activities related to "Sea Horizon" exhibition played a strategic role to capture people attention about the exhibition and the other related activities and public programs, but also to inform people about the re-opening of the science centre after the criminal fire. The communication plan adopted, was based on a **multi-purpose strategy** using different dissemination channels (i.e. web sites and social networks, mailing list, city advertising and printed material) in order to address different targets groups. **Press releases** were diffused to journalists about the exhibition scientific contents and the program of related events: newspapers and magazines, web magazines, TV and radio.

In order to **assess the effectiveness and the impact** on visitor of the "Sea Horizon" exhibition, evaluation tools were implemented. In the general framework of Responsible Research and Innovation process, this project activity enhances the strategic role of citizen participation. Two typologies of questionnaires were submitted to visitors in order to investigate their **opinions about scientific research in general and about the effectiveness of the exhibition**. The first questionnaire was explicitly oriented to investigate: the public engagement within the fields of

science and technology, the social perception of RRI aspects and the exhibition effectiveness. The second questionnaire was oriented to investigate visitors feedbacks and to collect comments from visitors specifically about marine scientific research; this questionnaire was available into two versions: a **paper version**, with open-ended answers, and a **digital version**, available on the smart-phone app dedicated to the exhibition with multiple-choice answers.
The results of the data analysis, pointed out with the support of **Social Studies experts,** were translated into **recommendations** that will be available for policy makers and scientist.

IMPACT

The main **project result** is represented by the exhibition "Sea Horizon", with its scientific contents. The exhibition was structured, according to the outcomes of the participatory process, into islands each of one is dedicated to a specific theme. The thematic islands of the exhibition are presented to visitors through questions in order to stimulate their interest and to create a better interaction. Moreover, an informative panel dedicated to each topic of the exhibition, introduces the opinions of the seven real characters which are virtually accompanying visitor along the exhibition.
The first island deals with **Responsible Fishery and Aquaculture** and aims to find an answer to the question: "Many seas or one single Ocean?". One of the exhibits is a bioreactor which represents a model reproducing the artificial process for algae biomass production. The main algae considered in this section is "Spirulina"; its nutritional power and potential uses in the food industry are illustrated. A spectacular interactive exhibit, the Digital Globe, shows to visitors interesting atmospheric and biologic phenomena.
The second island is related to the **prevention and mitigation of natural and manmade catastrophes** and is introduced to visitors by the following question: "The sea: a friend or enemy?". In this module examples of bio-inspired research are provided through a prototype of underwater robot (PoseiDrone) developed by the "Bio-robotic Institute – Scuola Superiore S. Anna". An interactive exhibit shows the operating principles of a sonar system, which is commonly used to study natural phenomena that generated tsunami and earthquakes.
The third island is focused on **renewable energies** coming from the sea clean "A sea of energies?" and aims to find an answer to the question: "A sea of energies?. A lab equipment, supported by a video product, shows hydrogen production from sea bacteria, a lab corner shows biofuel production from unicellular algae called Diatoms and a suggestive interactive exhibit shows to visitors the process for energy production from sea waves. In the forth island, dealing with **habitats and biodiversity**, the question is "The abyss: sterile environment or full of life?". Visitors can observe different marine species through the use of a microscope (i.e. shellfish, Diatoms etc.) and the first underwater robot, Octopus, developed by the "Bio-robotic Institute – Scuola Superiore S. Anna", is shown. The fifth thematic island shows to visitors **new materials and products** obtained from the recycling of marine resources and their uses through spectacular exhibits. These topic are introduced to visitors by the following question: "New products from the sea: are they safe?" The last island, "The marine traffic: safer or more chaotic?", is focused on the **new technologies in the field of maritime transport.** The latest results from the scientific research, connected to the "Internet of the Sea", are shown. In the introduction area of the exhibition visitors RRI approach is well explained to visitors through informative panels, video products and scientific articles, project reports and data. In the last module of the exhibition, visitors can upload their visit diary or deliver the paper questionnaires where they are asked to express their opinions.

A remarkable result of the project is represented by the **active participation of some prestigious research centres** (i.e "Bio-robotic Institute – Scuola Superiore S. Anna" of Pisa, Stazione Zoologica "Antonio Dohrn" of Naples, Istituto di Chimica Biomolecolare - CNR of Naples, Second University of Naples etc.) which provided prototypes, lab equipment etc.. These scientific institutions had the opportunity to share with the public the concrete results of their studies and experiments through the dissemination of real data. In this way they gained a good visibility. The active participation of a few young researchers providing **science demonstrations** in the exhibition was considered an efficient way to improve the communication between the science world and society. This aspect was appreciated especially by school teachers, for the message given to their students.

Another relevant outcome, achieving one of the initial objectives of the project, is represented by the definition and specification of **educational activities** addressed to students of different levels. These activities were defined on the basis of the experiences collected during the workshop with teachers and facilitators. The planned activities are related to some of the topics included into the exhibition, but also focus on the RRI issues. So for each scientific subjects are shown the possible implication on social, legal and ethical point of views, so that students can approach the RRI issues and see how research can suggest possible solutions. The topics selected for these educational activities were: New products coming from the recycling of marine resources; Tsunami and monitoring systems; The assessment of water bodies environmental quality; Renewable energies and environmental education. The beginning of all these activities will occur in March 2015, which is usually the period with major presence of school visits.

The development of the exhibition based on a **participatory methodology**, with the engagement of societal actors with different backgrounds (experts on key issues of RRI with national and international relevance, researchers working in Universities or in Research Centres, school teachers, students, science communicators, business people, civil society organizations, fisherman and policy makers), can be considered a significative **impact** of the project. The benefits coming from this methodology helped to increase the quality of the contents selected for the exhibition; furthermore, the engagement of stakeholders has also represented an opportunity to consolidate and to create future scientific collaborations with experts and other actors differently involved within the science centre activities (research institutes ect.).
Moreover, the most evident impact is represented by the high **number of visitors** to "Sea Horizon" exhibition and to all the activities connected to marine science scheduled by the science centre. The active participation of scientists, research groups and experts during the events, played a strategic role for science results dissemination, from RRI perspective. The **opening ceremony** included an interesting scientific talk show concerning the extraordinary engineering operation put in action for wrecks removal of the cruise ship Costa Concordia. Futuro Remoto presented a ten days intense program of activities such as conferences and debates with the participation of scientists, writers and artists, as well as the organisation of science labs and science performances, or the projection of movies and documentaries. Additional educational activities (i.e. science shows, scientific demonstrations) were promoted in the science centre program after the exhibition opening to the public, especially during the weekends. During the first months after the exhibition opening to the public (from October 31$^{st}$ to December 31$^{st}$, 2014), quantitative and qualitative data about the museum visitors were collected. The total number of visitors during the first two months after the exhibition opening to the public has reached about **30.600**. Visitors were clustered into two different categories: "school students" and "general public". The percentage repartition between school students and general public was respectively **44%** and **56%**.

Another relevant impact has been **that researchers and research institutes** consolidated their awareness about the importance and the potentialities of science museums for dissemination of research activities and results. In this sense, the project stimulated future cooperation between Città della Scienza and scientists. In particular, some of the involved institutes manifested their interest to implement specific research and educational activities related to the exhibition topics and exhibits. The **Digital Globe** interactive exhibit was appreciated by teachers, for educational purposes and by research institutes, which proposed some research developments to be implemented through this spectacular exhibit; the peculiarity of the Globe is represented by its flexibility to display other scientific representations considered relevant not only for exhibition purposes and future scientific research, but also for the global impact of the industrial activities that we do today.

**Notes from the Evaluation analysis**

The analysis of the data collected from the questionnaires submitted to people should take into account that the sample of visitors interviewed, having a medium-high cultural level, is surely more sensitive and has a positive attitude towards the scientific topics tackled in the exhibition and towards science in general. This is the typical "sample" of public visiting Città della Scienza, and more in general cultural institutions.

On the other hand, it's to underline that about 2/3 of this sample declared not to be sufficiently informed about science developments. This aspect enhances the importance and the mission of science centres and science museums to disseminate the most current aspects of the advancement of science to a public not highly specialized. In this sense, the biggest challenge of science centres is to involve the target groups which are less informed and less sensitive to scientific themes. In fact the exhibition "Sea Horizon" was a tentative to facilitate the exchange between the scientific community and the general public concerning research activities. It is important to underline that research institutes and researchers have actively participated within the exhibition development process, by preparing some exhibits or prototypes or by dialoguing with the public, especially during events of the the festival Futuro Remoto (30/10 to 9/11).

From the analysis of data concerning means and sources used by visitors to learn about science, the predominance of internet as a source of information emerges at the first position. Internet is effectively widely used today in all fields for its remarkable easy access and for the possibility to share data in real time, but it presents some risks related to the reliability of information: scientific contents are not always validated and certified by competent institutions and authorities. Science centres and museums, being also a significant source of information for citizens, can play an important role toward citizens not only to be better informed about the advancement of science, but also in being more critical in regards to all information diffused in internet.

The 97% of visitors shows a sufficient confidence in scientific research. This result can be attributed to the fact that scientist still have, in the general opinion, a strong recognition and are regarded as authoritative figures (more than policy makers), because of their high-level education and professionalism. This phenomena is amplified as the cultural level of the users becomes lower. In fact, people with an higher cultural background are in average more capable to highlight critical aspects connected to scientific research.

Data analysis shows that visitors have less confidence in technological innovation, in comparison to scientific research. One explanation for this may be the fact that the technology is perceived with more doubt about risks and benefits, until it is not concretely used by people. Some visitors believe that science is "dangerous"; this could be explained by the fact that technology is perceived as "unnatural", as a result of human actions that are not responsive to their natural context. A significant share of visitors sees Science as a discipline "elitist" and "difficult"; this may

reflect the widespread conception that science is not accessible to everyone and that for an exhaustive understanding of scientific topics it's necessary to be supported by competences and tools based on a high or post university education.
Analysing visitors opinions about the exhibition effectiveness, it emerges that the exhibition was considered very instructive and stimulating by more than 60% of visitors. This aspect reinforces the peculiarity of science museums of new generation which enable a learning based also on an emotional enrichment: science approaches to the public when from rational becomes emotional.

**Visitors Feedbacks And Comments**

Visitors observations about the exhibition tackled topics can be summarized as follows:
1. Most visitors underlined the importance of scientific research related to the sea. According to some visitors, the research should be focused on the preservation of marine ecosystems from overexploitation of sea resources. The main aspects proposed by visitors to protect marine species were related to the study of their "life cycles", through adequate monitoring systems, in order to calibrate the fishing operations. In general lines, all visitors highlighted that one of the first purposes of scientific research should be the respect for the environment.
2. The majority of visitors expressed a positive opinion on the role of scientific research to prevent natural marine catastrophes, underlining the importance of the implementing monitoring systems. The high attention of visitors towards natural disasters could be a consequence of the fact that most of them live in geographical areas with high levels of seismic risk.
3. Most visitors have a positive opinion about renewable energies coming from the sea, but they also expressed clearly that marine ecosystems equilibrium must be significantly preserved. A few visitors highlighted that the processes to obtain energy from the sea should respect marine biodiversity. However, the renewable energy topic registered some scepticism by visitors.
4. Visitors opinions related to the protection of marine biodiversity reveal some uncertainness. In fact, it seems that some visitors, despite their high level of education, do not feel sufficiently informed by the scientific community. Other visitors pointed out that a better interaction and dialogue amongst scientists and policy makers would be necessary. A few visitors proposed to increase the number of "marine protected areas".
5. Analysing the answers, it came out that the scientific research related to the sea should be addressed to the food industry and to the recycle of materials coming from the sea.
6. The importance of scientific research and technological innovation related to marine traffic has been pointed out. In particular, visitors attention is focused on the devices to improve traffic safety and security. Furthermore, some visitors proposed to regulate the traffic of cruise ships by the coast and especially inside the ports, to reduce pollution emissions. Also in this case, the high sensibility of visitors towards marine safety could also depend on recent disasters occurred in Mediterranean sea (i.e. Costa Concordia cruise ship, Norman Atlantic ferry).
Finally, in general lines, it is possible to conclude that almost all visitors are particularly confident in the role of scientific research, from different points of view. From this survey it emerges clearly that visitors are strongly involved in environmental sustainability topics. Some of them pointed out the necessity to dedicate more financial resources to research.

**Recommendations**

At the end of the project implementation and as a conclusion to this evaluation exercise, we would like to point out some recommendations on how to address RRI aspects in exhibitions and in science centres and science museums programs. These recommendations should consider the specificities of the local context where the project was implemented as enounced along the analysis of questionnaires in this Deliverable and looking at the visitors sample in Deliverable 5.2.
The "Sea Horizon" exhibition was conceived to stimulate visitors interaction and participation. Considering the positive feedbacks about the exhibition in terms of scientific contents and of the modalities used to transfer the scientific knowledge, it seems that the general project goal has been achieved. Even if visitors in average have a positive perception about science, the widespread conception that science is not accessible to everyone could represent a key aspect to work on, as well as some of the RRI aspects.
1. Channels of communication between science and society has evolved very quickly with internet in the recent years. In this respects science centers and science museums should respond to the new needs of citizens, not being only a place where understanding scientific phenomena but also giving them the tools to access to reliable sources and to have the capacity of selection and critics.
2. Explaining the concept and the issues of the RRI is not an easy task for museums and science centres, since they can sound as abstract topics to visitors. The solution to introduce them related to an exhibition on marine research provided to be successful, so, in similar circumstances, we suggest to show practical examples on how research can get closer to citizens if the RRI aspects are taken into account.
3. The exhibition development process of Sea Horizon in PIER was a wonderful exercise of participation and governance. The involvement of different target groups (scientists, teachers, CVOs, industrials, etc) in workshops and focus groups was very effective in developing a reliable and balanced layout of contents. Such methodologies will be replied in the next future at Città della Scienza for the development of the new science centre and can be extend to other institutions or communication means.
4. While equal opportunities is a well know concept in our societies today, the influence of research in tackling this issue by taking into consideration gender differences is not clear for visitors. Further efforts should be done to communicate better the gender dimension in research and how this will help to build more inclusive societies in the future.
5. Science exhibitions are very effective in explaining scientific phenomena to visitors, because they are very attractive and they have a strong educational impact. They offer good quality of science education (tools and knowledge for participating and taking part in the research and innovation process) as well as activities that encourage the interest of young people for science and scientific careers. Science centres and science museums reaches totally the educational challenge in RRI and they can be considered as a best practice for their connection with and their support to formal education.
6. Nevertheless science exhibitions are not enough to engage citizens to participate in debates or talks about science and technology, since citizens prefer spending their visit time in interaction with the exhibits or with other visitors, the nevertheless science centres can give elements for a further flourishing participation. As described in Deliverables 5.2 Città della Scienza has developed with the exhibition a wide range of dialogue activities for different target groups: children, schools, the public in general. Such programs, organized both in the centre and in other venues should become part of centres infrastructure as exhibitions are. Science centres also could be seen

as a place where research centres and universities could explain the results of their research to the public, since they provide a friendly and stimulating environment for visitors and for this reasons citizens feel at their ease in dialogue with scientists, thing that doesn't happen in academic venues.
7. News forms of participation with scientific institutes have been also established during the PIER project at Città della Scienza: scientists were involved not only in the development of the exhibition but in running programs (demonstrations and prototypes) in the exhibition area during the public opening. New forms of "living" science labs have been designed and tested with teachers and students, and new relationships have been established with scientists and scientific institutions with respective benefits. This new approach foster an open discourse with research and innovation, transparent and accessible for citizens. Furthermore, it allows not only to disseminate the results but also the methods and people behind. It is highly recommended that scientific institution that foster citizen science use science centres as a vehicle to inform and recruit citizens, not only because of the large number of visitors that science centres have, but also because science centres visitors are people with a strong motivation and willing to be part of a scientific process.
8. In the era of internet, people can be engaged easily and widely in societal issues via social networks, but such engagements remain often very superficial. Plus internet is recognized as being and easy but not reliable source of information. Further steps should be implemented on this basis, gathering communities of interest in more organized forms of participation and engagement in science and technology and in the research process. Science centres and science museums can be a place where such groups can find solutions of spaces and forms of meeting, dialogue and interaction.

**Web site**

The address of the project public website, if applicable as well as relevant contact details.

www.pier-project.eu