



Istituto di Ricerche sulla Popolazione  
e le Politiche Sociali - CNR

# Monografie

2007



## Monitoring progress towards ERA

### Country Report Italy

Sveva Avveduto, M. Carolina Brandi

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## 1. Introduction

The project has a dual aim: first, to provide insights into the stage reached in Europe with respect to internationalisation of research policies, and second, to lay the ground for the preparation of a monitoring system to assess evolutions of national R&D policies and strategies towards the ERA. This is done in an exploratory fashion, focusing on a sample of 7 EU countries and on 4 specific subjects:

- a) mobility initiatives;
- b) transnational partnerships and opening up of universities;
- c) opening of national R&D programmes;
- d) joint R&D initiatives.

The research Italian system is considered already in a good position as for the involvement in international knowledge creation: the Ministry for University and Research states that 4% of world Knowledge creation can be ascribed an Italian component and that Italian researchers each year produce some 17.000 papers cited in the Science Citation Index.

6,400 of those papers (37% of the total) are developed within international collaboration activities. Most of them, if we consider only one nation, are done with partners from the United States (25%) but the highest amount is made of the sum of partnerships with European countries: UK 11%, France 9%, Germany 8%, to cite the first 3 ones.

The Ministry of Universities and Research is interested in promoting the Italian participation to Framework Programs of the European Community as an important step in the internationalization of the R&D activity and policy.

Figures indicate that the participation of Italian teams in the Sixth Framework Program is to be considered significant. Italy is involved in 55% of proposals submitted to the various calls. In 14% of the cases Italian researchers coordinate the projects. Italy is second only to Germany. The trend of approved projects is less positive. As a matter of fact, the projects coordinated by Italian researchers have a lower rate of success: 13.1%. Italy is in fourth place in the negotiation stage (second stage in the process of approving a project).

However Italy records very good results in the participation to projects coordinated by foreign researchers: the success rate rose to 18.6%. Thanks to this good

performance, Italy is in the fourth place after Germany, UK and France, and obtained 9.2% of the total allocated funds.

The Italian research strategies are set up in the National Research Plan, which is prepared each 3 years. The internationalization of the research system is explicitly recalled as an important aim to be pursued and reinforced to reach the research objectives of the Plan.

The Europeanization of research policy can be found in the systematic approach adopted by either national research policy and many institutional policies, to shape national goals in close harmonization to European ones. The European research policy objectives are, in fact, always indicated as the backbone of the national ones either in National Research Plans and in many institutional Plans of the various research institutions, as the internationalization of Italian research system is one of the objectives of our research policy.

In September 2007, the Italian Parliament approved a budget law that delegates to the Government the reordering of public research institutions that are under the authority of the Ministry of Universities and Research. Among the main criteria followed to prepare the new normative structure there is the adoption of measures fostering the European and international dimension of research.

This objective is fulfilled through the use of different tools at different levels of initiative and diffusion, national and institutional.

An important one at national level is the implementation of intergovernmental agreements on science and technology, which are drafted in accordance with the priorities contained in the National Research Plan and linked to the priorities of the Framework Program of the European Union. These agreements are put into force through an executive bilateral protocol between Italy and a foreign country.

In the last 3 years a number of agreements have been either launched or renewed. The following paragraph presents the updated list of the countries.

*Recent bilateral cooperation agreements for science and technology launched or renewed*

In 2006 the Italian Parliament ratified the agreements with Azerbaijan, Hungary, Sweden, Thailand, Switzerland, Guatemala, Jordan. In 2007 with Pakistan, China and Bulgaria.

In 2006 and in 2007 Executive Protocols entered into force (or have been renewed) with: Algeria (2006-2009), Argentina (2006-2007), French Community of Belgium (2007-2008), China (2006 - 2008), Cyprus (2006-2009), Republic of Korea (2007-2009), Greece (2006-2008), Mexico (2007-2009), Pakistan (2006-2008), Poland (2007-2009), Canada-Québec (2007-2009), Romania (2006-2008), Slovenia (2006-2009), Turkey (2006-2009), Uzbekistan (2006-2010), Vietnam (2006-2008) and Yemen (2006-2009).

At national level specific initiatives have been implemented to foster international mobility: special policies for defined groups, particularly students and scholars; financial incentives; non financial incentives; visiting programs and schemes; exchange programs. Many of these programmes have been fostered through the European policy.

Special immigration policies and visa for foreign students or researchers, have been recently set up to ease access in the Country introducing visa for research activity, together with tax deduction as described in the following case study.

In addition to favor an active role of Italy in the European research context by giving broad and updated information and practical assistance to researchers in all the fields related to their experience of mobility, the ERAMIT project (European Research Area Mobility in Italy) has been set up.

The main purpose of the project is to develop a national network of "Mobility Centers" which can provide information to researchers concerning the entry, stay and residence procedures in Italy (with information on related administrative procedures), as well as giving them the first practical information that they might need once they arrive in the national territory.

In Italy most if not all mobility initiatives are regulated via bi or multilateral cooperation agreements that regulate also the scientific cooperation between universities and research centers with foreign partners. The following chapters present a selection of some of these initiatives.

Universities and research institutions have a main role to play in promoting mobility and in fostering what has been called academic migration, the types of mobility opportunities offered vary from the short term leave to longer commitment.

Mobility schemes do not necessarily encompass per se a high level of mobility to be reached by a country, but it is clear that without these schemes entering a mobility

experience proves to be a hard experience. INFN initiatives, described in a case study, are in this respect a good example.

The transnational partnerships and the opening up of Italian university is witnessed by a large number of international agreements and cooperation activities that, as stated before, are initiated by initiative of the single university but are inscribed into the national framework of agreements regulated by the Foreign affair ministry.

The attractiveness of Italian universities for foreign students is higher within large metropolitan universities (for example Rome attracts a relatively high number of foreign students) whether the attractiveness of staff is weaker, probably due to the still not high number of courses taught in English

and to beurocratic difficulties that certainly in the recent past have prevented the inflow of foreign professors. Needless to say that the salary differentials should have played a relevant role as well.

The national research programmes may be opened to foreign participation in cooperation with Italian research centers and structures. They are mainly directed to national institutions, either universities, R&D centres or private companies but the cooperation of foreign partners is envisaged and non nationals can be funded via the national contractors.

Joint research activities are by their intrinsic nature transnational and most if not all research institutions in Italy participate, at different level of involvement, to one or more joint initiatives.



## **2. Topic 1. National Mobility initiatives**

### **2.1 Overview of topic**

#### **2.1.1 State-of-play**

International mobility of researchers is part of the general concern on science and technology policy of the country. Mobility is assured within universities and research institutions either through direct agreements or through the framework of the bilateral scientific collaboration programs contracted by the Ministry of Foreign Affairs (Mae).

The initiatives are directed either to young researchers and to senior ones, depending on the kind of scheme proposed. Young researchers are more likely to join for instance a European programme like Marie Curie, while senior ones generally use either the Foreign Affairs scheme or the direct ones (but generally most of them regulated through a Mae framework agreement) proposed by the single Higher education or Public research Institutions.

The type of mobility addressed may be either short or long term, but within the Mae agreements the short term one prevails. For each research approved programme, organised by field of research, the agreement promotes the exchange of researchers between the two interested Countries; support is assured for travel and accommodation expenses plus a per diem or a monthly amount.

During the preparatory and drafting stages of the Scientific and Technological Executive Collaboration Programme, Italian and partner-country researchers can submit joint research projects to obtain funding for research-related travel and visits. The Italian side funds travel for Italian researchers and accommodation for foreign researchers while the foreign partner funds travel for its own researchers and accommodation for Italian researchers. The projects are evaluated at the national level initially. Italy and the Executive Programme partner country then carry out a joint evaluation to select which projects deserve funding. In evaluating and selecting the projects the following criteria are taken into account: the scientific importance of the project; the foreign counterparty's level of involvement in the project; the impact of the project on bilateral scientific and technological relations; the technological transfer and human resource development opportunities (for emerging countries); the potential for promoting research and development; the potential social and economic

impact; the possibility of importing know-how (for advanced countries); the quality of the project submission. Foreign researchers taking part in a joint research project as part of a current Scientific and Technological Executive Programme can make one or more paid stays in Italy to implement the project.

Few other initiatives have been performed in addition. In particular a Programme set up to attract foreign researchers and professors, or Italian researchers and professors working abroad. This project, called "Return of the Brains", allows universities to recruit directly foreign professors and researchers. The tax exemption can be provided for non-resident researchers either Italian ones working abroad wishing to come back to their home country either to foreign nationals residing abroad and wishing to work in Italy.

The spirit of the legislation is not only to prevent and restrain the inexorable "brain drain" widespread lately but also to facilitate the technological and scientific growth in the country. In fact, Art. 3 of the Law Decree No. 269 applies to those Italian and foreign nationals with high knowledge background that enables them to facilitate the development of the research in Italy. Despite of the considerable theoretical funding of these contracts, the actual lack of support to the Universities ordinary budgets made this initiative not much effective, mainly because of the lack of contract renewal after the first year that often may occur.

In addition, several public research institutions in Italy carry out initiatives for researchers mobility. A relevant example is the INFN institute, since 1993 it has devoted a special chapter, within its budget, to encourage mobility of young researchers and international collaboration, at the same time, INFN mobility initiative covers a strategic sector for the Italian research.

The main national Programmes set up to ease mobility in Italy have been directed to non-European countries, particularly China and India. Towards strengthen the cultural, social and economic links between China and Italy, the Conference of Italian Universities Rectors has created in 2005 the Marco Polo Programme.

The programme is aimed to facilitate academic cooperation between China and Italy, and to contribute to the consolidation of relationships between the two countries.

On a voluntary basis, Italian Universities and Confindustria – the association of Italian Industry, together with various other interested parties, participate in the Marco Polo programme. Various services and facilities are offered to Chinese

undergraduate students and PhD students wishing to study in Italy. Specific measures are addressed to Chinese Researchers wishing to work in Italy, together with Chinese partners, for scientific and technological research in private and public sectors, including the exchange of researchers between the two countries. Advice and assistance are offered to Chinese graduates seeking work placements in Italy within Italian firms, including those already present in China.

Link [ww.crui.it/marcopolo/eng/marcopolo\\_eng.asp](http://ww.crui.it/marcopolo/eng/marcopolo_eng.asp)

Special programmes can be found through direct agreements such as, for instance the “Invest your Talent in Italy” programme directed to Indian and Turkish people, supported by the Italian Ministry of Foreign Affairs and by the Italian Ministry for Economic Development.

(<http://www.postgradinitaly.esteri.it/postgradinitaly/menu/theproject/>)

We should also mention some specific new initiatives. A recent program set-up also to ease researchers’ mobility, can be found in the agreement signed on 16 October 2008 in Rome between the Region of Piedmont and the National Research Council (CNR), the National Metrological Research Institute (INRIM), the National Institute of Nuclear Physics (INFN), and the Agency for New Technologies, Energy and Environment (ENEA) in support of Italian researchers. The aim of the agreement is not only to increase the number of researchers working in Research Institutes in Piedmont but also to raise the overall level of quality and efficacy of the system.

The agreement will be of three years duration and for 2008 envisages the activation of 45 two-year research grants and 14 visiting scientists for a cost borne by the Region amounting to about 1 million euro.

### **2.1.2 Indicators availability**

Inflow of foreign researchers in public research sectors; Outflow of domestic researchers in research positions abroad; Amounts spent in mobility initiatives; Use of tax relieves for foreign researchers.

## **2.2 Case studies**

### **2.2.1 “Return of the Brains” Program**

The “Return of the Brains” Programme was set up in 2001 (DM 26/1/01 n.13), between the Minister Berlinguer reform and the Minister Moratti reform, for the

purpose of facilitating the return of Italian researchers from abroad and to encourage foreign researchers to work in Italy.

Italy is a European country that invests less than others in research and development, as a result of which many of its better researchers are compelled to emigrate.

The main idea behind the programme is to allow researchers to work in their country of origin, developing research projects, reinstating lost contacts, making themselves known to the Italian scientific community and transmitting their experience and knowledge to a new generation of students.

Each year Italy exports a relevant number of researchers and imports very few. This means that substantial resources are invested in training researchers that our system is then unable to retain. The “Return of the Brains” programme is therefore aimed to recoup this investment, at least to a small extent, also by exploiting the fact that those with experience of working abroad have received high-level training and have acquired specific skills which they bring back with them together with a network of contacts and collaboration with prestigious foreign institutions.

By allowing scholars to return from abroad, the Ministry, in keeping with similar European and extra-European initiatives, has therefore promoted the development of innovative research programmes and the enhancement of teaching activities carried on in Italian universities.

The legislation underlying the “Return of the Brains” project regulates the return of scholars both from the point of view of actual research, the aims of which are laid down in a programme that precedes the entry of the researcher, and from the point of view of teaching activities; in the case of the latter it had previously been the rule that teaching had to be carried on for at least one academic semester each year in degree courses, specialist degree courses, or research doctorate, specialist or university master courses. By means of successive amendments, in 2005 it was established that teaching activities had to be carried on for a minimum of 30 hours and a maximum of 60 hours per academic year.

The programme involves the university at both the logistics and the economic level: the university structure is called upon to provide adequate structures to house and support the researcher’s activity in a department or institute and must moreover undertake to co-fund the proposed research programme to the tune of 10%.

The programme lays down that it is the government, through the ministry's activity, that must bear the entire cost of the researcher's remuneration unless the university agrees to supplement it. In any case the universities are not obliged to provide such a supplement.

University pays 10% of total expenditures, included researchers' salary; the rest of expenditures is covered by the Programme.

*Key actors for implementation of the initiative*

The Ministry of the University and Research, Universities.

*Type of mobility addressed*

The "Return of the Brains" is the biggest incoming mobility program in Italy. The type of mobility addressed is long term. The Programme, as regulated by successive Ministerial Decrees, initially required the contracts to have a minimum duration of 6 continuous months and a maximum duration of 3 years. In 2003 this period was modified as follows: the contracts had to have a minimum duration of 2 years and a maximum of 4 years. This amendment was confirmed in the 2005 guidelines which regulate the present programme.

Once the project has been approved, the researcher must begin his/her activity no later than one year after the approval of the contract by the Ministry.

*Scope: geographic, sectorial, fields of research*

There is no discrimination neither regard to the geographic location of the university that is to host the researcher, nor regard to sectorial scope and fields of research. The programme actually applies to the whole of Italy, albeit with some differences. At the territorial level these differences correspond to the exist split between North and South on the Italian peninsula.

Indeed the total number of contracts funded by the Ministry in the North and Centre account for about 85% of the total number of contracts. Between 2001 and 2007 the universities of the South accounted for the remaining 15% of contracts funded under the programme (aggregated of ex novo and renewed contracts).

**Tab. 1 – Geography of contract (total of new and renovated contracts) from 2001 to 2007\***

<b>Zone</b>	<b>N. contracts</b>	<b>%</b>
Center	225	40,3
South	88	15,7
North	246	44
<b>Total</b>	<b>559</b>	<b>100,0</b>

Source: CINECA 2008

\*2007 data are only on renovated financed contracts

### *Target groups*

The idea underlying the programme is to address researchers and experts of all disciplines and nationalities without any distinction regarding age provided they have PhD qualifications or the equivalent at the time of application and have been employed abroad in teaching or scientific activities for at least the last three years.

### *Content of the initiative*

The “Return of the Brains” programme is aimed at encouraging Italian researchers to return from abroad as well as to attract new foreign researchers to Italy. The research programmes promoted by this initiative must be of a high scientific level and tailored to suit the structures available at the university. In this sense the quality of the research programme is of great importance for the purpose of assessing the application, which is approved by the Evaluation Committee.

Certain fundamental prerequisites must be respected. One of these prerequisites is to have worked for at least three years abroad in the field of research activities, as certified by an explicit declaration by the researcher.

In order to participate it is not necessary to have had any previous contact with Italian universities. Indeed should the researcher not have any type of contact, the Conference of Rectors of the Italian Universities (CRUI) will scrutinize the candidature and direct the researcher to a university willing to accept him/her.

It is subsequently possible to participate in a selection process, the winners of which stipulate a contract with the university by which they have been called. The applications are assessed by a Committee of Guarantors (established by Ministerial

Decree) which will scrutinize the absolute scientific value of the project, as well as the researcher's competence as a function of his/her level of scientific maturity.

From the birth of the Programme to the present day, increased emphasis has been laid on the correlation between age and academic position occupied, without prejudice to the aim of the programme to give preference to the acquisition of young researchers.

However, in the case of senior candidates deemed of particular interest by the host university, the Committee, when evaluating the funding, may grant non renewable contracts limited to one academic year's duration.

The researchers must lodge their application with the universities via the web site set up ad hoc by CINECA, either in Italian or in English, although, particularly in the case of scientific subjects, it would be preferable to present the projects in English

The measures taken so far by the Ministry of the University and Research to encourage the entry or re-entry into Italy of researchers from abroad has resulted in the return of numerous professional figures who are now operating effectively in Italian universities.

*Specific initiative for international mobility or embedded into broader initiative targeting research work force, infrastructures, etc.*

The Return of the Brains is a specific initiative administered by Minister of University and Research and Universities.

*Interactions, complementarity and links with other initiatives*

Not applicable because The Return 13 totale Brains is a specific initiative.

*Main mechanisms involved financial*

The Ministerial Decree no. 13 of 26 January 2001 regulates the incentives provided for the stipulation of contracts between universities and foreign and Italian researchers and experts who have been permanently employed abroad for at least three years in teaching and scientific activities.

About 2 million euros were earmarked in 2001 (1 for contributions to contract expenses and 1 for contributions to funding the research programmes to be entrusted to the contractees), and the same amount in 2002.

The Ministry, after approving the program and costs, will pay 90% of total funding of research to University.

In 2003 (DM 20 March 2003, n.501) 7 million euros were allocated while, in Ministerial Decree of 1 February 2005, MIUR undertook to finance the contracts to the maximum extent of 35,000 euro per year for students deemed equivalent to researchers, 55,000 euro for those equivalent to associate professors and 75,000 euro for those equivalent to full professors.

The financial support offered by the “Return of the Brains” programme involves:

- a) publication of the project results;
- b) the purchase of the equipment necessary for the research project
- c) travel and missions linked to project activities

*Funding sources, budgetary amounts foreseen*

Once the research project and related costs have been approved, the Ministry transfers to the university 90% of the research funds.

*Amounts spent on the initiative, take-up rate*

In 2003 (DM 20 March 2003, n.501) 7 million euros.

*Mechanisms and amounts of cross-border funding, if any*

Not applicable.

*Barriers and incentives identified for international mobility of research staff (legal, financial, cultural, etc.), with a focus on possible solutions*

The first barrier for incoming foreign researchers concerns the differences in salaries earned abroad, more compared to those offered by the Italian research system.

Language may be a second possible barrier although the diffusion of English in the research work activities is now widespread and this can not be considered a main barrier anymore. A major barrier could be related to ‘paper- work’ problems encountered in obtaining work permits and papers. This is particularly applicable to non- EU born researchers. But the special programme is envisaged to solve also these kind of problems.



*Monitoring system for the initiative and for international mobility in general*

The number of contracts and funding amounts are available in website [www.miur.it](http://www.miur.it) and [www.cervelli.cineca.it](http://www.cervelli.cineca.it)

The “Return of the Brains” Programme was started in 2001 (D.M. 26/1/01 no.13). Between 2001 and 2007 the contracts for proposed funding totaled 559, 86.1% of which (for 481 researchers) consisted of contracts stipulated ex novo for projects involving for the first time the researcher who would receive the post, while 14.0% (78 researchers) referred to the renewal of a contract for a researcher who had already returned thanks to the funds allocated by the “Return of the Brains” Programme (source: <http://cervelli.cineca.it>).

**Tab. 2 - Percentage of newly financed and renovated contracts from 2001 to 2007 \***

<b>Year</b>	<b>Frequency</b>	<b>%</b>	<b>Total % (new + renovated)</b>
2001	99	20,6	17,7
2002	125	26,0	22,4
2003	67	13,9	12,0
2004	87	18,1	15,6
2005	88	18,3	15,7
2006	15	3,1	2,7
<b>Total new contracts</b>	<b>481</b>	<b>100,0</b>	<b>86,1</b>
2006 renovated*	33	42,3	5,9
2007 renovated*	45	57,7	8,1
<b>Total renovated contracts</b>	<b>78</b>	<b>100,0</b>	<b>14,0</b>
<b>Total sum new and renovated contracts</b>	<b>559</b>	<b>-</b>	<b>100,0</b>

Source: CINECA 2008

\*2007 data are only on renovated financed contracts

In 2007 some 500 scholars distributed over the various disciplines, with a preponderant number of contracts dedicated to scientific fields, although also other sectors such as philosophy, architecture and law were represented.

The first four faculties that responded more strongly to the programme are Mathematical and physical sciences, Humanities and philosophy, Medicine and surgery and Engineering. This indicates that the scientific faculties are involved to a much greater extent than the humanities. This entails a greater orientation towards the production of patents and the country's innovation system.

**Tab. 3 - Financed contracts according to Faculties that have joined the "Return of the Brains" Program from 2001 to 2007\***

<b>Faculty</b>	<b>N. financed contracts</b>	<b>%</b>
Mathematics and Physics	183	32,7
Humanities e philosophy	88	15,7
Medicine and surgery	72	12,9
Engineering	60	10,7
Economics	24	4,3
Agriculture	19	3,4
Foreign literature and languages	18	3,2
Architecture	16	2,9
Law	14	2,5
Political science	12	2,1
Sociology	12	2,1
Pharmacy	10	1,8
Others	31	5,7
<b>Total</b>	<b>559</b>	<b>100,0</b>

Source: CINECA 2008

\*2007 data are only on renovated financed contracts

The measures taken so far by the Ministry of the University and Research to encourage the entry or re-entry into Italy of researchers from abroad has resulted in the return of numerous professional figures who are now operating effectively in Italian universities

In particular the "Sapienza" University of Rome, between 2001 and 2007, activated 61 contracts funded under the project for new researchers and for the renewal of

several existing contracts, followed by Siena (40 contracts funded), Bologna (33) and Florence (29).

**Tab. 4 - First 10 universities that have joined the “Return of the Brains” Program from 2001 to 2007\***

University	N. financed contracts	%
Roma "Sapienza"	61	10,9
Siena	40	7,2
Bologna	33	5,9
Firenze	29	5,2
Roma "Tor Vergata"	26	4,7
Trento	26	4,7
Pisa	24	4,3
Milano	19	3,4
SISSA - Trieste	19	3,4
Trieste	17	3,0
Others	265	47,6
<b>Totale</b>	<b>559</b>	<b>100,0</b>

Source: CINECA 2008

\*2007 data are only on renovated financed contracts

#### *Assessment of results and Evaluation of impact of the initiative*

Not available.

### **2.2.2 Visa for Research activities and Tax Deduction for incoming researchers**

#### *Rationale, objective and origin of the initiative*

To encourage and facilitate the entry of foreign researchers and control the brain drain, the Italian government has launched specific rules of tax and regulatory entry of foreign researchers coming into Italy.

#### *Visa for research activities*

Law No. 17/2008 modifies Decree Law No286/1998 (Immigration law) and establishes a special procedure for incoming researchers.

In addition, the Decree of 11 April 2008 established a list of public and private institutions that can accept third-country nationals for the purposes of research projects, these institutions will host researchers who will not be anymore tied to a maximum number of entrance set each year by the decree that regulates the flows.

The new article states that the number of admission of foreign citizens who hold a higher education degree, of a type that gives access to doctoral programs, is not bound to a maximum number of accesses within those allowed each year by the decree that regulates the flows. The number is only depending on the request done by a research institute or a university which are included in the special list set up by the Ministry for Universities and Research. The procedure for issuing visas and residence permits is based on the conclusion of an agreement between the research institution and the researcher that specifies the type of research work they agreed on.

#### *Tax deduction for incoming researchers*

Italian Law Decree No. 269/2003, which enacts the 2004 budget law, includes research incentives such a 10% deduction of the costs incurred in respect of research and development or a 90% tax exemption on personal income tax and total exemption on Regional Tax on productive activities (the latter s.c. IRAP) for 3 tax years provided that certain conditions are met.

Citizens who do not reside in Italy can benefit of some exceptional conditions which are established in the Treaties against the double taxation. In Italy, The Ministry of Finance has signed, together with other foreign Countries, some Treaties against the double taxation . These conventions establish that the foreign worker can choose whether to pay the taxes in his residing country or in Italy.

.The spirit of the legislation is not only to prevent and restrain the inexorable "brain drain" widespread lately but also to facilitate the technological and scientific growth in the country. In fact, Art. 3 of the Law Decree No. 269 applies to those Italian and foreign nationals with certain knowledge background that enables them to facilitate the development of the research in Italy.

#### *Key actor(s) for implementation of the initiative*

Specific rules of tax and regulatory entry (VISA) of foreign researchers coming into Italy was launched by Italian government and Italian Revenue Agency.

*Type of mobility addressed*

The type of mobility addressed is long term. The new Article 27b of immigration law provides the creation of a new type of entry visa and residence permit to conduct research, for a period of staying that exceeds three months.

*Scope: geographic, sectoral, fields of research*

The special permit for research and the tax deduction are open to all scientific disciplines, all scientific sector and there is no discrimination with regard to country of origin.

*Target groups (e.g. researchers at the start of their career versus world-class researchers with well-established scientific expertise, women, etc.), eligibility criteria*

*Visa for research activities*

The special permit for research is a new tool, linked to the process of facilitating the entry of specific high skilled workforce for research. The involved researchers should have a stated research activity either in the forms of self-employment or subordinate or training.

*Tax deduction for incoming researchers*

Art. 3 of the Law Decree No. 269 focuses on the tax exemption for non-resident researchers either Italian ones working abroad wishing to come back to their home country either to foreign nationals residing abroad and wishing to work in Italy.

*Content of the initiative: rules, conditions, type and amount of support, eligible expenses, mode of delivery of the initiative (calls...)*

*Visa for research activities*

The specific procedure for issuing permits for research activities is based on a hosting agreement. This act shall include the specification of the legal relationship and working conditions that will actually be put in place. The researcher will obtain a residence permit for a period equal to that one of the research program, but renewable if extended. The permit can assure also the possibility of teaching and of requesting family reunification.

Moreover, the application for admission for the purpose of scientific research and, therefore, the possibility of obtaining the residence permit can be granted even if the foreign national is already regularly in Italy except if he is in the country for reasons of asylum or temporary protection.

The decree also states that foreigners already admitted as researchers in other European countries can come to Italy without a visa to continue their research activity for three months. They should not even ask for the stay permission, but only submit a simple request and the text of the agreement already made in the foreign country. To reside more than three months they have to conclude a new agreement with an Italian research institute.

#### *Tax deduction for incoming researchers*

The exemption applies if the conditions indicated in the Letter Circular No. 22/E/2004 of the Italian Revenue Agency are met, i.e. that researchers:

- a) have a first degree or equivalent qualification;
- b) reside abroad;
- c) they have carried on research activity for at least 2 years running at University or State or private Research Centers;
- d) as of the date the law comes into force or within 5 years following the one of the effective date decide to carry on their activity in Italy and, accordingly, return/come to Italy and become tax residents.

The law does not lay down which requirements employers must possess. The opinion of the Italian Revenue Agency is that employers should be Universities or State or private Research Centers as well as enterprises or entities that, because of the area in which they operate, have research structures.

Taxes are paid on the income received in Italy and for the income received abroad in case the person is a "permanent resident" in Italy.

Effects of the tax exemption (precisely of the 90% tax exemption on personal income tax and of the total exemption on Regional Tax on productive activities) is that:

- a) the employment or self-employment income yield in Italy by carrying on research activity takes part in the aggregate taxable income with the extent of 10%;

- b) self-employment income yield in Italy by carrying on a research activity is excluded from the formation of the value of the net output for IRAP purposes.

Note that in this case the exemption is due to researchers if they carry on their activity as a professional whilst if they perform their activity as employees the exemption is due to the withholding tax agents that pay salaries for the research activity. According to the clarifications made by the Italian Revenue Agency in the aforementioned Letter Circular tax exemption is applicable not only to employment and self-employment income but also to that income treated as employment income and provided by Art. 50 of the TUIR (i.e. income from collaborations if related to a research activity).

It is possible to take advantage of the tax exemption up to 3 tax years maximum, precisely for the tax year when the researcher becomes tax resident in Italy and for the two tax years following the previous one provided that the residence in Italy is kept.

*Specific initiative for international mobility or embedded into broader initiative targeting research work force, infrastructures, etc.*

The special permit for research and the tax deduction are special initiatives for international mobility.

*Interactions, complementarity and links with other initiatives*

Not applicable.

*Main mechanisms involved*

*Financial*

*Tax deduction for incoming researchers*

A foreign citizen, employed and residing in Italy, pays his taxes calculated only on the income received while working in Italy. From a general point of view, foreign citizens who stay in Italy for more than 183 days per year are subject to the Italian taxation system

In Italy taxes are grouped into two main categories:

- a) **Direct taxes** on the income of individuals (known as IRPEF but whose acronym has recently been modified to IRE) and on the income of

enterprises/companies (IRES). This last is not directly applicable to researchers. It is calculated on the percentage of the income according to the brackets of taxation. In general, all the individuals, resident or not resident, are subject to this calculation of taxes on their income. All resident individuals are subject also to the regional and municipal additional IRPEF.

- b) **Indirect taxes:** on goods, services or imports ( IVA, equivalent to VAT), on regional production (IRAP), on real estate (ICI), etc.

Therefore, if additional "allowances" are recognised to the researcher beyond his remuneration, these will be, in theory, subject to taxation.

In detail, as far as the research scholarship Marie Curie is concerned, it should be considered that:

- a) the monthly "mobility allowance", as compensation for being away from home, is paid in addition to the salary and it is, therefore, subject to taxation;
- b) the "travel allowance", a "una tantum" yearly contribution, if paid directly to the researcher is subject to taxation, but could also be treated as a reimbursement. In order to avoid a further taxation to the foreign researcher, the hosting institution can buy directly the travelling ticket;
- c) the "career exploratory allowance", a "una tantum" contribution, if paid directly to the researcher is subject to taxation, but it could also be treated as a reimbursement if the researcher is able to justify it with all the necessary documents.

The amount of taxes to be paid depends on the type and duration of the contract. As a general rule, if EU and foreign citizens stay in Italy less than 183 days in a calendar year, they will be considered non-resident citizens and thus not resident in Italy for fiscal purposes. EU and non-EU citizens become automatically residents, and ought to pay taxes on income earned in Italy when they stay in Italy for more than 183 days in a calendar year.

### *Non-Financial*

#### *Visa for research activities*

It is important for foreign researchers (non UE) to contact the inviting organization before applying for the Visa because, depending on the nature of the mission, it can



be necessary a different visa. These are the types of visa which are generally used by researchers:

- a) self-employed (a not subordinated professional or working activity, meaning coordinated and continuous co-operations on project or occasional co-operations);
- b) subordinated work (receivers of contracts of dependent work);
- c) study (study grant for studying and/or researcher or other occasional or continuous cultural activities);
- d) family reasons.

This visa is divided into two different types:

- a) for the family, for the people belonging to the family of the foreign citizen that enter together with him in Italy
- b) for family rejoining, in case components of the family join the foreigner in a following moment

For short term staying (less than 90 days), the foreign citizen must receive an invitation letter which will allow him to apply for a proper visa. The invitation letter must show:

- a) object and date of the possible seminar/study to attend
- b) the indication of the sum that will be given to him as reimbursement (or the coverage of the travel and staying expenses).

*Funding sources, budgetary amounts foreseen*

Not available.

*Amounts spent on the initiative, take-up rate*

Not available.

*Mechanisms and amounts of cross-border funding, if any*

Not applicable.

*Barriers and incentives identified for international mobility of research staff (legal, financial, cultural, etc.), with a focus on possible solutions*

There are, in Italy, some difficulties to easily obtain residence permits for work and study for foreign visitors.

*Monitoring system for the initiative and for international mobility in general*

*Assessment of results*

Not available.

*Evaluation of impact of the initiative*

Not available.

### **2.2.3 Research Network Program for Post Docs and Faculty in the field of physics (INFN)**

*Rationale, objective and origin of the initiative*

Since 1993, the National Institute for Nuclear Physics (INFN) has inside his budget a special chapter dedicated to the “expenditures for foreign scholars scientific collaborations”, including a “Fund for Foreign Affairs”. This fund supports the stay of foreign researchers, requested by the various research units. Special agreements are operative with the Spanish Ministry for Education and Science (MEC), supporting the exchange of researchers and technicians, the MIT (USA), concerning scientific collaboration in the field of theoretical nuclear and sub-nuclear physics, and the Czech Academy of Science, in order to collaborate in research activities concerning selected topics in the field of experimental and theoretical nuclear and sub-nuclear physics and related subjects to be agreed upon the general scientific agreement between Italy and Czech Republic. Also, National Institute for Nuclear Physics organizes an exchange program for summer students, for mobility of young researchers.

*Key actor(s) for implementation of the initiative*

The National Institute for Nuclear Physics (INFN); Spanish Ministry for Education and Science (MEC); Massachusetts Institute of Technology (MIT-USA); Academy of Sciences of the CZECH Republic; DoE US; National Science Foundation (NSF).

*Type of mobility addressed***a) Scientific collaboration between Spanish Ministry for Education and Science (MEC) and National Institute for Nuclear Physics (INFN-ITALY)**

Exchanges of researchers have a maximum term of 48 months and will be the host country to ensure the coverage of costs. This program began in 2006 and it is valid for 4 years with possibility of renewal and change;

**b) Scientific collaboration between Massachusetts Institute of Technology (MIT-USA) and the National Institute for Nuclear Physics (INFN-ITALY)**

Every two years research fellowships (assistantships) are made available for Italian students, in possession of a degree in physics (laureate), wishing, to get the Ph.D. in Physics at MIT;

Every year MIT includes in its research programs a young Italian theoretical physicist, financially supported by INFN at the post-doctoral level. The appointments is for one or two years, as appropriate. Each appointment commences at the beginning, of an MIT academic year;

MIT professors are able to visit any Laboratory or Section of INFN. Professors of INFN are able to visit the Centre for Theoretical Physics of MIT.

Each visit should not exceed 3 weeks; The collaboration is carried out for a total amount up to 3 people/months per year for each of the parties (total 6 months/people per year).

**c) Scientific collaboration between the Academy of Sciences of the CZECH Republic and the National Institute for Nuclear Physics**

INFN undertakes to host in its Laboratories and Sections personnel of the AS-CR initially up to a total of 12 men/months per year, in the framework of research programmes and activities;

**d) DOE/INFN Summer Exchange Program for 2008**

It entails summer study periods of 10 weeks duration to be spent respectively in INFN structures and in US laboratories;

**e) INSF/LIGO Summer Exchange Programme**

By means of this programme 4 students are selected who are willing to spend a period of 8 to 10 weeks working in LIGO project laboratories or those of the LIGO Scientific Collaboration (LSC) in order to carry on scientific research.

*Scope: geographic, sectoral, fields of research*

Specialists in the field of physics without geographical discrimination.

*Target groups*

Researchers at the start of their career, professors and graduate students.

*Content of the initiative: rules, conditions, type and amount of support, eligible expenses, mode of delivery of the initiative (calls...)*

**a) Scientific collaboration between Spanish Ministry for Education and Science (MEC) and National Institute for Nuclear Physics (INFN-ITALY)**

The program aims to facilitate cooperation and exchange among researchers and specialists in the field of nuclear physics and in the form of elementary particles, theoretical physics and particle astrophysics.

The aim of the program is to :

- develop common experimental and theoretical work;
- participate to meetings or joint seminars Schools;
- stimulate new partnerships and strengthen existing ones;
- facilitate the joint use of an experimental plants;
- coordinate research activities on European bilateral framework;
- jointly develop new technologies.

**2) Scientific collaboration between Massachusetts Institute of Technology (MIT-USA) and the National Institute for Nuclear Physics (INFN-ITALY)**

It is an agreement between the **Massachusetts Institute of Technology (MIT-USA)** and **the National Institute for Nuclear Physics (INFN-ITALY)** about scientific collaboration in the field of theoretical nuclear and sub-nuclear physics, considering their interests in the field of theoretical nuclear and sub-nuclear physics, and that

they have already under way certain joint activities in the scientific field

The collaboration is implemented at three different levels:

- *graduate student level;*
- *post-doc researcher level;*
- *faculty member level.*

These expenses reimbursements adhere to the host's established guidelines.

The exchanges of personnel take place according to the following conditions. MIT and INFN establish a Coordination Committee with the purpose of:

- a) following the implementation of the joint research program described above;
- b) agreeing on the detailed exchange program foreseen and to be defined every year;
- c) dealing with any other matter related to the collaboration under the present Agreement.

The Committee are made up of four members, MIT and INFN shall designate two representatives each in the Committee.

**b) Scientific collaboration between the Academy of Sciences of the CZECH Republic and the National Institute for Nuclear Physics**

It is an agreement between the Academy of Sciences of the CZECH Republic and the Istituto Nazionale di Fisica Nucleare that considering their common interests in the field of nuclear and sub-nuclear physics and wishing to develop their collaboration in this field of the research on a reciprocal basis. They collaborate in research activities concerning selected topics in the field of experimental and theoretical nuclear and sub-nuclear physics, according to the reciprocal scientific interests.

Also National Institute for Nuclear Physics organizes an exchange program for summer students, for mobility of young researchers.

Among these the most important are:

- **DOE/INFN Summer Exchange Program for 2008**

The programme has been running since 2002 and involves both experiments carried out in the USA and experiments carried out in INFN structures in Italy.

This exchange programme is now in its seventh year and caters to 12 young US physicists and 12 young Italian physicists. and

Italian candidates are selected by means of a call posted on the INFN web site containing a list of admission requirements. The candidate profiles are then examined by an ad hoc Commission composed of members drawn from the INFN structures and then transmitted to the US Commission in order to check the compatibility of the candidates' CVs with the activities they are expected to perform. At the end of the study grant period the tutors having supervised the young physicists produce a report of the activities carried out for each individual grant holder.

- **INFN - NSF/LIGO Summer Exchange Programme**

By means of the LIGO programme, the National Nuclear Physics Institute (INFN) and the National Science Foundation (NSF) of the United States promote an exchange programme for students with an interest in the field of gravitational waves detection. This programme has been running since 2002. Under the terms of the initiative, the INFN provides financial support for Italian students going to the USA while the NSF supports US students coming to Italy to work in INFN laboratories. The programme is intended for students of physics, mathematics, informatics, engineering and materials science.

The INFN is active in the field of gravitational waves involving the Virgo interferometer (<http://www.virgo.infn.it>), at the European Gravitational Observatory (<http://www.ego-gw.it>) in Cascina near Pisa, the resonant bars Explorer, Nautilus and Auriga, and in the preparation of the LISA mission. The NSF is present with the two interferometers of the LIGO project, located in Hanford (WA) and Livingston (LA) as well as with numerous institutions participating in the Ligo Scientific Collaboration (LSC).

The candidates must be enrolled in an Italian university and must have accumulated at least 90 university credits in subjects relevant to a Degree in Physics, Mathematics, Informatics, Engineering or Materials Science.

To be eligible for selection candidates must:

- a) specify their reasons for participating in the exchange programme;
- b) indicate a research programme together with the name of a US tutor and a workplace

- c) indicate an Italian tutor who is a researcher at INFN or with a scientific association at an INFN section or laboratory;
- d) produce a CV in electronic form describing their study and research experience, indicating the examinations undergone, the marks obtained and the number of relative CFU credits;
- e) indicate the addresses of the tutors mentioned in their application, from whom a letter of presentation may be requested.

*Main mechanisms involved*

*Financial*

- a) **Scientific collaboration between Spanish Ministry for Education and Science (MEC) and National Institute for Nuclear Physics (INFN-ITALY)**

Not Available.

- b) **Scientific collaboration between Massachusetts Institute of Technology (MIT-USA) and the National Institute for Nuclear Physics (INFN-ITALY)**

The research fellowship for the first two years, covering tuition, living expenses, and medical insurance at the level established for physics research graduate students, is borne by INFN.

For the second two years, MIT, through the Department of Physics and the Laboratory for Nuclear Science, has to fully support the students through research fellowships or assistantships.

It is expected that the graduate students teach during at least one of the four semesters that they are fully supported by MIT. Should be the time required shorter or longer the relative expenses are shared by the two Institutions on a 50%/50% basis. Each visit is covered as follows:

- *travel expenses are borne by the sending Institution;*
- *living expenses are borne by the hosting Institution.*

**b) Scientific collaboration between the Academy of Sciences of the CZECH Republic and the National Institute for Nuclear Physics**

The mutual exchange of personnel take place according to the following conditions:

- travel expenses are borne by the home Institute;
  - living expenses of the visitors are paid by the host Institute.
- 
- **DOE/INFN Summer Exchange Program for 2008** is funded in the form of study grants each amounting to Euro 5,000 gross paid by the host institutions, in the case of collaboration with the DoE and by the Institutions in the country of origin in the case of collaboration with the NSF.

The total cost borne by INFN is Euro 60,000.00, the equivalent of 8 study grants for US physicists in Italy and 4 study grants for Italian physicists in the USA.

- **INFN - NSF/LIGO Summer Exchange Programme**

The financial support provided to the selected candidates amounts to 5.000 Euro gross and is used to defray the cost of travel and board and lodging in the United States. The regulations make provision for 20 % of the amount paid to the winner to be withheld and which may be recouped if necessary when the income tax return is lodged.

*Funding sources, budgetary amounts foreseen*

See Main mechanisms involved: Financial.

*Amounts spent on the initiative, take-up rate*

See Main mechanisms involved: Financial

*Mechanisms and amounts of cross-border funding, if any*

Not applicable.



*Barriers and incentives identified for international mobility of research staff (legal, financial, cultural, etc.), with a focus on possible solutions*

No major barriers are envisaged as the young researchers are introduced in a specific programme and barriers, if any, has already been faced in advance.

*Monitoring system for the initiative and for international mobility in general*

Not Available.

*Assessment of results*

Not Available.

*Evaluation of impact of the initiative*

Not Available.

### **2.3 Conclusion**

Italy is one of the countries in which the outflow of researchers is not offset by a significant inflow. The emigration of highly qualified personnel from Italy nevertheless remains a comparatively poorly investigated phenomenon, above all due to the paucity of statistical data.

However, that this phenomenon exists is demonstrated both by the few published official data and by the data referring to the presence of highly qualified Italian personnel in the statistics referring to immigration of countries that implement policies encouraging this type of immigration to satisfy the increasing demand coming from the economy for intellectual work, such as the United States. In particular, the US Immigration Bureau data show that in 2006 some 23,000 temporary working visas were granted to highly qualified Italian citizens (researchers, liberal professionals, managers, etc.). This migration is constantly increasing.

Visa for Research activities and Tax Deduction for incoming researchers were a good initiative that should be encouraged as well as exchanges of excellent young researchers and students promoted by INFN.

The “Return of the Brains” program has favoured the return of professionals and professional skills that are currently operating effectively in the Italian university system. That said, the program remains uncompleted: it does not yet offer the

deserving recipients of these prestigious contracts the possibility of becoming part of the national academic system on a more than temporary basis. At the conclusion of his or her four-year contract, the returning scholar is thus faced with a difficult choice: to remain in Italy in the hope to eventually get a permanent academic position after the selection through a *concorsuale* (public competition) or to return abroad where there are more opportunities in research.

The case studies presented show that the preferable way to ease mobility is preferably to be linked to a direct intervention but should be supported by follow up activities which in some cases are missing.

### 3. TOPIC 2. Transnational strategic partnerships and opening up of universities

#### 3.1 Overview of topic

##### 3.1.1 State-of-play

Italian higher education is structured in a binary system, consisting of two main articulations:

- the university sector;
- the non-university sector.

At present, the university sector is made up of 89 university institutions which are classified in:

- 58 State universities;
- 17 non-State universities (legally recognised by the State);
- 2 universities for foreigners;
- 6 higher schools specialised in postgraduate university studies;
- 6 telematic universities.

##### 3.1.2 Variety along key dimensions

The degree of internationalisation of university in Italy can be measured by different tools, one of them is the presence of foreign students and PhDs. In 2006 on the total of 300,735 graduates (172,889 of which female) 5,027 were foreign (3,188 female), of which 3,672 coming from European countries.

The foreign students totally enrolled in 2005/06 were 41,589 (24,357 female), which sums up to 2.28% of foreign students in Italian Universities.

The newly enrolled share is 2,81 foreign on 100 students.

Foreign graduates enrolled in post-graduate studies summed up in 2005/06 to 4,994 (2,663 female). 1,126 graduate students were EU citizens.

**Tab. 5 - Number of foreign professors in Italian Universities 2006-2007**

Male	Female	Total
630	371	1.001

Source: MIUR Statistics Office

**Tab. 6 - Enrolled foreign students in Italian Universities by areas and gender**

	<b>Total 2005/06</b>	<b>%</b>	<b>Total 2007/08</b>	<b>%</b>
<b>North America</b>	754	1,8	835	1,6
<b>South America</b>	2.811	6,8	3.752	7,2
<b>Africa</b>	4.036	9,7	5.758	11,1
<b>Asia</b>	4.742	11,4	7.939	15,3
<b>EU 27</b>	10.587	25,5	13.454	26,0
<b>Other European Nations</b>	18.398	44,2	18.357	35,4
<b>Oceania</b>	66	0,2	39	0,1
<b>n.a.</b>	195	0,5	1.656	3,2
<b>Total</b>	<b>41.589</b>	<b>100,0</b>	<b>51.790</b>	<b>100,0</b>

Source: MIUR Statistics Office

**Tab. 7 - Newly enrolled foreign students in Italian Universities by areas and gender**

	<b>Total 2005/06</b>	<b>%</b>	<b>Total 2007/08</b>	<b>%</b>
<b>North America</b>	192	2,1	165	1,4
<b>South America</b>	767	8,4	968	8,4
<b>Africa</b>	932	10,2	1.891	16,4
<b>Asia</b>	1.298	14,2	2.378	20,7
<b>EU 27</b>	1.551	17,0	2.675	23,3
<b>Other European Nations</b>	4.356	47,8	3.378	29,4
<b>Oceania</b>	9	0,1	4	0,0
<b>n.a.</b>	8	0,1	39	0,3
<b>Total</b>	<b>9.113</b>	<b>100,0</b>	<b>11.498</b>	<b>100,0</b>

Source: Miur Statistics Office

**Tab. 8 - Foreign graduates in Italian Universities by areas and gender**

	<b>Total 2005/06</b>	<b>%</b>	<b>Total 2007/08</b>	<b>%</b>
<b>North America</b>	111	2,2	126	2,2
<b>South America</b>	345	6,9	401	6,9
<b>Africa</b>	402	8,0	505	8,6
<b>Asia</b>	447	8,9	614	10,5
<b>EU 27</b>	1.617	32,2	1.739	29,8
<b>Other European Nations</b>	2.055	40,9	2.378	40,7
<b>Oceania</b>	8	0,2	9	0,2
<b>n.a.</b>	42	0,8	70	1,2
<b>Total</b>	<b>5.027</b>	<b>100,0</b>	<b>5.842</b>	<b>100,0</b>

Source: Miur Statistics Office

Both their autonomy and the increased sensitivity of Italian universities to internationalisation policies have led to a considerable increase in the collaboration agreements drawn up directly between Italian and foreign universities. Academic Cooperation activities with foreign universities are set up to organise joint study programs, to promote scholarship for research in partner University, to increase the exchange of professors, researchers, students, to enhance cooperation in research.

All levels of the single University may be involved according to their specific responsibility

Each partnership is differently regulated in scope, defined in activities and linked to a specific programme and discipline, it is not possible to generalize at national level.

#### *Content of the partnerships, instruments used*

The opening up of universities and the implementation of strategic partnerships is also regulated via the use of intergovernmental bilateral agreements on science and technology. Most agreements between Italian and foreign universities are put into practice through this tool.

Not each university but almost all among them present a number of different typology of partnership with foreign partners, which are carried out through:

- Framework cooperation programmes

- Academic exchange agreements
- Inter-university cooperation
- Contracts
- Consortia
- Agreements on joint Graduate schools
- Students or professors exchange

Within the bilateral agreement the two Parties agree to jointly support research projects and, in deciding which projects should be given priority for financial support, agree on the following criteria:

- scientific relevance;
- potential impact on building scientific and technological capacity and on bilateral relations;
- potential social and economic impact;
- quality of project content and methodology;
- quality of collaborating partners.

The financial contribution for the bilateral research projects covers the research expenses of the projects and it is defined jointly for each one.

Each University may also propose a relevant research project to be included in the protocol from the beginning in the early phase of the negotiations.

A commission of expert appointed by the Foreign affairs and the Universities and research Ministries does the choice of the winning projects.

At present 43 Framework scientific and technological agreements are operational with 43 different countries, each one involving a relevant number of research groups of several universities.

#### *Centres of excellence as an attracting pole*

Although not specifically created only to attract foreign researchers we can mention the creation of a number of Centre of excellence in Italy to support research in specific fields. They have been created since 2000 (Ministerial Decree 13/01/2000 n. 11) and must assure interdisciplinarity, cooperation activities between university public research centres and industry, medium-long term commitment on higher education, national and international cooperation networks. The first 3 years of

funding are granted by the Ministry but the aim is to reach self sustainability and generation of "spin-off" activities.

Among the overall objectives of a Center of Excellence, apart from the obvious research ones, the Centres aim to establish a cooperation with scientists at both the domestic and international level and within its human resources policy offers opportunities to different categories of Italian and foreign scientists. For all the research positions the duration is three years renewable.

As a possible indication for Centres of excellence the Senior researcher position the gross salary range is between 70.000 and 80.000 euro per year. The Researcher positions are intended for experienced researchers that do not yet have coordinated research groups. The gross salary range is between 48.000 and 60.000 euro per year. The Post-doc / Junior Researcher positions are for PhD holders or for people with at least three years experience in research. Duration is three years

renewable. The gross salary is between 26.000 and 36.000 euro per year. The Research assistant positions are for master holders that have some experience in research. The gross salary is between 18.000 and 24.000 euro per year. PhD positions are available. The gross salary is the same as the one of the PhD students of the school i. e. 15.000 euro per year. The Centres have positions for visiting scientists and visiting professors.

Other different schemes are currently used. For instance every year the Conferenza dei Rettori delle Università italiane - CRUI (Conference of Rectors of Italian Universities) in collaboration with other Institutions in Germany, Great Britain and France launches research Programmes to increase collaborations between university research groups. The programmes are -Vigoni Programme (Italy-Germany), British Council Programme (Italy- United Kingdom) and Galileo Programme (Italy-France) The key objective of these Programmes is to focus collaboration on young researchers. Preference is given to projects which provide research training opportunities, post-doctoral training in the partner country. Projects applications are assessed and selected by a Joint Committee consisting of Italian and Partner country's experts.

Among direct inter university cooperation we can mention three Centres:

- 1) the German-Italian University Centre (opened in 2003). Founders of this network are the University of Trent, the DAAD (the German Academic

Exchange Service), CRUI and HRK (the Conference of Rectors of Italian and German Universities respectively). The Centre aims at developing synergies for the creation of a bi-national network dedicated to higher education, scientific and technological cooperation between Italy and Germany, thus creating a link between the educational, cultural, economic and entrepreneurial systems of both countries. The Centre's main objectives are the development of joint degree and PhD programmes; the exchange of students and teachers, the enhancement of commonly recognised degrees and the experimentation of new teaching methodologies and technologies.

- 2) The Italo-French University (UIF) was established in 1998 following the declarations of the Sorbonne and of Bologna on the harmonisation of European systems of higher education that envisage a strengthening of bilateral university cooperation and the promotion of an interface between their respective university systems through interuniversity agreements on joint degree programmes. Aims include the creation of interuniversity data bases and computerised network. The University operates through two secretariats, one in Turin and one in Grenoble, and is meant to increasingly become a point of reference for bilateral interuniversity collaboration.
- 3) The UNIADRION interuniversity network was established by the Conference of Ravenna in 2000. The project grew out of the Adriatic-Ionian Initiative (AII), which unites the countries of the Adriatic basin (Italy, Albania, Bosnia, Croatia, Serbia, Montenegro, Slovenia and Greece) with the aim of strengthening collaboration in sectors such as cultural and environmental heritage, ecology and sustainable development, and cultural tourism. In particular, this interuniversity cooperation network falls within the AII's intentions of fostering the internationalisation of the universities of the region.

The UNIADRION Network's programme is based on an awareness of culture as an extraordinarily important aspect of the processes of conflict prevention and resolution that universities can ideally launch. The UNIADRION Network's mission is to use communication, research and training to have a medium- to long-term impact on the economic prospects, well being and security of the Adriatic/Ionian basin.



UNIADRION connects 29 universities along the Adriatic and Ionian coast, strengthens collaboration and transnational relations. The UNIADRION Network is not only virtual, as it also runs workshops and masters courses and a Summer School, ensuring the proper balance between on-line and traditional forms of study.

The EU programmes cover a large part of international activities of Universities. A number of different programmes are present in many institutions particularly:

- Lifelong Learning programme (LLP)
- Erasmus
- Erasmus Mundus
- Erasmus Mundus External Cooperation Window
- Tempus
- Comenius
- Asia-Link
- Alfa
- EU-USA
- EU-Canada

### **3.1.3 History and recent trends**

Italy has played an important role in European higher education: it is one of the four countries that first engaged to create the so-called "European Area of Higher Education" (Sorbonne Declaration, May 1998), thus starting that type of higher education reform which, known as "Bologna Process" (Bologna Declaration, June 1999) is being implemented all over Europe. The commitment is continuing and witnessed by the variety of agreements and activities as shown above.

### **3.1.4 Indicators availability**

The available indicators are:

- number of international research agreements signed by universities;
- number of international cooperation projects in which universities are involved;
- number of international cooperation projects in which universities are involved;

- Share of staff from the country of origin having moved to similar position in another country;
- Share of international joint publications on total publications, Joint international patenting;
- Share of foreign students in total student population;
- Participation in EU mobility schemes like Marie Curie fellowships and Erasmus;
- the available figures are attached.

### **3.2 Case studies**

We selected 3 Universities following different criteria: geographical, dimensional, of the background and in relation to their new or old establishment.

We selected Milan-Bicocca, a very young Northern University strongly connected with the industrial background of the Region and with the international business context, Sapienza University of Rome, a central University, the largest Italian one well established within its national and international context and University of Cagliari an insular relatively small but very lively university with a good interest in opening up and reinforcing its international cooperation activities.

#### **3.2.1 University of Cagliari**

##### *Degree of internationalisation of university*

This is a very old university: the Studium Generalis Kalaritanum was founded in 1606. Today a new University campus on the outskirts of town hosts the science faculties, many departments with their respective faculties, and one of the University general hospitals, integrated with other medical institutions.

At present the University has the following faculties: Architecture; Economics; Education Sciences; Engineering; Foreign Languages and Literature; Humanities; Law; Mathematical, Physical and Natural Sciences; Medicine and Surgery; Pharmacy; Political Sciences.

The University has about 36.000 enrolled students, a teaching staff of over 1200 and a technical-administrative staff of about 1300 people.

At the moment the University of Cagliari is one of the largest enterprises in the Region of Sardinia, has a strong international policy, and numerous agreements with universities in Europe and around the world.

#### *Rationale and justification for strategic partnerships*

The University of Cagliari has been operating within the international academic community for the implementation of a policy of promotion and development of international inter-university co-operation as a means of improving the quality of higher education.

#### *Level of commitment: university board, faculty, major research labs*

The commitment of University includes many levels which can change, according to the single projects from the faculty to research labs etc. It is not possible to generalize.

#### *Scope of partnerships*

Through the participation in specific programmes of European and international mobility, the University has enhanced its character as an educational system open to foreign countries by offering students the possibility of experiencing first-hand different educational models operating in Europe.

Allowing students and young researchers to participate in transnational educational and training programmes means first of all to enhance their professional preparation but also helping them in acquiring higher language competences and it allows an opportunity for intellectual growth and improvement in communication skills and the ability to understand and appreciate other populations and cultures.

Experience in living abroad helps students to understand that they can acquire new skills and truly become citizens of Europe through the sharing of common values and awareness of belonging to a common social and cultural area. The main programmes of transnational training from which students and graduates of the University of Cagliari can benefit from are:

- Socrates - Erasmus Action
- Leonardo
- Co-Operation Between the European Union and The United States, Canada, Japan and Australia

- Alfa
- AlBan
- Scholarships for Postgraduate Studies Abroad
- Scholarships Offered by The Italian Ministry of Foreign Affairs
- Fulbright Scholarships

*Content of the partnerships, instruments used with a focus on research activities*

The University of Cagliari carries out international cultural and scientific relationships through different kinds of agreements.

*Instruments used for research activities*

*Community and international co-operation*

In the last ten years the University of Cagliari assigned a higher priority to its policy of cooperating with universities throughout the world. The University assesses and stresses the importance of stipulating wide-reaching agreements to act as short-term catalysts for the availability of universities of other countries to co-operate in research and teaching through specifically designed exchange programmes in areas of mutual interest to be decided on.

In particular the University of Cagliari promoted a policy of expansion towards the countries of Eastern Europe to take advantage of the opportunities offered to professors and researchers in sharing technical and scientific updating and contributing to cohesion in the different areas.

In the same way, special attention has been dedicated to this period in relations with Mediterranean countries and those across the oceans, where the University comes into contact with realities that are both culturally and geographically distant from us (the United States of America, Latin America, the Chinese People's Republic and Japan, just to mention a few).

The commitment to co-operation concerns study and research in disciplines of common interest; the universities involved organize exchanges of students, professors and researchers, seminars, courses, periods of training, round tables and meetings, as well as the circulation of the relevant publications and scientific information.

These protocols are inspired by two principles:

- a) reciprocal support and transfer of know-how with world-wide universities;
- b) strengthening of exchange programmes and the drawing up of projects in common with universities in more highly developed countries.

There are substantial common elements to all these agreements: these can be summarized as follows:

- the commitment of representatives of the universities involved (in most cases the chancellor or president) to implement policies to promote study and research in areas of mutual interest;
- the formalization of a ‘Protocol of Intent’ in which the disciplines of major interest are identified;
- the duration of the agreements, mostly medium-term (three to five years), with the possibility of extending them as well as modifying their contents; normally, the parties grant each other the right to recede from the agreement without compromising projects already in progress;
- the identification of the person or persons responsible for implementation through specific agreements (called ‘additional agreements’ or ‘exchange programmes’) within the protocols of intent; normally the person or persons responsible are chosen from among the representatives of the project in the department in the area of studies that the protocol addresses;
- the object, which consists of the performance of research activities, teaching and exchanges of publications and information of a scientific and technical nature;
- the duties of the parties to the agreement, which consist of the specification of the costs that the universities must cover in starting the co-operation; normally, the ‘sending’ universities cover the travel expenses of their professors and students to the ‘receiving’ university, which covers the living costs and any compensation owed.

In some protocols the knowledge and skills required by the host university, such as the language or specific aptitudes, are specified.

The University of Cagliari carries out international cultural and scientific relationships through different kinds of agreements.

1. **Memorandum of Understanding (MoU)** which are signed in order to establish partnerships with any other University and educational centres abroad. This MoU has general extension and shows political willing to start a dialogue with foreign potential partners. It should be signed by its legal representatives only, or by their proxy. The MoU ensures that the partners have equal distribution of duties and rights. The partners who usually work in cooperation abroad are provided with health injury assistance. The time distribution is fixed, and there possibilities of renewal and withdrawal stand, as well as the equal distribution of financial duties. The responsibility of referring on the contents and of updating operational agreement are delegated to a full or associated Professor or researcher.
2. **The operational agreement** gives rules in specific items foreseen by MoU. It works as an annexe of MoU, so it needs The International Office's support in its drafting. Deans of Faculty, Departments and Institutes, Directors and heads of Courses and researchers could sign this kind of agreement, with the understanding that they make the consistence of financial resources for the project management clear to partners.
3. **The didactic-scientific protocol** is the tool used in order to discipline specific activities in scientific research or higher education, even if there are no previous general agreements.

The following examples illustrate the content of the main agreements of Cagliari University.

**a) Agreements with European Union countries and Eastern Europe**

*Uni.CA/Université "Bernard Lyon I", France*

An agreement for co-operation and exchanges having the objective of teaching and research in Science and Health, the stipulation of agreements for implementation of plans of study and the exchange of professors and researchers. Stipulated in March 2000, it is a three-year agreement.

*Uni.CA/Université de Toulouse "Le Mirail", France*

A skeleton agreement for inter-university co-operation in teaching and research in the L.E.A.-Erasmus programmes. Other subjects of research may be added. Specific

exchange programmes for professors are drawn up as well as plans for studies in common. Stipulated in April 2000, it is a three-year agreement.

*Uni.CA/Université de Pau et des Pays de l'adour, France*

Agreement for international scientific co-operation mainly dealing with Chemistry, Chemical Engineering and Industrial Chemistry. Stipulated in April 2002, it is a five-year agreement.

*Uni.CA/Université de Mulhouse, France*

Co-operation agreement aiming at the exchange of professors, students and combined research activities and the exchange of scientific publications and information. Stipulated in December 1995, it is renewed each year.

*Uni.CA/Universitatea din Bucuresti, Romania*

Agreement for co-operation signed in July 2002 for a three-year period. The signatories agree to promote co-operation in research and teaching as well as to favour scientific and cultural projects of mutual interest. For this purpose, the possibility of drawing up research projects on the basis of specific three-year agreements is foreseen. Also foreseen is the exchange of faculty members and researchers for the purpose of exporting research and consultancy and of training scientific personnel, organizing workshops, symposiums and addressing themes of common interest. It was thus agreed that the two universities would recognize each other's academic diplomas. The parties to the agreement reserve the right to withdraw from the agreement by giving six months' notice.

*Uni.CA/"Gh'Asachi" Technical University of Iasi, Romania*

Agreement for inter-university scientific co-operation which was signed in November 2000 for the purpose of co-operating in all programmes of mutual interest, with special emphasis on studies in the fields of chemistry, chemical engineering and industrial chemistry.

These objectives are pursued through exchanges of professors and researchers, the planning of joint training programmes and the organization of missions, workshops, training periods and meetings. The two universities also deal with the finding of the necessary funding in proportion to their respective resources. The reaching of the aforementioned objectives is outlined in specific agreements that establish

procedures in the search for funding, the content and duration of the programme and its continuation. Such agreements must be approved by the authorities of the two institutions and by government authorities. The universities designate, for each programme regulated in such a way, a person responsible in each university and commit themselves for a five-year period, which may be extended by mutual agreement. It is possible to terminate the agreement by giving six months notice.

*UniCa/University of Valencia, Spain*

The agreement was signed in April 2004. The objective is the promotion of the improvement of teaching quality, of scientific research, of management planning, also through the increase in value of the university personnel and the joint participation to programmes of international co-operation, particularly community programmes. It is a three-year agreement.

*Uni.CA/Universidade de Aveiro, Portugal*

The agreement stipulated in 2001 was renewed in January 2006 (until 2009) and includes a co-operation for a Research Doctorate Degree in Environmental Sciences.

***b) Agreements with Mediterranean countries***

*Uni.CA/Mohamed-Agdal V University, Rabat, Morocco*

Agreement for scientific, cultural and training co-operation signed in June 2001. The persons responsible for implementing the agreement are the directors of the departments of Earth Sciences, but the possibility of bringing in departments competent in other fields of study and research is also expressly contemplated. For each activity specified in the protocol the drawing up of an agreement for its implementation is provided for. The agreement is for a three-year period and it is renewed in writing so long as the parties are capable of finding the necessary funds.

*Uni.CA/I.N.S.A.P. Institut National des Sciences des Archéologie et du Patrimoine, Morocco*

Stipulated in August 2004, this agreement foresees combined research activity through the use of technologies applied to the preservation of cultural and environmental heritage. It is a three-year agreement.

*UniCA/E.N.I.M., Ecole Nationale de l'Industrie Minérale, Morocco*



Stipulated in January 2004, this convention foresees the development of combined research activities, the exchange of information, of undergraduate and postgraduate students, and professors for activities of study, teaching and research, for summer training and schools. It is a five-year agreement.

*Uni.CA/Institut National du Patrimoine de Tunisi, Tunisia*

Convention for cultural co-operation first signed in 1993 concerning archaeological, historical and artistic sciences. It is still ongoing, with tacit renewals. It includes a co-operation in excavations of the site of Uthina and publication of the relevant findings. The programme was signed in October 2000 for a two-year period, renewable for the same duration.

***c) Agreements with Latin American and African countries***

*Uni.CA/Universidad de Santiago del Chile, Chile*

A skeleton agreement stipulated in January 2003 for a period of five years by means of which the partner universities engage to cooperate by implementing a policy of exchanges of human resources for participation in courses, seminars, training periods, summer schools, teaching modules and similar activities. Research and teaching activities as well as information-sharing are also provided for. Subjects concerning the departments of architecture of the two universities are considered as being of common and interest, but the possibility of devoting specific exchange programmes to other, disciplines is expressly contemplated.

*Uni.Ca/Universidad de Chile*

Agreement (2005-2010) for teaching-learning and research projects, as well as students', professors' and researchers' mobility. Fields of study to be defined.

*Uni.Ca/Universidad Central de Chile*

Agreement (2005-2010) for teaching-learning and research projects, as well as students, professors and researchers' mobility. Fields of study to be defined.

*Universidad de la Serena, Chile*

Mathematical, Physical and Natural Sciences. Agreement (2005-2010) that has the objective of carrying out research activities and exchanges on shared interests.

*Uni.CA/Universidad de Cuenca, Ecuador*

A skeleton agreement in the field of medicine, Latin languages and literatures and mineralogical and environmental research. For all these activities, agreements for their implementation have been stipulated and are still in progress. To facilitate procedures in co-operation between the two universities, admission to academic, scientific, technological and cultural services is contemplated. The co-operation, which began in January 2002, is for the duration of two years.

*Uni.Ca/Universidad Nacional de Mar del Plata, Argentina*

A declaration of intent followed by a specific agreement between the humanistic faculties and in particular with the Departamento de Historia de Europa Moderna and the Dipartimento di Studi Storico-Geografici ed Artistici. Signed in January 2002, it is for the duration of five years, but the parties to the agreement have agreed that the programme is to remain in force until it has been completed.

*Uni.CA/Universidad de Morón, Buenos Aires, Argentina*

A skeleton agreement for co-operation in all activities held to be of mutual interest. The parties intend to begin consultations for the solution of their specific problems. It is a four-year agreement signed in December 1999.

*Uni.CA/Fundação Visconde de Cairú, Salvador de Bahia, Brazil*

A skeleton agreement for international co-operation prevalently concerning economics, business administration and law. Signed in June 2002, it is renewable every two years. It provides for exchanges of all information through publications and other means of communication. It is possible to implement courses leading to masters degrees and doctorates of research in places which from time to time appear the most suitable.

*Uni.CA/Universidade Federal del Ceará, Brazil*

Stipulated in March 2004, this agreement foresees the promotion of common research activities and the implementation of exchange programmes for students and professors, the implementation of seminars, meetings and short-term academic programmes, as well as combined courses of specialization. It is a five-year agreement.

*Uni.CA/U.F.S.C. Universidad Federal de Santa Catarina Brazil*

Stipulated in August 2004, this agreement foresees the implementation of study, research and exchange programmes, the contents of which will be specified each time through a specific agreement. It is included in the Programme of Territorial Partnership with the Italians Abroad (P.P.T.I.E.). The people responsible of this convention are Dr. Gianfranco Bottazzi and Dr. Franco Nurzia, respectively professors at the Economic and Social Research Department and of Mechanical Engineering at the Faculty of Political Studies and Engineering. It is a five-year agreement.

*Uni.CA/Universidad Federal de Bahia, Brazil 2004-2009*

A declaration of intent (2005-2010) that has the objective of carrying out research activities and exchanges on common interests.

*Uni.CA/Universit  di Tocantins, Brazil*

The agreement (2005-2010) has the objective of implementing common teaching and research projects, training courses, students' exchange, professors, the organization of seminars, conventions and scientific conferences and the elaboration of publications.

*Universit  "Gaston Beger" di Saint Louis, Senegal*

The agreement (2005-2010) has the objective of implementing common teaching and research projects, training courses, students' exchange, professors, the organization of seminars, conventions and scientific conferences and the elaboration of publications.

***d) Agreements with Far Eastern countries****Uni.CA/University of International Business and Economy of Beijing (UIBE), Peking, China*

Convention for co-operation signed in June 2001 with the purpose of promoting and developing an active contribution to the achievement of results of interest common to both universities through exchanges of professors, researchers and students and the creation of scientific research projects with emphasis on courses in Economic History, Political Economy, Business Law, Business Administration and Finance and

Marketing. The disciplining of such projects is dealt with in agreements for implementation of the convention which provide the possibility of establishing direct contacts between the faculties and departments of the two universities. The commitment of each university is to participate in teaching and research programmes in compliance with the rules and regulations in force in each country. Finally, each university engages to be punctual in following the timetable established for reporting on the stages in the development of research and teaching activities. The agreement is for two years and is renewable, with the faculty of making joint amendments and the obligation of obtaining the approval of the competent authorities.

*Uni.CA/Università di Hainan, China*

Agreement for teaching-learning and research projects, as well as students, professors and researchers' mobility.

*Uni.CA/Waseda University, Tokyo, Japan*

A declaration of intent to facilitate the admission of qualified students from one university to the other for the purpose of enrolling in programmes for graduates of first and second level, as well as allowing participation by senior students. Also promoted are all academic activities leading to the development of the objectives of research, information-sharing and teaching. Implementation calls for a five-year additional agreement starting from February 2002. This additional agreement has established the number of two students, including graduates, to the partner university following a selection of candidates by the university sending the ones chosen on the basis of academic merit and aptitude in the disciplines offered by the host university.

*Availability of specific budget lines for international research projects within university budget*

The international research projects are funded with external funds.

*Availability of national funding sources providing a stimulus for universities to engage in international research projects or to attract foreign staff*

University can apply to general funds provided by MIUR within "Return of the brain".

*Specific soft support mechanisms for international research collaboration*

Not applicable.

*Legal, administrative and other barriers and incentives for opening up of universities (with a focus on possible solutions)*

The barriers are typical ones coming from bureaucratic questions and of different kind of pensions schemes present in the various countries. These problems can be overcome by direct agreements or general framework agreements between nations or supra-national agreements.

**3.2.2 Sapienza University of Rome***Degree of internationalisation of university*

Sapienza University was founded in 1303 as Studium Urbis - the University of Rome. In the academic year 2007/2008, with its 126.310 students, it is the first university in Europe as for the number of students. It offers an almost complete range of fields of study. There are 6.351 foreign students and an incoming and outgoing flow of Erasmus students at around 1,000 per year. The teaching staff is made of 4,500 professors and the administrative and technical staff counts approximately 5,000 people. In 2005-06 some 4481 foreign students were enrolled; most of them coming from EU countries (1259 from Albania, 460 from Greece, 223 from Poland, 215 from Romania)

Sapienza is an autonomous State University participating in the international scientific community through different ways of international cooperation activities. The Sapienza University of Rome has several relationships with national and international Universities and institutions, aiming at developing joint research and teaching activities and to promote academic mobility.

*Rationale and justification for strategic partnership*

Sapienza University of Rome promotes and encourages the international dimension of study and considers, among its core tasks, the development of international exchanges of professors and students in order to carry out institutional joint activities with foreign countries regarding teaching and research. Sapienza, to achieve the above-mentioned goals, signed framework agreement of international cooperation, executive protocols of framework agreements or agreements for cultural and

scientific cooperation in specific fields. The international cooperation agreements may concern staff exchange for: teaching and/or scientific activities, experiences in using complex technological instruments, every other activities promoting the International area of Sapienza University of Rome.

Through inter-university cooperation agreements, international and eU research activities, education and cooperation programmes nad international visits and events.

*Level of commitment: university board, faculty, major research labs*

The commitment of university includes many levels which can change, according to the single projects from the faculty to research labs etc. It is not possible to generalize.

*Scope of partnerships: disciplines, activities*

As part of International activities concerning the University, signing inter-university agreements implements the cultural and scientific collaborations with the Academic Institutions of other countries.

These agreements mainly promote research and/or teaching between Sapienza University of Rome and the partner Institution and encourage the international exchanges of professors, researchers, PhDs and students.

*Content of the partnerships, instruments used*

The agreements between universities are necessarily endorsed by the Rector (in Italy) and by the equivalent Academic Authority of the partner Institutions in the foreign country (the Rector, the President, or the vice chancellor); are distinguished by the two following alternative types: Framework Agreement and Specific Cultural and scientific agreement.

The Framework Agreement is a legal deed of international importance, which expresses a general interest in promoting and developing the collaboration between Sapienza University of Rome and the partner Institutions. It does not provide, due to its nature, any kind of limitation to any sector of research or teaching.

The implementation of the previously mentioned general interest can be carried out through: Executive protocols.

These protocols implement the Framework agreement assuring the professors and researchers' mobility within a single or more areas of research or teaching.

The protocol of the University:

2. invests directly on didactic and/or research structure in each signatory Institution and guarantees a principle of balance through the involvement of structures having the prevailing same purpose (Faculty and Faculty, Department and Department, Centre and Centre, etc.);
3. is signed by the corresponding organisation responsible for the reference structure;
4. mentions their Scientific Person in charge related to the mentioned structure and to the branch of learning in which the inter-collaboration will be implemented;
5. provides that the parties are committed, within the limit of their own available funds, to bear the cost of the travel expenses for their scholars and the subsistence expenses for scholar hosted according to the principle of mutuality.

It is possible to stipulate an additional protocol to a Framework agreement between universities for the mobility of extra European students: this protocol implements the Framework agreement formalising the student's mobility and partner Institution.

This specific protocol:

1. involves a Faculty directly in each signatory Institutions;
2. is signed by the respective Faculty's President;
3. indicates the number of students (identical for the two faculties) that can be admitted to the mobility for each academic year according to a principle of mutuality;
4. doesn't consider any financial burden created by signatory universities (sending or hosting).
5. provides that the admitted student shall continue to pay the fees only at the university of origin but as the same time he/she has the right to receive services at the hosting university, like any other regular student enrolled.

The agreement for Cultural and Scientific collaboration in a specific field (Specific Agreement) is a legal deed of international importance, which expresses a "specific interest" and it is designed to assure professors and researchers' mobility.

The Specific Agreement:

1. involves a teaching and/ or research structure in each signatory Institutions in accordance with a principle of balance;
2. identifies the field where the inter-collaboration will be implemented;
3. provides that the party will be committed, within the limit of their own available funds, to bear the costs for the travel expenses for their scholar and the subsistence expenses for the guest scholar.

#### *General Agreement of International Cooperation*

Framework Agreement of International Cooperation is defined as a inter-university Agreement stipulated by the Rector or his delegate, and by a Professor of I or II Level or a researcher. The professor may present a short description of the reasons for the agreement's creation which will be subsequently submitted to the University Council of the International Relations to make a preventive exam, to obtain the Rector's signature, and then to send it to the foreign institution.

#### *Executive Project for the students' mobility*

The Executive Project for student's mobility is an Additional Protocol to a pre-existing general Agreement signed by the President of the faculty interested in the project. Students are allowed to follow courses and take exams in a foreign university.

#### *Cultural and Scientific Collaboration in a specific field*

A Cultural and Scientific Cooperation Agreement is focused on a specific topic, and is signed by the Rector of the two partner Universities.

The professors interested in collaborating in a specific field through Executive Protocol of a pre-existing general agreement or a Cultural and Scientific Collaboration Agreement need the approval of the Structure Council to begin the cooperation.

Teaching or Scientific programmes proposed for the collaboration with the foreign University. A letter signed by a professor of the partner university, which expresses the will to collaborate on a common programme and to guarantee the mutual budgetary support.



### *General Agreements*

The following countries are partners of the University in a General Agreement

Afghanistan, Albania, Algeria, Angola, Argentina, Australia, Austria, Belgium, Bielorussia, Bolivia, Bosnia-Erzegovina, Brasil, Bulgaria, Camerun, Canada, Chile, China, Colombia, South Korea, Cuba, Egypt, Eritrea, Finland, France, Japan, Germany, Giordania, Greece, Hungary, India, Indonesia, Iran, Iraq, Israel, Kazakistan, Kenya, Kyrgyzstan, Latvia, Lybia, Macedonia, Madagascar, Malesia, Malta, Morocco, Messico, Moldavia, Montenegro, Mozambico, Nicaragua, Palestina, Peru', Poland, Portugal, Romania, Russia, San Marino, Serbia, Siria, Spain, South Africa, Suriname, Ucraina, Uruguay, USA, Venezuela, Yemen.

### *Additional Protocols*

Sapienza University of Rome signed Additional Protocols for the students' mobility within General Agreements ratified with international universities, allowing students to undertake exchange programmes. Fee waiver is guaranteed to students wishing to study at Sapienza under a condition of reciprocity.

Additional Protocols are currently active with the following universities:

Brazil, China, South Korea, Japan, India, Iran, Russia, Syria, Hungary, USA, Venezuela, Yemen.

### *Visiting Professor Scheme*

Sapienza University of Rome promotes incoming mobility of foreign scholars as "visiting professors", for a period ranging from 1 up to 3 months, in order to develop researching activities. Sapienza's professors and researchers interested in hosting a foreign scholar can apply each year following the publishing of a call for application. The monthly contribution, before taxes, amounts to 2.582,00 € for full professors or others with equal qualification, and to 1.808,00 € for associate professors and researchers. Contribution for travel expenses varies according to home country, as indicated in the call.

International scholars should be invited by a colleague of Sapienza who will apply for funding on their behalf.

The University of Rome and the partner foreign university agree on the general cooperation scheme to be carried out on the basis of equal and mutual advantage.

The cooperation will be implemented through the exchange scholars; the participation in research programmes; the sharing scientific information, documentation and scientific publications; study meetings, seminars and courses on the subjects laid down in the agreement. Each University ensures, in compliance with its respective laws and regulations, the assistance and facilitations for scholars temporarily residing on its territory.

The agreements generally remain in force for three years, and are automatically renewed for an equal period, if either of the parties do not decide to withdraw, at least three months before its expiry.

*Availability of specific budget lines for international research projects within university budget*

The annual university budget provides the appropriate funds aimed at supporting the international mobility of professors and researchers regarding the inter-university agreements between Universities. Each scientific person in charge (professor or researcher) of Sapienza University of Rome can submit specific request for funds or contributions to finance the international trade.

Depending on annual financing availability, the University provides scholarship in order to support the mobility of selected students according to those “Additional Protocol” managed by each Faculty. In 2008 240,000 euros have been devoted to finance these initiatives.

*Availability of national funding sources providing a stimulus for universities to engage in international research projects or to attract foreign staff*

University can apply to general funds provided by MIUR within “Return of the brain”, FIRB and other projects.

*Specific soft support mechanisms for international research collaboration*

Not applicable.

*Legal, administrative and other barriers and incentives for opening up of universities (with a focus on possible solutions)*

The barriers are typical ones coming from bureaucratic questions and of different kind of pensions schemes present in the various countries. These problems can be

overcame by direct agreements or general framework agreements between nations or supra-national agreements.

### **3.2.3 Bicocca University of Milan**

#### *Degree of internationalisation of university*

Milan is historically open to competition, innovation, and internationalism. In 2006, 13% of all Italian exports came from Milan; 45% of exports from the Lombardy region. 67% of all imports to Lombardy and 24% of all national imports came to Milan.

The province of Milan receives the highest quantity of foreign investment in Italy and 41.7% of all companies in this province have an international partner. The city is also the headquarters of several Italian and multinational corporations.

The University of Milano - Bicocca with a Campus Structure in 277.000 sq. Meters located in the North of Milano in a place denominated "Cultural District", turns 10 in 2008.

Its multidisciplinary campus has over 30,000 students (BA plus MS), 500 PhD students plus 1346 international students (1031 of which non-EU) and 936 researchers and lecturers, 700 technicians and administratives. In 2005-06 some 666 foreign students were enrolled; most of them coming from European countries (the most numerous group being 193 from Albania) with a significant presence from South America (84 students).

The University of Milano – Bicocca, created in 1998, did not at that time have an officially nominated teaching staff. Groups of professors and researchers from the same scientific fields chose to come from other universities and participate in the project. From the start the climate intended to favour new assets either in the training ground and in research, even for the most traditional disciplines.

Presently the The University of Milano – Bicocca has 7 Faculties, 1 Medical School, 21 Research Departments, 4 Research Centers, 36 Bachelor's degrees, 30 Master's degrees, 3 single cycle degree courses, 40 PhD courses, 23 Post Graduated courses (Professional Masters), 34 Medical Specialization Courses. And it is home to the 'Research Area Number 3' of the CNR (government owned National Research Council), and the Pirelli Lab with its 150 researchers and 13,000 square meters of laboratory space. The INFN - the National Institute of Nuclear Physics - just came in

recently with its own researchers working on the Large Hadron Collider (LHC). This project is run by the European Organization for Nuclear Research - CERN - in Geneva, the world's largest particle physics centre.

The University of Milano - Bicocca is partner to many projects worldwide and can offer experimental theses, internships in corporations, scholarships, doctorates, research grants, and international research exchange facilities. There is a constant interaction with over 250 universities, corporations and researchers in 24 countries on 5 Continents.

#### *Doctoral Programs (PhD)*

The Doctorate degree courses can be carried out in association with other Universities in Italy or abroad. A period of study and research abroad is anyway required to obtain the title. The University of Milano - Bicocca organises 40 different research doctorate courses.

#### *Research Centre and Consortia*

The Department is the foundational structure of a research project. Centers of Excellence, Research centers and Consortia have been created to manage large multidisciplinary research activities with international agreements, collaboration and/or financing.

Centers of Excellence are financed by the State and the Regional government and managed according to specific guidelines that guarantee their high scientific standards. The other Centers and Consortia are jointly sponsored by Italian and foreign Universities and corporations. They are engaged in important long term research and receive funds from public and private agencies.

The Bicocca University has 75 cooperation agreements for research with foreign universities located all over the world.

#### *Rationale and justification for strategic partnership*

*Project QUA\_SI QUAlity of life in the Information Society Doctoral and Advanced Research Programme in "Information and communication Technology applied to knowledge society and learning processes"*

The pervasive proliferation of information and communication technologies (ICTs) represents the most significant, and in many respects subversive, social phenomenon

in contemporary society, defined—appropriately—as the Information or Knowledge Society (the distinction between the two terms is less evident than is generally believed) For the first time since the industrial revolution, human beings have designed and constructed a machine that interacts directly with intellectual labour, and even more so with the labour of intellectuals; this situation helps to explain the enormous—and since the 1980s increasingly intense—interest that ICTs have attracted in all contemporary societies. Clearly the problems concern not only intellectuals, but all activities with a high level of information content, which represent a growing percentage of the global economy. These highly pervasive and interactive transformations are slowly coming to have an impact on all aspects of social life, to the extent that we can begin to see the emergence of a new form of society; they represent, to use a popular and succinct phrase, the passage from a society of places to a society of flows.

Accepting the intellectual challenges of this transformation, the University of Milan-Bicocca has initiated an ambitious interdisciplinary project dedicated to the study of the Information Society, financed by the Ministry of Education, University and Research (MUIR).

This project is a response to one of the fundamental vocations of the University, namely the encounter and collaboration among scientific disciplines linked to technological development and to the social and human sciences. The QUA\_SI Project proposes to investigate diverse aspects of relevance to the Information Society, both from the point of view of the evolution of information and communication technologies and the associated scientific-technological transfer, and from the point of view of the social and human sciences and the social transformations associated with the changes currently underway.

*Level of commitment: university board, faculty, major research labs*

The Steering Committee includes representatives from University of Milan-Bicocca, University of Milan, Academia Europaea, UCB University of California-Berkeley, UOC Universitat Oberta de Catalunya.

The Steering Committee:

- supervises and coordinates Project activities, in particular the relationship between the Doctoral Program and the advanced research projects;

- evaluates and approves the advanced research activities and the organization of the Labs;
- coordinates collaboration, exchanges and partnerships with other institutions, Italian and foreign universities;
- assures the scientific quality and verifies the progress of project activities.

#### *Doctoral Committee*

The Doctoral Committee involves the following Departments of University of Milan-Bicocca: Computer Science, Sociology, Psychology, Education, Regional Studies.

The Doctoral Committee:

- supervises the educational activities of the doctoral program and provides direction and guidance to doctoral students;
- approves the doctoral students' individual research projects, coordinates their research activities;
- defines the doctoral program plan of activities, including annual review procedures.

Specifically, the QUA\_SI Project engages University scholars and well-known international experts from four disciplines:

- *Cognition, Communication and Learning*
- *Environment, Space and Society*
- *Organization, Labour Markets and the Economy*
- *Information Technology and Multimediality*

In 2005 the QUA\_SI Project joined the IISU (Istituto Italiano di Scienze Umane) Consortium, which unites a variety of Italian initiatives in the area of doctoral studies and advanced research.

The QUA\_SI Project has two major areas of activity:

- Interdisciplinary Doctorate in the study of the Information Society (IDIS)
- Advanced Research Program

In addition, the QUA\_SI Project worked as a catalyst, attracting additional projects in different sectors such as research, education, professors and students' mobility,

funded by the Lombardy Region, the Italian Ministry of Education, the Italian Ministry of Labour, the European Community, and private partners:

- Bando Ingenio, Lombardy Region (formation and grants up to 900,000 Euro)
- Doti Ricercatori, Lombardy region (researchers)
- Prin 2005 (mobility)
- Prin 2007 (mobility)
- Bando FIXO, Italia Lavoro
- Master in gestione dell'Innovazione e sviluppo locale, con Università Federale Fluminense, Ministry of Labour
- Memory line - Socrates CE

*Content of the partnerships, instruments used*

*Thematic Area Standing Committees*

The Thematic Area Standing Committees involve four different areas:

- Cognition, Communication and Learning
- Environment, Space and Society
- Information Technology and Multimediality
- Organization, Labour Markets and the Economy

The four Thematic Area Standing Committees supervise the project's advanced research activities; in particular they:

- define the advanced research activity plan (labs, seminars, workshops and internships) and identify the research and educational activities to be conducted in association with the Doctoral Program;
- supervise the research activities carried out by scholarship holders within the context of approved projects;
- conduct periodic reviews with respect to: project results vs. objectives; the scientific quality of results in each of the main areas of research.

*Partners*

The QUA\_SI Project is part of an international network. National and international scholars that have joined the project participate in all scientific activities. They also

represent important reference points for PhD students and young researchers for the development of research projects and internships.

## **ITALY**

*Industrial partners:*

- E-Biscom

*Institutional partners:*

- Centro Interuniversitari Tempi
- National Research Council,
- Milan Research Consortium
- Fondazione Rosselli
- Istituto Irso

## **AUSTRIA**

- University of Technology

## **BRAZIL**

- Universidade Federale do Rio de Janeiro

## **GERMANY**

Humboldt Universität zu Berlin

## **FINLAND**

- University of Oulu

## **FRANCE**

- INRIA Futurs

## **NETHERLANDS**

- European Master in Clinical Linguistic

## **SPAIN**

- UOC - Universitat Oberta de Catalunya

## **SWEDEN**

- KTH-The Royal Institute of Technology



**UNITED KINGDOM**

- CARISMA - Brunel University
- LSE - London School of Economics - University of Nottingham

**UNITED STATES OF AMERICA**

- UCSB - University of California Santa Barbara

*Doctoral Program*

The Doctoral Program is divided in three modules, aiming at:

- provide for the education and training of expert researchers who will prove capable of approaching theoretical problems associated with the information society in an interdisciplinary manner;
- familiarize project participants with technological production in the areas of multimedia and *eLearning*;
- introduce the doctoral students and researchers into a system of exchanges and internships and the project's international collaboration networks.

Three doctoral cycles have been initiated (2003-2008) for a total of n. 34 students involved.

*“MPC” - Multimedia Production Centre*

The QUA\_SI Project launched a project dedicated to research and experimentation in the area of multimedia communication known as CPM “*Multimedia Production Canter*”. CPM serves as a focal point of interdisciplinary approaches to research for the doctorate DISI, which in the doctoral program curriculum explicitly requires a significant degree of practical experimental activity.

CPM will evolve in to a pull charged University Centre.

CPM develops experiments and production activities in collaboration with the University Technological Node for “*Nettuno - Network per Università Ovunque*”:

- Implements research and experimentation through the use of digital and cross-media methodologies;
- develops and evaluation of research and research products at the University;

- develops of multimedia tools to improve the University's communicative skills;
- develops the University's *eLearning* content.

*“NOMADIS” - Mobility, proximity and ubiquity Lab*

The NOMADIS lab (*New and Old Mobility Analysis and Design for the Information Society*) was formed to develop research projects on the use of wireless network technologies, multimedia communication and location-based services with regard to mobility, proximity and ubiquity. NOMADIS deals with research issues both from an information technology point of view and of their social and economic impacts.

The NOMADIS infrastructure has two sections:

- *NOMADIS-Env*: an environment for research and demonstration of mobility technologies,
- *NOMADIS-AppShop*: a workshop for projects and the production of mobile applications.

*NOMADIS-Env* provides a common basis for all NOMADIS projects. *NOMADIS-Env* is an environment able to sustain the requirements of research regarding the mobility of users linked via wireless (WiFi) and a number of localization technologies. The main idea is to amplify people's ability to use technology and communicate while leaving open the possibility of their using mobile terminals that are consistent with their own needs

*NOMADIS-AppShop* works on the development of general methodologies of project and implementation. This usually starts from the drafting out of the characteristics of the desired applications, in collaboration with the researchers that participate at NOMADIS. Then it moves on to the phase of micro and macro analysis and to the implementation and test of the overall project. The main aim is to arrive quickly at the development of prototypes that are needed to carry on research projects that use mobile technologies.

*Availability of specific budget lines for international research projects within university budget*

The annual university budget can provide funds in accordance with the availability from the national budget. The source of funding for the Quasi project is the Italian

Ministry for Universities and Research.

*Availability of national funding sources providing a stimulus for universities to engage in international research projects or to attract foreign staff*

University can apply to general funds provided by MIUR within “Return of the brain”, FIRB and other projects.

*Specific soft support mechanisms for international research collaboration*

Not applicable.

***Legal, administrative and other barriers and incentives for opening up of universities (with a focus on possible solutions)***

The barriers are typical ones coming from bureaucratic questions and of different kind of pensions schemes present in the various countries. These problems can be overcome by direct agreements or general framework agreements between nations or supra-national agreements.

### **3.3 Conclusion**

The level of internationalization of Italian universities is not equally distributed but the tension towards its increase is everywhere experienced.

The Ministry for education, universities and research, the Italian Conference of Rectors and each body that has within its missions to enhance the rank of Italian universities, strongly support the internationalization issues.

The three case studies chosen show how three different typologies of universities, the first, *University of Cagliari*, a very old but insular and therefore geographically peripheral one, the second, *Sapienza University of Rome*, a very old and very large one situated in the capital and therefore very central and at the core of national network and the third one *Milan Bicocca*, a very young, relatively small but lively and growing university situated in one of the most industrialized area of the nation, share a common commitment to improve international cultural and scientific relationships using the different kinds of possibilities offered at national level such as scientific agreements, exchanges, mobility schemes etc.

Many partnerships have been established with foreign Universities and other partners either using didactic or scientific protocols and international programmes

that include a range of different activities such as bilateral and multilateral partnerships with universities and research institutions of both European and extra-European countries, as well as agreements with the European Union on research, training, cooperation and structural projects, plus the organization of student, professor and staff exchange.

## 4. TOPIC 3. Opening up of national research programmes

### 4.1 Overview of topic

#### 4.1.1 State-of-play: history and recent trends

Research national policies are indicated in the 'Guidelines for Scientific Research and Technology of the Government', drawn up by the Council of Italian Ministers.

Research national actions and priorities are generally established in two main strategic pluriannual documents:

- the PNR (National Programme of Research), produced by the Ministry of Education, University and Research (MIUR);
- the PON Research (National Operational Programme), which governs the national planning of the European funds, the so called Structural Funds; these are the European funds administered by the Italian public authorities to strengthen the research activities in some of the Italian regions;
- the new PON will cover the period 2007-2013.

National funds for research are then indicated in several operational programmes aimed at governing national research projects, the main of which are managed by the Ministry of University and Research (MIUR) and by the Ministry for Productive Activities. The following have been the most important programmes until 2006. In the near future they should merge in a new single programme, the FIRST (Fund for Investment in Research, Science and Technology):

- PRIN (Funding for Research Projects of National interest)
- FISR (Integrated Special Fund for Research Activities)
- FAR (Funding to facilitate Research Activities)
- FIRB (Funding to supplement Basic Research)

The National R&D Programmes are mainly directed to national contractors that can be either higher education or research institutions or private firms. The funds that HE and R&D institutions or firms acquire may be re-directed as a sub contracts to foreign partners, but a direct funding of foreign partners is not to be found in National R&D Programmes.

Italian policy maker have recognized since a long time that international bilateral cooperation in research and technological innovation contributes to strengthening

activities in support of the Italian scientific and technological system. This task is mainly performed by the General Directorate for Cultural Promotion and Cooperation of Ministry of Foreign Affairs.

This Directorate is responsible for the promotion and dissemination of Italian language and culture abroad, collaboration in science and technology and international scientific organizations. It also covers the Italian Cultural Institutes and academic institutions abroad, Italian lecturer positions in foreign universities and scientific experts; study grants to foreign and Italian students abroad; study grants offered to Italian citizens by foreign governments and international organizations. The Directorate awards grants each year for bilateral scientific and technological projects, in conjunction with the Ministry for the Universities and Research. The Directorate promotes and supports cooperation between national scientific and technological research facilities, both public and private, and similar facilities in other countries through the negotiation of Executive Programs. Bilateral Executive Programs take into account the priorities set out in the National Research Programs and the European Union's Framework Programs. At the present time, about 20 executive programs with European Union countries and about 30 with Extra-European countries are in place.

Public research institutions to play a key role in opening up national research programs to foreign scholars.

In the scientific, technological field and in the ambit of the technical regulation, National Research Council (CNR) takes care of the cooperation with bodies and institutions of other countries or with international bodies, with reference to non-governmental agreements. Upon request of governmental authorities, it also provides specific competences for the national participation to organizations or international scientific programs between different governments. CNR may also take part to international research centres in cooperation with similar scientific institutions of other countries. Furthermore, CNR support and promote the researchers exchange working on large scale and "free theme" programs in the framework of bilateral scientific and technological agreements contracted with analogous research institutions all over the World: to date, 50 agreements are in operation. Bilateral agreements include "common research projects", having a double leadership of an Italian and a foreign Principal Investigator. In any agreement, budget is foreseen for

travels and research funding and special funds can be allowed (under contemporary application by the Italian and foreign PI's) for bilateral seminars in Italy or abroad.

The Italian National Agency for New Technologies, Energy and the Environment (ENEA) is a public undertaking operating in the fields of energy, the environment and new technologies to support competitiveness and sustainable development. The agency promotes, in the sectors in which it operates, collaboration with the organizations and institutions of other countries in the scientific and technological spheres. As part of bilateral government agreements, scientific and technological cooperation is carried out through the drawing up of protocols or working programs having scientific, technological and socio-economic contents and goals related to research activity. At the present time 27 bilateral agreements are in place in the scientific sectors within the competence of the Agency. ENEA operates intensely in the sphere of international relations. In particular, the Agency supports the participation of its delegates/experts in international committees and groups on STR-related topics; maintains relations with the Ministry of Foreign Affairs, and other institutions, providing tools to help support the development of European Projects and research activities; hosts, in its research Centres, official delegations of European and non-European countries; finances and promotes hospitality at its laboratories for foreign grant holders operating in sectors of interest to the Agency programs.

Since 1993, the National Institute for Nuclear Physics (INFN) has inside his budget a special chapter dedicated to the "expenditures for foreign scholars scientific collaborations", including a "Fund for Foreign Affairs". This fund supports the stay of foreign researchers, requested by the various research units. Special agreements are operative with the Spanish Ministry for Education and Science (MEC), supporting the exchange of researchers and technicians, the MIT (USA), concerning scientific collaboration in the field of theoretical nuclear and sub-nuclear physics, and the Czech Academy of Science, in order to collaborate in research activities concerning selected topics in the field of experimental and theoretical nuclear and sub-nuclear physics and related subjects to be agreed upon the general scientific agreement between Italy an Czech Republic.

The National Institute for Astrophysics (INAF) has a dedicated "International Relationship Office" in order to promote and coordinate international relationships with public and private partners, on a bilateral, European and multinational scale. In

particular, the "Fundación Galileo Galilei - INAF, Fundación Canaria" (FGG) is a Spanish no-profit institution constituted by "INAF", the Italian Institute of Astrophysics. The FGG's aim is to promote the astrophysical research, as foreseen in the international agreement of May 26, 1979, by managing and running the Telescopio Nazionale Galileo.

Also the Large Binocular Telescope (LBT) is a collaboration between the Italian astronomical community (represented by the Istituto Nazionale di Astrofisica (INAF)), The University of Arizona, Arizona State University, Northern Arizona University, the LBT Beteiligungsgesellschaft in Germany (Max-Planck-Institut für Astronomie in Heidelberg, Landessternwarte in Heidelberg, Astrophysikalisches Institut in Potsdam, Max-Planck-Institut für Extraterrestrische Physik in Munich, and Max-Planck-Institut für Radioastronomie in Bonn), The Ohio State University, Research Corporation in Tucson, and the University of Notre Dame.

*ASI Italian Space Agency* plays a key role at the European level where Italy is the third contributor country to the European Space Agency. It also is involved at the international level outside Europe, for example, ASI has a close working relationship with NASA, we can just mention the construction and activities of the International Space Station.

Thanks to ASI's efforts, the Italian scientific community has had unprecedented successes in recent years in astrophysics and cosmology, contributing among other things to reconstructing the first moments of life in the universe or making essential steps towards understanding the gamma ray bursts phenomenon. Furthermore, ASI has contributed significantly to space exploration by building scientific instruments that are aboard NASA and ESA probes bound for discovering the secrets of Mars, Jupiter and Saturn. In all of the major missions planned for future years—from Venus to the comets, up to the outer limits of our solar system—there will be a piece of Italy.

ASI Italy's participation in ESA programmes has always been a fundamental complement to national or bi/multilateral programmes of cooperation of ASI, supporting national industry within the framework of European context, also often allowing the acquisition of a position of continental excellence. ASI's participation in ESA programmes allows, among other things, to selectively support



specialization, to pursue excellence and therefore, to produce returns in terms of improving competitiveness.

At present ASI cooperates with several European and non-European countries and Space Agencies. ASI manages the National Space Plan.

Italy actively participates in the opening up of national research programmes in many different fields. We may recall for example the National Antarctic Program that manages the national activities in Antarctica of scientific research, including organising expeditions, in close coordination with the National Antarctic Programs of the 29 participating countries. The Italian founding partners are:

ENEA Ente per le Nuove tecnologie, l'Energia e l'Ambiente, CNR Consiglio Nazionale delle Ricerche, INGV Istituto Nazionale di Geofisica e Vulcanologia, OGS Istituto nazionale di Oceanografia e di Geofisica. The National Antarctic Commission sets up the 3 year plan and the objectives to be reached. To mention some of these initiatives, Italy cooperates in Antarctic Climate Evolution (ACE), Subglacial Antarctic Lake Environments (SALE), Evolution and Biodiversity in the Antarctic (EBA), Antarctica and the Global Climate System (AGCS), Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR).

#### **4.1.2 Indicators availability**

The available indicators are: Number of programmes open to foreign participation, by type. Amount of national R&D funding allocated to foreign participants. The available figures are attached.

### **4.2 Case studies**

#### **4.2.1 The Integral Mission**

*Origin, aim and content of the programme and and rational for opening to foreign participation*

INTEGRAL, originally a joint Italian, French, German and Danish proposal, was selected by the ESA in June 1993 as the next ESA medium-size scientific mission (M2) of its Horizon 2000 program. The mission was conceived as an observatory led by ESA with contributions from Russia (Proton launcher) and NASA (Deep Space Network ground station).

The mission is dedicated to the fine spectroscopy and fine imaging of celestial gamma-ray sources in the energy range 15 keV to 10 MeV with concurrent source monitoring in the X-ray (4-35 keV) and optical (V-band, 550 nm) energy ranges.

When the program was selected, ESA appointed Alenia Spazio, Italy, as industrial prime contractor, responsible for the design, integration and testing of the satellite. On board, four instruments from teams led by scientists in Italy, France, Germany, Denmark, and Spain are today gathering and analysing the gamma-rays from space. INTEGRAL is now a truly international mission with the participation of all member states of ESA plus the United States, Russia, Czech Republic, and Poland. A Russian Proton rocket successfully placed the spacecraft into orbit. ESA and NASA ground stations are keeping in touch with INTEGRAL. The mission operations centre responsible for satellite control is located at ESOC in Germany. The INTEGRAL Science Operations Centre (ISOC) at Noordwijk, the Netherlands, is providing the observation plan, and Switzerland hosts the centre for the scientific data, the INTEGRAL Science Data Centre (ISDC).

Originally planned for a 2 years operative life, INTEGRAL Mission is now extended up to December 2012.

*Target groups of programme (domestic and abroad)*

INTEGRAL target group is the the international High Energy Astronomy scientific community.

It is an observatory-type mission with nominal lifetime 2 years and extension approved up to 2012, with a checkpoint in 2008. Most of the total observing time is awarded as the General Programme to the scientific community.

The sixth call (AO-6) for observation proposals was issued on 10 March 2008, with a proposal submission deadline by 18 April 2007. The AO-6 process was completed in June 2008 and a new AO was released.

Typical observations last from 100 ksec up to about two weeks. Proposals for observations are selected on their scientific merit only by a single Time Allocation Committee. These selected observations are the base of the General Program.

An INTEGRAL Key Program (KP) is a scientific investigation which requires a very significant fraction of the observing time (available per annual AO-N cycle) in order to achieve its scientific objectives. Typical examples are ultra-deep observations of

nucleosynthesis emission and/or diffuse emission (lines and continuum), or studies of (a number of) point sources in a field, each requesting a few Ms observing time. The remaining fraction of the total observing time is reserved for institutes which have developed and delivered instruments and the data centre (guaranteed PI time), for Russia and NASA for their contributions to the program, and - to a smaller extent - for Mission Scientists and ISOC. The fraction of observing time reserved for the Core Program has been progressively reduced during the mission extension. The termination of the CP as of 2009 has been approved by ESA's Science Program Committee in November 2007.

*Scope: thematic, geographic, types of research*

Gamma-ray astronomy explores the most energetic phenomena that occur in nature and addresses some of the most fundamental problems in physics and astrophysics. It embraces a great variety of gamma-ray continuum and gamma-ray line processes: nuclear excitation, radioactivity, positron annihilation and Compton scattering; and an even greater diversity of astrophysical objects and phenomena: nucleosynthesis, nova and supernova explosions, the interstellar medium, cosmic-ray interactions and sources, neutron stars, black holes, gamma-ray bursts, active galactic nuclei and the cosmic gamma-ray background. Not only do gamma-rays allow us to see deeper into these objects, but the bulk of the power radiated by them is often at gamma-ray energies.

The scientific goals of INTEGRAL are addressed through the use of high resolution spectroscopy with fine imaging and accurate positioning of celestial sources in the gamma-ray domain. Fine spectroscopy over the entire energy range permits spectral features to be uniquely identified and line profiles to be determined for physical studies of the source region. The fine imaging capability of INTEGRAL within a large field of view permits the accurate location and hence identification of the gamma-ray emitting objects with counterparts at other wavelengths, enables extended regions to be distinguished from point sources and provides considerable serendipitous science which is very important for an observatory-class mission.

Some of the topics addressed by Integral are:

- Compact Objects (*White Dwarfs, Neutron Stars, Black Hole Candidates, High Energy Transients*);

- Extragalactic Astronomy (*Galaxies, Clusters, AGN, Seyferts, Blazars, Cosmic Diffuse Background*);
- Nucleosynthesis Studies (*Hydrostatic Nucleosynthesis (AGB, WR Stars), Explosive Nucleosynthesis (Supernovae, Novae)*);
- The Galactic Centre (*Sgr A\*, diffuse emission, monitoring the Galactic Centre and Bulge*);
- Gamma-Ray Bursts (*Alerts, GRB properties*);
- Classification and Identification of High Energy Sources (*Source Catalogues, Identifying Gamma-Ray Objects*);
- *PLUS: Unexpected Discoveries (Obscured sources, Supergiant Fast X-ray Transients, hard tails from magnetars).*

*Funding mechanism of the programme: role of national funding sources, international funding sources*

Italy supports INTEGRAL mission through a dedicated fund included in the National Space Plan, managed by the Italian Space Agency (ASI). These funds include the direct support to the Italian Research Institutes involved in this mission (in its first phase, supporting the design and production of prototypes of the Italian mission to be proposed to foreign partners and to ESA, now supporting the contracts for personnel purposely dedicated to INTEGRAL mission management and scientific data analysis) and the Italian share of the ESA contribution to this mission. Actually, ASI plays a key role at the European level where Italy is the third contributor country to the European Space Agency. It also is involved at the international level outside Europe, for example, ASI has a close working relationship with NASA.

*Mechanism for openness:*

**a) Channels for accessing programmes by foreign participants**

Following a preliminary phase, where the access to INTEGRAL program was allowed only to the Institution that designed, built, launched and managed the spacecraft and its instruments (INTEGRAL Science Working Team “guaranteed time”, see before), INTEGRAL is now open to the whole astronomical community, regardless to the nationality. Observing time is assigned in open competition, where observing proposal are evaluated and accepted or rejected by an international referees panel (Time Allocation Panel) on scientific base only.

In 2005, ESA decided to set up an INTEGRAL Users' Group (IUG) in parallel to the already existing INTEGRAL Science Working Team (ISWT) for the extended mission. As a consequence of the termination of the Core Programme beyond 2008, however, one of the main tasks of the ISWT ("Establish and optimize the Core Programme") vanished, and the IUG and ISWT teams have been merged, in November 2007, into one IUG. After 12 years, the ISWT has been formally dissolved and its members have been transferred to the new IUG.

The tasks of the INTEGRAL Users Group (IUG) are to:

Advise the Project Scientist on all matters relevant to maximising the scientific return of INTEGRAL within the boundary conditions.

Advise the Project Scientist on how to ensure that INTEGRAL maintains the principal characteristics of an observatory satisfying the objectives of the scientific community at large.

Act as a focus for the interests of the scientific community in INTEGRAL and act as an advocate for INTEGRAL within that community.

Maintain contact with the wider scientific community on matters specific to INTEGRAL (e.g. coordinated observations, science operations and General Observer interface) and to provide a route so that the community can advise ESA on INTEGRAL's scientific goals from a general point of view.

Monitor the ISOC and ISDC activities to ensure that they best meet the needs of the user community within the resources available.

Identify, in consultation with the Integral Operations Coordination Group (IOCG), a coherent calibration and performance verification policy.

Advise, in consultation with the IOCG, on the maintenance and possible further enhancement of the science ground segment with particular reference to the operational scenario, observatory products and database structure.

The IUG shall meet approximately twice a year, and the meeting venue is normally either ESAC (Villafranca, E) or ESTEC (Noordwijk, NL).

The decision process in the IUG should be one of consensus rather than conflict. In case, however, a voting is required, the voting rights as established for the XMM-Newton Users Group shall be applicable (ref.: ASTRO (2007)16).

The chairman of the IUG will make annual reports to the AWG (Astronomy Working Group).

In all cases where the Mission Manager judges that the recommendations made by the IUG violate the resources available, or jeopardize the mission's safety, or if the ESA management otherwise disagrees, the recommendation will be taken to higher ESA management for a final decision. At that point, the chairman of IUG will also be invited to provide his or her input. It is, however, envisaged, that these cases will be an exceptional situation.

The IUG is composed of (i) external members, (ii) the chair of the Time Allocation Committee (TAC), (iii) members of the former ISWT, and (iv) ESA staff.

External IUG members should be active researchers in the field of high-energy astrophysics and be regularly using INTEGRAL scientific data. They should not formally be affiliated with INTEGRAL PI teams (neither instruments nor ISDC). The IUG chair is an external IUG member. Membership of the IUG is for two years. It is foreseen that two years after the formal start of the IUG, half the external members will be replaced, and in another two years (i.e. four years after set-up) the full external membership will be reviewed. External IUG members are appointed by D/SCI, after consultation with the Astronomy Working Group, the outgoing IUG and the Project Scientist.

IUG members from the former ISWT are The Co-PIs for IBIS and SPI, PIs for JEM-X, OMC, and ISDC, respectively; Mission Scientists and the Russian representative for the PROTON launcher. IUG members from ESA are the Project Scientist, the Mission Manager and the secretary.

Current members of the IUG are from the following Institutions are representatives of National Institute for Space Research –SRON (NL) , INAF - Brera Observatory (IT), Space Research Institute –IKI (RU), Service d'Astrophysique – CEA (FR), Clemson University (USA), Dr. Karl-Remeis-Sternwarte, Univ. Erlangen-Nürnberg (DE), University of Amsterdam (NL), University of Bologna (IT), NASA Goddard Space Flight Center (USA), INAF Rome (IT), CESR Toulouse (FR), MPE Garching (DE), DNSC Copenhagen (DK), INTA Madrid (ES). MPA Garching (DE), ESA ESTEC.

#### **b) Rules for foreign participation**

The INTEGRAL Users Group (IUG) advises the Project Scientist on all matters relevant to the scientific return of INTEGRAL.

Technical and operational issues are discussed in the Integral Operations Coordination Group (IOCG) which advises the Mission Manager.

The Ground Segment includes the INTEGRAL Science Operations Centre (ISOC) Team at ESAC, the Mission Operations Centre (MOC) Team at ESOC and the team of the INTEGRAL Science Data Centre (ISDC).

The four Principal Investigator (PI) Instrument Teams are continuing their support throughout the mission, participating in the IUG and the IOCG as well as in direct support of the Ground Segment for instrument operations, calibration, software development etc.

The Integral Operations Coordination Group (IOCG) advises the Integral Mission Manager on all aspects of the operation and conduct of the Integral mission.

The IOCG has been created as a forum to deal with operational issues which previously were discussed within the ISWT, at Ground Segment Coordination Meetings, or both. Its membership consists of the instrument PIs and Operations Managers, ISDC representative, Spacecraft Operations Manager (MOC), Science Operations Manager (ISOC), Project Scientist, and Mission Manager.

Specialist ad-hoc Working Groups (e.g. for telemetry allocation) report to the IOCG. The IOCG meets irregularly, as required by operational issues.

The INTEGRAL Science Operations Centre (ISOC) is responsible for the definition of scientific operations including the instrument configuration for each observation, the mission planning and implementation of the observing program.

In summary, the ISOC:

prepares AO's for observations, receives proposals and assesses their technical feasibility and makes these assessments available to the Time Allocation Committee.

is responsible for the mission planning (scheduling) and implementation of the observing program.

is responsible for the definition of scientific operations including the instrument configuration for each observation

will decide on the generation of an alert for Targets of Opportunity in order to change/interrupt the observing program (responsibility of Project Scientist).

will keep an archive of all scientific data as created and maintained by the INTEGRAL Science Data Centre (ISDC).

The ISOC is located at the European Space Astronomy Centre (ESAC), situated at Villafranca del Castillo near Madrid (Spain).

In November 2003, the SPC approved a mission extension for INTEGRAL (ESA/SPC(2003)45, rev. 1). This paper stated the Executive's intention to set up an INTEGRAL Users' Group (IUG) in parallel to the already existing INTEGRAL Science Working Team (ISWT) for the extended mission: *"Based on the successful experience with XMM-Newton"..."to institute a Users' Group for INTEGRAL in order to maximize the connection of the mission with the widest community"*.

The Executive and the ISWT reviewed and evaluated the role and responsibilities of the XMM-Newton Users' Group in order to establish the Terms of Reference for the INTEGRAL Users' Group (IUG). There is a fundamental difference between XMM-Newton and INTEGRAL in the definition and optimization of the Guaranteed Time observing programme (Core Programme) during the extended mission phase: XMM-Newton defined the Core Programme for the entire mission well in advance, before its Users's Group was established and the XMM-Newton Science Working Team was dissolved. On INTEGRAL, the ISWT review and define the Core Programme prior to each AO. The ISWT is convinced that the Core Programme should not be frozen for several years in advance, as this would prohibit any reaction to new scientific priorities, to forthcoming missions, or to changes in the instrument performance. Following discussions with the ISWT, it was concluded that for INTEGRAL, rather than replacing the SWT by the UG as was done on XMM-Newton, the IUG and the ISWT should exist in parallel as separate - but communicating - bodies.

After taking the decision to open up all available time for Guest Observers from 2009 onward, the ISWT was formally dissolved in 2007, merging effectively with the INTEGRAL Users' Group (IUG).

The tasks of the newly established INTEGRAL Users Group (IUG), were part of the responsibilities of the ISWT during the development and the nominal mission phases (from 1993 until Dec 2004) as described in the INTEGRAL Science Management Plan (SMP, ESA/SPC(94), rev.1, Section 3.1). For the INTEGRAL mission in its extended phase, ESA has decided to implement an INTEGRAL Users Group (IUG) and consequently, the tasks of the ISWT during the extended mission phase were:



1. Establishing and optimizing the Core Programme (guaranteed time observations)
2. Identifying and maintaining a coherent calibration and performance verification policy
3. Participation in major programme reviews
4. Advising on the maintenance and possible further enhancement of the science ground segment with particular reference to the operational scenario, observatory products and database structure.

**c) Funding rules for foreign partners versus domestic one, any legal issue**

No special funding is foreseen for observers winning the observing time competition, regardless for his nationality, but the use of the instrument is given for free.

**d) Foreign dimension in evaluation criteria**

Not applicable (the evaluation is performed regardless to the nationality of the proposal).

**e) Use of foreign expert in project evaluation**

The evaluation of the project is fully international.

**f) Results achieved: rate of participation / funding of foreign partners in national R&D programs**

To date, more than 2000 observation proposal was received worldwide: about one third was accepted.

**g) Legal, administrative and other barriers and incentives**

Not applicable.

**4.2.2 FIRB (Basic Research Investment Fund)**

*Origin, aim and content of the programme and rationale for opening to foreign participation*

The FIRB is the principal method used to fund Basic Research, that is, it is used to finance the activities aimed at extending scientific and technological knowledge not linked to immediate and specific commercial or industrial objectives for the purpose of boosting the competitiveness of this country at the international level.

The FIRB was set up under the 2001 financial law (budget) for the purpose of making available a financial support instrument specifically addressing basic research.

In accordance with the National Research Plan the FIRB contributes to:

- the development of the network of public-private laboratories of excellence engaged in "mission-oriented" Basic Research;
- supporting the medium-long term research agenda of the national technological platforms;
- the development of "joint-research labs" as provided for in international agreements;
- the implementation of strategic mission-oriented Basic Research programmes coupled to the participation of Universities – Public research entities – Companies.

#### *Target groups of programme*

The FIRB is used to fund basic research project having a high scientific or technological content, as well as projects to boost large public or mixed research infrastructures. Other areas of intervention are those referring to strategic projects to develop pervasive and multisectoral technologies and to the establishment, reinforcing and networking of high quality public or private scientific centers, also at the international level.

#### *Functioning*

The fund provides for the establishment in universities, entities or institutes of Research Units that carry on and coordinate the various activities. These research units may be set up also in inter-university consortia.

Funds are provided to hire staff, to buy scientific instruments and computing facilities, to carry out research, training, planning, feasibility studies and technical/scientific management.

Each research unit is obliged (annually and at the completion of the project) to present a report accounting for the expenses effectively incurred during the period in question. Each coordinator is obliged (annually and at the completion of the project) to present a report on the activities carried out during the period in question.

*Scope: thematic, geographic, types of research*

FIRB-funded activities are involved in the 11 strategic projects listed below. For each strategic project a variable number of project goals (“*Progetti-obiettivo*”) have been identified within which the specific research projects (the corresponding number of which is indicated in parentheses) are funded for the Universities and research agencies. The data refer to the period 2001-2005, years for which complete overall figures are available. Projects refer to different field of science, that is:

- Chemistry/pharmaceutics
- Inheritance and prospects in the Human Sciences
- Fusion
- Nanotechnologies, microtechnologies, integrated development of materials
- Neurosciences
- New medical engineering
- Post-genome
- Science and technology in the Knowledge Society
- Human, economic and social sciences
- Enabling technologies for the ICT knowledge society
- Safeguarding of citizens rights and security

*Funding mechanism of the programme and mechanisms for openness*

Within the framework of the projects funded the universities may hire untenured staff to perform technical and scientific activities (research, training, planning, feasibility studies, etc.) or technical-scientific management. Project-linked or coordinated and continuative collaboration work contracts are offered, together with research grants or research doctoral funding and study grants.

The FIRB is addressed in particular to young researchers and to the internationalization of research activities. This preference for young people and international collaboration is regulated by norms that set a fixed quota for contracts catering for these specific aims.

Each of the projects approved for funding, at the time of the approval, must make provision also for collaboration and project-linked work contracts stipulated (by one or several of the research units participating in the project) with young researchers

and/or with researchers of international standing for an amount of not less than 10% of the total project cost.

All the procedures involved in the stipulation of the contracts for young researchers and/or for researchers of international standing (involving sums at least equal to those provided for in the project) must be implemented as quickly as possible after receiving notification that the grant has been approved.

Nevertheless, at the expiry of twelve months after the date from which project activities run, or else if total amounts of less than 10% of the project cost have been stipulated, the MIUR reserves the right vis-à-vis all the research units involved in the project to suspend the payments and to activate the procedures to revoke the contribution and of proceeding to recover any sums already paid.

Contracts with young researchers must make provision for full-time employment and cannot have a duration of less than three years. They must be stipulated with graduates of no more than 32 years of age or with graduates with at least three years documented experience in the field of scientific and technological research, or again with holders of research doctorates or an equivalent post-graduate qualification.

The minimum remuneration levels must lie within the following range:

- an amount not lower than the research grant for graduates of no more than 32 years of age;
- an amount lying within the range of the remuneration of a university researcher and an associate professor for graduates with a documented experience of at least three years in the sector of scientific and technological research, and the holders of a research doctorate or equivalent post-graduate qualification.

Contracts with researchers of international standing must make provision for a commitment of a duration of not less than six months full-time equivalent.

In principle, researchers of international standing may be eligible for remuneration equivalent to the remuneration awarded in Italy for qualifications comparable to those held by the same researchers in their country of origin.

*Results achieved: rate of participation / funding of foreign partners in national R&D programs*

No information available.

*Monitoring procedures w.r.t. foreign participation in domestic research programmes*

No information available.

*Evaluation procedures and results*

No information available.

*Legal, administrative and other barriers and incentives for opening up national R&D programmes with a focus on possible solutions*

No information available.

**4.2.3 National Programme of Research in Antarctica***Origin, aim and content of the programme and rational for opening to foreign participation*

Law no. 284 of 10 June 1985, setting up the National Antarctic Research Plan-PNRA and entrusted to the Ministry of Education, the University and Research-MIUR (denoted as MURST at the time) the task of coordinating Italian activities in Antarctica. The Minister makes use of the National Antarctica Scientific Committee (CSNA) to set up multi-year research programmes. Italian National Agency for new technologies, energy and the environmental (ENEA) has the task of implementing the annual executive programmes and of pursuing the scientific objectives, which are identified in collaboration with the National Research Council (CNR) .

Law no. 380 of 27 November 1991 confirms Italy's commitment in Antarctica, eliminating the obligation to present new ad hoc legislation and including it as an item in the annual State budget.

In July 1995 the interministerial economic planning committee CIPE approved the Five-Year Plan 1996-2000 which updates the preceding Five-Year Plan after 3 years as provided for by law no. 380.

Law no. 266 of 7 August 1997 authorizes the continuation of Antarctic research for the years 1998 and 1999, subject to the presentation of the final scientific and financial report.

Decree Law no. 204 of 5 June 1998 states that from 1 January 1999 the Antarctic research funds flow into the ordinary funds for the research entities and institutions funded by MIUR.

Interministerial (MIUR and Ministry of Productive Activities) Decree of 26 February 2002 redefines the subjects charged with implementing the Programme in order to guarantee the continuation of research activities in Antarctica and Italy's participation in the Antarctic Treaty.

The MIUR decree of 23 December 2003 established the new CSNA while the founding act of 17 April 2003 set up the Consortium for the Implementation of the National Antarctic Research Programme (Consorzio PNRA S.C.r.l.), which took over from ENEA, for the implementation of the National Antarctic Research Programme (PNRA), on the strength of the provisions of art. 4 of the Interministerial Decree of 26 February 2002. On 26 October 2005, during the Extraordinary General Meeting of the PNRA S.C.r.l. Consortium, an amendment was made to the By-Laws (the original was deposited with the C.C.I.A.A. (Chamber of Commerce) of the Province of Rome. The Consortium was set up with 4 Founding Entities (ENEA, CNR, INGV, OGS) which formed a Board of Directors (with 1 President, 1 Vice-President and 1 Director General) and a Board of Auditors.

Within the PNRA (National Antarctic Research Plan (PNRA) experimental research on climate change and technological research are carried out by ENEA. Together with CNR (the National Research Council), OGS (the National Institute of Oceanography and Experimental Geophysics), and INGV (the National Institute of Geophysics and Volcanology), it is partner of the PNRA S.C.r.l. consortium with a 28% share. It coordinates two out of twelve PNRA research sectors – Glaciology and Technology – and is member of the National Scientific Committee for Antarctica. The research on Antarctic are carried out in close cooperation with foreign research institutions within international agreements, several projects are carried out such as EPICA, TALDICE, ITASE to mention only some one.

*Target groups of programme (domestic and abroad)*

Target groups of National Antarctic Research Plan is the national and international scientific community involved in Polar Science. International scientific accords have been or are expected to be stipulated on several topics of particular scientific significance and/or logistic endeavour, such as:

- Concordia – Multidisciplinary research project based on an agreement between France and Italy but open to other countries to develop scientific and

technological research in the fields of glaciology, physics and chemistry of the atmosphere, astrophysics, human biology and geophysics. The project has also led to the construction of the permanent station Concordia on the polar plateau in the Dome C area which will operate all year round starting from the austral winter 2005.

- EPICA – European Project for Ice Coring in Antarctica is a EU funded scientific programme involving the deep drilling of the East Antarctic ice cap in order to study climate evolution over the past 900 thousand years. The drilling sites are Dome C and Dronning Maud Land.
- ITASE –International Trans-Antarctic Scientific Experiment is a framework programme that, by means of surface traverses thousands of kilometers in length, gathers data concerning the behavior of the cap and the related variations in global sea level as a consequence of the variations in climate and the environment over the past 200 years.
- Talos Dome – This is an international agreement currently being negotiated between Italy, France, Switzerland and Germany covering the deep drilling of the ice at Talos Dome, a peripheral culmination of the East Antarctic ice cap, situated some 300 km from the Mario Zucchelli station. Its aim is to study the climate and environmental evolution of North Victoria Land and the surrounding seas over the past 200,000 years.
- ANDRILL – Antarctic Drilling is a four-nation scientific agreement (USA, New Zealand, Germany and Italy) involving two drilling seasons in the Ross Sea area of sedimentary sequences using the technology trialed during the Cape Roberts project for research on climate evolution over the last 35 million years.
- BOOMERANG – The Balloon Observations Of Millimetric Extragalactic Radiation And Geophysics experiment allowed certain data to be collected on the early phases of the formation of the Universe; over the three-year period it is envisaged to develop this research in close collaboration with US research institutes.
- Antarctic Climate Evolution (ACE) – This is a multidisciplinary international programme promoted by SCAR aimed at coordinating ongoing research and at

stimulating fresh research on Cenozoic climate evolution in the Antarctic region.

- Evolution and Biodiversity in the Antarctic (EBA) – This is a multidisciplinary international programme promoted by SCAR aimed at coordinating ongoing research and at stimulating fresh research on the evolution of the Antarctic biota in response to climate change and at combining it with our knowledge of the climatic and tectonic context in which this evolution took place.
- Antarctica and the Global Climate System (AGCS) – This is a multidisciplinary international programme promoted by SCAR aimed at coordinating ongoing research and at stimulating fresh research on the role of Antarctica in the global climate system.
- Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR) – This is a multidisciplinary international programme promoted by SCAR aimed at coordinating ongoing research and at stimulating fresh research in the polar regions viewed as privileged sites for observing Sun-Earth relationships in the upper atmosphere.
- Sub-Glacial Lake Exploration (SALE) – This is a multi- and inter-disciplinary programme promoted by SCAR having the ultimate aim of using non polluting technology to sample the water, the biota and the sediments of several of the numerous sub-glacial lakes lying beneath the East Antarctic Polar Cap. The best known of these lakes is Lake Vostok, although Lake Concordia, near the Franco-Italian station of the same name, is scientifically no less important and significant.
- FDSN –Federal Digital Seismographic Network, is the international network into which the seismological data gathered by the Observatory research sector will be fed.

*Scope: thematic, geographic, types of research*

The programme objectives of the PNRA are:

*Global changes in the past*

Ice and sediment cores will be studied to extend knowledge of the geodynamic and environmental evolution of the planet on different time scales. A study will therefore be made of climate variation, greenhouse gas content, and the role played by ocean



currents and astronomic agents. In particular, very short term climate variations will be studied as well as the influence of anthropic effects on global climate. An enhanced knowledge of world-wide pollution will pave the way to an understanding of phenomena linked to global changes and will allow models and tools to be developed to enhance the environmental protection of the planet.

#### *Climatic processes*

Indications of on-going climate change will be drawn from the study of the extension of sea ice, ice platform dynamics, the mass balance of the polar caps as far as ice and ozone concentration are concerned, the minority gas components and aerosol characteristics, as far as the atmosphere is concerned. Also the monitoring of the marine and land ecosystems will prove useful.

#### *Biodiversity and adaptation*

The respect for and safeguarding of the environment presuppose the safeguarding of biodiversity so as to ensure the survival of all living species. The study of evolutionary physiological adaptation and of the present-day biodiversity of marine and land organisms will provide elements on which to base predictions of the effects of variations due to human activity. In particular, scenarios resulting from possible global warming will be constructed. The investigation of bacteria that prefer environmental conditions characterized by extreme temperature and salinity could possibly be used in the technological/applications field.

#### *Man's adaptation to environmental extremes*

Low temperatures, lack of oxygen at high altitudes and its isolation make Antarctica an ideal place in which to gain insight into man's adaptation. Attention will therefore be focused on the physical, psychological and also alimentary aspects and the problems linked to remote assistance (telemedicine) will be addressed. The results will be partly extendable to other extreme environments such as outer space.

#### *Ocean ecosystem*

The structure of land and pelagic communities, of vertebrate populations and the genetic variability of key species will be studied as a function of the variation of environmental parameters along a section of the North-South coast lying within a latitude of approximately 10°. A detailed study will be made of the role of marine ice

in biological productivity (a capacity that all plant species have to transform solar energy into organic matter) and the relative processes. Within the framework of CCAMLR, the international marine resources supervisory body an assessment will be made of the productivity of the Antarctic system as a whole as well as of the available marine resources as a function of their possible sustainable exploitation.

#### *Permanent observers*

The most satisfactory knowledge of the time evolution of polar phenomena and their influence on global climate is obtained through the analysis of historical data series. The most important data refer to physical, chemical, climatological, magnetic, ionospheric, seismic, geodetic and mareographic parameters.

#### *Antarctica and global tectonics*

The aim of this study is to reconstruct the processes of formation and evolution of the Antarctic continent over the geological eras and up to its present configuration. Investigations will focus on solving specific problems from the Ross orogen (500 million years ago) to the present time, inserting the data referring to the North Victoria Land into the broader context of the Transantarctic Chain. Geophysical surveys will add to our knowledge of the bed rock underlying the ice cover. The geophysical, geological and glaciological study of the subglacial lakes will allow the construction of glacial flow and water circulation models. The study of the edges of the Antarctic plate will yield information concerning the beginning and subsequent development of the Cenozoic glaciation (which according to recent estimates began some 34 million years ago). The accumulated knowledge concerning the continent will be progressively transferred to thematic (geological, geomorphological, glaciological and geophysical) maps.

#### *Space weather and astrophysical climatology*

The study of Sun-Earth interactions, such as the auroras and ionospheric currents, as well as enhancing our understanding of the complex of phenomena known as space weather, will provide an opportunity to test sophisticated technological equipment (e.g. radio communications), the failure of which is often a consequence of solar activity. Thanks to the transparency of the atmosphere and the low humidity, Antarctica is considered an ideal place from which to perform astrophysical

observations both from the ground and from balloons. In particular at Dome C, on the Antarctic plateau, where the finishing touches are being put to the Italo-French station Concordia, it is planned to install telescopes having different apertures. The features peculiar to ice cap dynamics facilitates meteorite concentration in specific zones called “traps”, which will continue to act as preferential sites in which to collect these samples from outer space. Meteorite analyses are useful for enhancing our knowledge of the mineralogical and geochemical composition of the solar system and for verifying the possible existence of life in space.

*Technological innovation applied to scientific research*

For the purpose of supplementing and completing the scientific activities, it is necessary to identify technological solutions and to develop prototypes in the fields of robotics, telescience and sensor science.

*Polar bases*

For the purpose of conducting the research the scientific stations “Mario Zucchelli” in Terra Nova Bay (SMZ) and “Concordia” at Dome C will be available, together with other supports both in Antarctica and in Italy and in the Arctic area (Ny-Aalesund).

In the Mario Zucchelli station the campaigns will be conducted during the austral summer. They will normally be subdivided into two or three periods and participation will be limited by the base’s accommodation capacity (about 70 persons). Fixed wing aircraft and helicopters will be available, together with small sea vessels, as well as mobile infrastructures for traverses and remote camps for activities outside the base.

At Concordia station, during the three-year period, both summer campaigns limited to about 50 participants will be conducted and technical-scientific activities limited to 16 persons during the winter period.

Calibration and comparative experiments and tests may be carried out at the Arctic base of Ny-Aalesund.

*Funding mechanism of the programme: role of national funding sources, international funding sources*

National Antarctic Research Plan is funded on a dedicated chapter of the Fiscal Year General Financial Law, approved each year by Italian Parliament. International funding are foreseen by the agreements concerning some of the bilateral or multilateral programs included in PNRA.

*Mechanisms for openness:*

**a) Channels for accessing programmes by foreign participants**

Participation is defined by bilateral and multilateral agreements.

**b) Rules for foreign participation**

Rules are defined by bilateral and multilateral agreements.

**c) Funding rules for foreign partners versus domestic ones, any legal issues**

Not applicable (each party funds its share).

**d) Foreign dimension in evaluation criteria: positive discrimination for international projects**

Though no formal positive discrimination for international projects is foreseen by PNRA, international projects are usually preferred.

**e) Use of foreign experts for project evaluation**

Foreign referees are usually employed.

**f) Results achieved: rate of participation / funding of foreign partners in national R&D programs**

No information available.

**g) Monitoring procedures w.r.t. foreign participation in domestic research programmes**

No information available.

**h) Evaluation procedures and results**

No information available.

**i) Legal, administrative and other barriers and incentives for opening up national R&D programmes with a focus on possible solutions**

No information available.

### **4.3 Conclusion**

The overview and the specific case studies presented can point out as Italy tends towards the opening up of its research system and its specific programmes.

INTGRAL mission is an example of a research program, first ideated and proposed by Italian scientists, that developed up to become a scientific collaboration open to the whole interested community worldwide. In fact, INTEGRAL mission starts from scientific interests and competences of the Italian astronomical community. The derived preliminary project of the instrument has been then proposed to research institutions of other countries, that were since long collaborating with Italian groups and originated a multilateral collaboration among Italy, France, Denmark and Germany. The resulting international working group was able to produce the operative design of an instrument with high potentiality that was selected in open competition with many other becoming an European project, though with Italian leadership, as it is proven by the fact that an Italian company was chosen as prime contractor. This project was then open to the collaboration of non-EU countries (USA, Russia Switzerland), that took part, at various level, to its realization. Last, the passage of the instrument, when it became fully operative, to the phase of international observatory opened the project and the collaboration to the whole worldwide community, on the only base of the merit of the proposals and without fund exchange. This path, common to other successful missions in the field of space based Astronomy, is possibly one of the most effective for research internationalization, since it does not start from targets that were selected outside the scientific community but by scientific needs and by an open and straight competition for selection of their best solution, in order to put the reached results in hand of the whole mankind.

Under many aspects, the path of the internalization of the Italian National Project of Research in Antarctica (PNRA) is similar. This project too started from Italian scientific community proposal; actually, the first PNRA base in Antarctica, the Terranova Bay Station, was born and for long was exclusively was a national base.

However, the need to extend the scientific activities, together with the natural tendency to the international collaboration of Polar Sciences scholars since the beginning of these researches, brought first to bilateral collaborations with USA and French polar expeditions, then to the creation of an international scientific station (Dome C), though this base has a prevalent French leadership and presence and to the integration of Italian leadership researches in the US Mc Murdo base.

Third proposed example is different: the “Fund for the Incentives to Basic Research” (FIRB) is a purely national structure concerning its funding sources and politic management and, as it was stressed in its description, foreign research structures are not allowed to receive FIRB-based funds. However, the need for internationalization of research is so strong in the Italian scientific community that this financial tool too was open to the participation of individual foreign scholars, whose presence has thus been inserted in the related rules. A number of young foreign researchers, who received three-years research contracts on FIRB funded projects, have now been permanently hired in the Italian research institutions that promoted these projects.

## **5. TOPIC 4. Joint R&D initiatives at country level**

### **5.1 Overview of topic**

#### **5.1.1 State-of-play**

The joint R&D initiatives may be regulated through governmental and ministerial agreements between countries or through the direct initiatives of Universities and Research institutions.

For example in February 2007, the Minister for Universities and Research signed, on behalf of the Italian government, an agreement with the French government in the field of space cooperation. The agreement also aims to strengthen links between the two national space agencies, the French CNES and the Italian ASI. This is a bilateral agreement defined within the framework of the European space policy.

In September 2007, the Minister of Universities and Research signed a joint declaration with the Chinese Minister of Science and Technology. They expressed the desire to increase cooperation in the following areas: new energies, energy saving and reduction emissions, environment, health, space, preservation of cultural heritage. This statement was followed by the publication of a call by the Italian Ministry of Universities and Research for funding joint projects for cooperation between the two countries' scientific institutions.

Another example of joint initiatives is the one signed between Italy and UK, which is a joint initiative, by the Minister of Universities and Research - in collaboration with the Conference of Rectors and the British Council. Its aim is to support collaborative projects between research groups in publicly funded institutions in both the higher education and non-higher education in Italy and the UK. The programme provides funding primarily for collaborative visits between the two countries. Project coordinators and members of the research groups must be in the early stages of their careers. The subject areas of the programme change yearly with the publication of the call for proposals each spring.

The key objective of this programme is to focus on new or recently initiated collaborative links offering international experience to young researchers. Projects are funded for a maximum of one year.

The international dimension is a relevant one in the policies of any research institution. Cnr international dimension is witnessed by its constant presence in many

European projects either as project leader or as a member of the research team. Bilateral agreements with its foreign counterparts are another relevant asset of CNR international policy and dimension.

Within the European Union, Eranet actions are the most relevant ones.

A number of different agreements are set up to regulate the use of big infrastructures. We may recall the cooperation with the UK CCLRC (Council for the Central Laboratory of the Research for the use of the neutron source ISIS (Oxfordshire – U.K.) or the cooperation with the French ILL (based in Grenoble).

The management of the CNR's major infrastructures affecting all the Organisation's activities represents a particularly important objective as far as the planning of resources to be allocated is concerned. The shared use of advanced equipment could also attract the interest of international research centres within an integrated European approach.

This equipment includes, for example: neutron beam sources for experiments on matter and also for life science applications; the oceanographic shipping fleet; the EMMA Laboratory managed in conjunction with other European countries to make available certified experimental transgenic animals.

### **5.1.2 Indicators availability**

The available indicators are: Number of countries involved. Budget lines devoted to joint initiatives. Number of research projects under joint R&D initiatives. The available figures are attached.

## **5.2 Case studies**

### **5.2.1 Executive Programme of Scientific and Technological Co-operation between Hungary and Italy for the years 2008 – 2010**

*Origin, framework and rationale of the initiative*

This agreement is presented as a typical agreement between Italy and a foreign country to carry out a scientific programme. The framework and rationale of the initiative is set up on the basis of the art.14 of the Scientific and Technological Co-operation Agreement between Italy and Hungary, which was signed in Rome on 21st May 2003 and came into force on 15th September 2006, the XVII Session of the Italian-Hungarian Joint Commission was held in Budapest on 13 December 2007 to examine the present state, further develop the scientific and technological co-



operation between the two Countries and define the new Executive Programme for the years 2008-2010.

The importance of science and technology for the economic, social and cultural development of the two Countries is growing. Particular emphasis is given to the role of international co-operation for the further development of the S&T system in the countries. A specific attention is paid to extending co-operation in international and European multilateral R&D programmes such as the Seventh Framework Programme of the European Union.

A further boost to scientific and technological co-operation will be given by the new Agreement on Scientific and Technological Co-operation which came into force on 15th September 2006.

Through this cooperation programme a number of research cooperation activities are foreseen that involve a relevant number of Italian and Hungarian universities and research institutions. 23 projects based in Italian Universities and 7 in public or private research centers have been chosen and financed within the chosen subject areas.

*Scope: Geographic target, R&D fields covered*

The geographic target is Hungary and the cooperation includes bilateral projects in the following priority areas:

- Basic Science
- Energy and Environment
- Life Science
- Nano-Science and New and Advanced materials
- Information and Telecommunication Technologies
- Technologies for cultural heritage

A total number of 76 projects were received and considered, by both Parties, eligible for the evaluation. The two Parties, in deciding which projects should be given priority for financial support, have agreed on the following criteria:

1. Qualification and experience of research teams
2. Methodology, approach, strategy, structure and documentation
3. Sufficiency of existing and proposed research infrastructure
4. Level of originality and innovation

5. Social and developmental added value for Italy and Hungary
6. Purpose of co-operation among the groups
7. Exploitation of results
8. Dissemination of results

In compliance with the above mentioned criteria, 28 projects were selected to be granted financial support for the exchange of researchers. The financing of the selected projects will be based on the national regulations being in force in both Countries. The selected projects are at present 23 based in Italian Universities and 7 in public or private research centers.

#### *Funding mechanisms and amounts*

Financial support means that the implementing institutions responsible for the management of the co-operation in science e technology between the two Countries will cover part of the research costs and the costs of the exchange of researchers.

The researchers will be entitled to the exchange only if they hold the nationality of one of the two countries signing this Executive Programme or if they hold a EU nationality and are legally resident in one of the two countries.

For each project short- term stay or 1 long-term stay will be financed yearly.

The researchers have to submit to the host Country, within 30 days after finishing their research, a final report on the activities of the study carried out. The report should be co-signed by both the Hungarian and the Italian researchers involved in the joint project.

For the stay of Hungarian researchers in Italy the Italian party will provide a contribution for accommodation expenses in Italy of researchers holding Hungarian nationality (or EU nationality and legally resident in Hungary).The Italian Party shall provide 93,00 Euro per day for short-term stays (up to 10 days) and 1300,00 Euro per month for long-term stays.

For the stay of Italian researchers in Hungary the planned visits will be agreed upon directly by the projects leaders. The visiting scientist shall get his/her per diem from his/her host Institution in the receiving Country. In case of short-term visits the allowance is 15.000 HUF/day. The allowance provided for long-term stays is 210.000 HUF/month.

At the end of the fiscal year an annual report on the tasks fulfilled and at the end of the project a final report on the results achieved, signed by both the projects leaders, will be submitted to the implementing agencies.

#### *Significant bilateral research projects*

The Italian party will consider granting an unilateral financial contribution to the significant bilateral research projects ("Progetti di Grande Rilevanza) These financial contributions are intended to partly cover the research activities of the project. The financial support will be granted to the Italian partners upon evaluation of the applications to be submitted according to the indications that will be given by the Italian side.

### **5.2.2 The European Mouse Mutant Archive (EMMA)**

*Origin, framework and rationale of the initiative (scientific cooperation agreement, objective )*

This project has been launched as a European consortium. The European Mouse Mutant Archive (EMMA) is a non-profit repository for the collection, archiving (via cryopreservation) and distribution of relevant mutant strains essential for basic biomedical research. The laboratory mouse is the most important mammalian model for studying genetic and multi-factorial diseases in man. Thus the work of EMMA intends to play a crucial role in exploiting the potential benefits to human health presented by the current research in mammalian genetics.

*Scope: Geographic target, R&D fields covered (generic or specific), type of research (basic, applied, pre-competitive)*

The EMMA network is a partnership of several laboratories and other institutions throughout Europe. The current membership includes the CNR Istituto di Biologia Cellulare in Monterotondo, Italy (core structure), the CNRS Centre de Distribution, de Typage et d'Archivage animal in Orleans, France, the MRC Mammalian Genetics Unit in Harwell, UK, the KI Karolinska Institutet in Stockholm, Sweden, the FCG Instituto Gulbenkian de Ciência in Oeiras, Portugal, the HMGU Institute of Experimental Genetics in Munich, Germany, the EMBL European Bioinformatics Institute in Hinxton, UK, the GIE-CERBM Institut Clinique de la Souris, Illkirch, France, the Wellcome Trust Sanger Institute in Hinxton, UK and the CSIC Centro

Nacional de Biotecnología in Madrid, Spain. The EMMA network is directed by Professor Martin Hrabé de Angelis who also heads the HMGU/IEG in Munich.

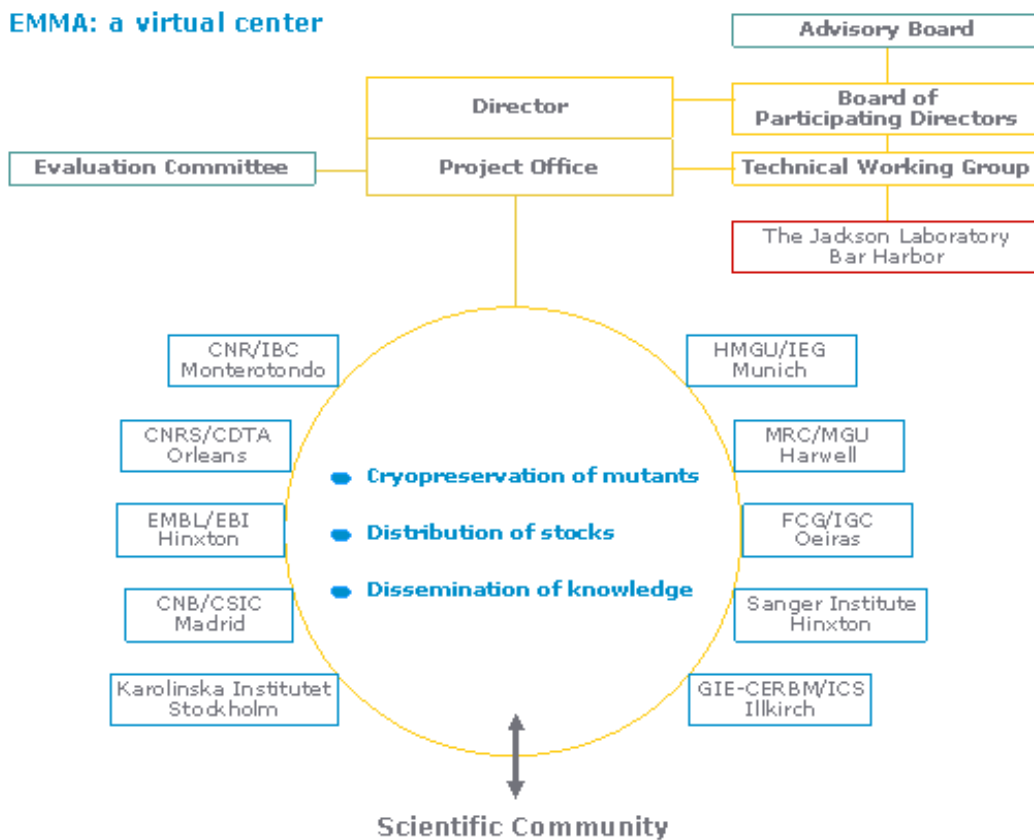
In Europe, several research institutes are creating a huge number of medically relevant mouse mutants. The capacity to make predetermined mutations in a mammalian genome and to mutate the genome on a large-scale basis stresses the need for professional, well co-ordinated archiving and distribution capacity. To fully benefit from these mutant resources, it is important to archive and distribute the most valuable lines in a concerted effort within Europe.

*Target groups in public and private research*

Bio-technology laboratories private and public institutions.

*Key players in research execution*

The formation of a consortium of several partners from different European countries leads to a huge potential for EMMA as the central mouse mutant repository in Europe. To work at optimal efficiency, different organisational levels have been created and implemented (see below).



CNR is the Head of the EMMA-Monterotondo Campus International Activities and the co-ordinator of the EMMAinf Research Infrastructures Programme grant under the Sixth Framework Programme of the European Commission. CNR-IBC is a partner of the EUMODIC, MUGEN and EUCOMM European Consortia for functional genomics in the mouse model, of the CASIMIR European Coordination Action and of the ESFRI INFRAFRONTIER Research Infrastructure.

*Key players in initiative implementation*

EMMA is supported by the partner institutions and by the European Commission's FP6 Research Infrastructures Programme.

*Modality of implementation: how is the transnational dimension incorporated into the initiative, selection criteria and procedure*

EMMA is involved in the European Conditional Mouse Mutagenesis Program (EUCOMM). EUCOMM is a Framework Project of the European Commission aimed at building a repository of mouse stem cells, each of which contains a mutation in one of the 20,000 or so genes in the mouse genome. Within the EUCOMM consortium EMMA is responsible for quality control of targeted embryonic stem cells and for cryopreservation and distribution of mice.

EMMA is a founding member of the Federation of International Mouse Resources (FIMRe), a collaborating group of mouse repository and resource centers from around the world whose collective goal is to archive and disseminate mouse strains as cryopreserved embryos and gametes, ES cell lines and live animals to the research community. Other FIMRe members include representatives from the United States, Canada, Japan and Australia.

*Content (instruments used):*

**a) EMMA Resource Database**

The EMMA-RDB classifies and describes all the mutant strains that EMMA stocks, including their genetic and phenotypic properties. It also constitutes a fundamental tool for the management of scientific, technical and logistical activities carried out by each EMMA partner and for the co-ordination and harmonisation of the resources and services to be shared by the different partners. The implementation of a virtual centre is the final goal. The project implements user-oriented access interfaces,

which provide external users with appropriate services for the development and application of protocols and standards facilitating data exchange and the distribution of EMMA scientific and technological resources.

The database models have been developed with the help of Rational Rose and Oracle Designer which helped to organise, visualise and understand the modelling problems and contributed to better communication between the people involved. The models capture the logical structure of the database and are independent of actual database implementation. There are two main packages: "Strain" and "Stock", while other EMMA activities (strain receiving/shipping, sanitary control, etc.) are modelled in separate packages. All packages are interconnected.

During the implementation phase the necessary software was installed for testing the generation of code from models. The code was concurrently tested on three database management systems (Oracle, Postgres, Sybase) to enable its usage on the EMMA partner sites with those systems already installed.

The EMMA-RDB partners interact with primary mouse bio-informatics resources and other genomics/proteomics databases (MGI-MGD, IMSR, ENSEMBL, SWISS-PROT, etc.) in order to develop and apply protocols and rules concerning gene and strain nomenclature and phenotype description in accordance with internationally accepted standards.

#### **b) Joint development and or sharing of infrastructure or facilities**

The database was developed in collaboration among the EMMA co-ordinating site at CNR-IBC, Monterotondo, the CNRS-CDTA and the EMBL-EBI. The partners co-operated in the production of the conceptual models of the database and in their implementation, installation and testing. They also interacted with the other EMMA partners and the bio-informatics services at The Jackson Laboratory (Maine, USA). CNR-IBC hosts the main server of the EMMA database. The EMMA Resource Database has obtained support by the European Commission's Framework Programmes 4, 5 and 6 and by CNR Strategic Projects.

The Consiglio Nazionale delle Ricerche-Istituto di Biologia Cellulare (CNR-IBC) at the "A. Buzzati-Traverso" International Campus at Monterotondo (Roma), is responsible for the management of the main EMMA facility and for the overall administrative co-ordination of the project.

The main server for the EMMA resource database (EMMA-RDB) is also located at the CNR-IBC. The 1,750-m<sup>2</sup> Monterotondo facility was renovated and upgraded in 1997, including a new 650-m<sup>2</sup> Specific-Pathogen-Free (SPF) barrier and new quarantine areas and cryopreservation, genotyping and sanitary analysis laboratories. With an estimated total capacity of 50,000-70,000 live animals and 100,000 frozen embryo/gamete vials, this is the largest research repository in Italy and the only Italian archive performing complete in-house processing and quality control of banked strains.

*Funding for scientific and technological meetings or workshops, provision of training*

Not available.

### **5.2.3 Project Environmental Management through Monitoring and Modeling of Anoxia)**

*Origin, framework and rationale of the initiative*

The project stems from the awareness that the Adriatic coastal area, and in particular the Central-Northern part of it, is subject to eutrophication and to anoxic events that have a large impact on society, both from an economic and social point of view, and specifically on the marine ecosystem (fishery), on tourism and on human health. The project aims at creating a connection between environmental research, local authorities and socio-economic operators. It intends turn scientific knowledge into operational strategies able to prevent and reduce the causes of anoxic events.

Hypo- anoxic waters are the result of two factors: an oxygen consumption and a segregation of the water body able to prevent a new oxygen supply. Oxygen consumption is due to biomass decomposition, often accumulated in the seawater because of its fertilization; segregation conditions are instead favored by windless weather. This was the case of the 70's and 80's hypo-anoxic events, which involved the whole North Adriatic Basin.

The growing importance fertilization loads and the strong influence of marine circulation, have led to the need for a detailed study on past and present hypo-anoxic events that affected that whole area.

To this purpose, the work program of the project combines scientific research with strategic planning and an awareness raising campaign targeted to local, regional and inter-regional administrations, as well as towards citizens.

The project intends to apply the results of scientific research by creating a working group which includes research centres, local and regional authorities as well as operators of the fishery sector to assess the implications of the anoxic phenomena from both an environmental and socio-economic point of view.

*Scope: Geographic target, R&D fields covered*

The principal objective of the project is to apply the results of scientific research and to turn them into a strategy, concerted at local level, aimed at improving the environmental quality through the reduction of the impact (environmental and socio-economic) of seasonal hypoxic and anoxic events occurring in the coastal areas of the Northern Adriatic Sea.

In particular the project is aimed at:

- Transferring scientific and technological knowledge to local administrations and to socio-economic operators with the objective of setting specific measures and interventions able to counteract the causes of deterioration of the marine ecosystem.
- Raise awareness on the need to use integrated environmental management systems, also in those local authorities which are not directly involved in the project.
- Exchange experiences and promote the use of the model in other Italian and European areas.

Actions:

- Design, implementation and test of a monitoring system able to record the key parameters of the main processes leading to potential anoxia/hypoxia conditions in the bottom waters and sediments.
- Design, implementation and test of a forecasting model able to anticipate the space-temporal evolution and the size of anoxic phenomena in the 72 hours after the emergence of the first anomalous signs. The system will assist institutions and socio-economic operators in the management of situations of



environmental risk and will allow decision makers to define appropriate intervention strategies in order to mitigate the impacts of these events.

- Transfer of the scientific and technical knowledge to those operators that, at the end of the project, will be responsible of the management of the monitoring system, to local public authorities and to other local operators involved in territorial management.
- Dissemination of project results at national and European level, with the goal of favoring the adoption of the model by other regions in the Adriatic Sea as well as other European regions affected by similar environmental problems.
- Awareness raising campaign on the need to adopt strategies of integrated management of the coastal areas at local, regional and inter-regional level.

Expected results:

- An experimental site for studying anoxia with the aim to integrate the monitoring network of the northern Adriatic Sea.
- A simplified 1D-hydrodynamic model able to forecast space and temporal evolution of dissolved O<sub>2</sub> concentration within 72 hours.
- A list of possible indicators of anoxic conditions based on fishing species specific behaviour.
- Management strategies based on the knowledge of demersal and pelagic fish resource distribution and on the analysis of the traditional fishing grounds, gear and behaviour of commercial fleets.
- An eco-toxicological protocol including the analysis of autochthonous marine bacteria along with bio-toxins, faecal pellets and chemical pollution.
- Short-term intervention strategies to be operated by means of temporary rules in order to manage ongoing anoxic events based on the integrated monitoring and forecasting system as well as on the DSS.
  - tools.

Long-term strategies to adopt concrete measures to prevent and reduce the negative impact of anoxia in the area by including project results in public management/planning

The CNR (Institute of sea sciences - Bologna) is the coordinator and Project Manager.

Participants are National Biology Institute of Piran (Slovenia), CNR - Istituto di Scienze Marine - Sede di Bologna, CNR - Istituto di Scienze Marine - Sede di Trieste, CNR - Istituto di Scienze Marine - Sede di Ancona, Università Politecnica delle Marche - Dipartimento di Scienze del Mare , Università degli Studi di Bologna - Dipartimento di Sanità Pubblica Veterinaria e Patologia Animale , ARPA-ER - Struttura Oceanografica Daphne , Comune di Rimini - Assessorato alle Politiche Ambientali , Regione Emilia Romagna - Assessorato Attività Produttive , Servizio Economia Ittica Regionale , ASTER s.cons.p.a.

The project is supported and co-financed by LIFE Environment program European Commission.

Scientific process

#### *The BUOY E1*

The E1 buoy, installed in Adriatic sea at 6 km offshore Rimini, is the core of this project and represent the fixed monitoring station. It allocates sophisticated apparatus to measure in continuum meteorological and oceanographical parameters useful to identify hypo-anoxic episodes. Operating since August 2006, it records every 30 minutes, at different depths: atmospheric pressure, temperature, relative humidity, wind speed and direction, solar radiation, temperature, salinity, dissolved oxygen, fluorescence and turbidity.

Data, transmitted via GSM every 2 hours at EMMA's Local Information Centre (LIC), are daily validated and analyzed, in order to be used into the forecasting model of hipo-anoxic events.

#### *The Monitoring Network*

The Project's dynamic monitoring system, implemented along the Adriatic coast of the Emilia-Romagna region from Lido Adriano to Cattolica, catches many goals to survey hypo-anoxia phenomena, improve the sensitivity of the forecasting system and became effective the Decision Supporting System (DSS).

Performed by ARPA-Daphne oceanography structure, a monitoring network of 18 stations perpendicular to the coast was identified and monitored every months (every 15 days in summer season) since April 2006. The monitoring includes: CTD profiles (temperature, salinity, dissolved oxygen, pH, chlorophyll) and composed total and dissolved of Nitrogen and Phosphorus.

Data collected in each stations are available in ARPA-Daphne web site .

### *The Forecasting Model*

A numerical 3-D model has been implemented in the Adriatic Sea aiming to follow and to forecast hypo-anoxic events. The model solves a set of equations representing marine dynamics (including vertical and horizontal advection and diffusion processes of oxygen) and biogeochemical fluxes (including oxygen simplified consumption and production).

Every day the model, received the river runoff and atmospheric numerical forecast data, computes dissolved oxygen (and biogeochemical parameters) evolution during the following 48 hours in the whole study area (see an example of forecast in the Rimini area). The showed good results are further improved by including (assimilating) the project buoy and monitoring network data.

The produced forecast is used by the Decision Supporting System (DSS).

### *DSS - Decision Supporting System*

The DSS is an instrument in a position to support the administrative and socio-economic subjects in the management of potentially critical situations deriving from the hypoxia/anoxia phenomena and to assist the decisional organs for a total improvement of the environmental quality through the elaboration of strategies of short and long term and of instruments political and trained adapted you to the need.

The project's DSS operates on two levels, scientific and managerial/socio-economic. The software is based on mathematical models of the main chemical, biological and socio-economic processes in the study area. It includes a module of multi-criterion analysis for the appraisal of the different management options of and a feedback that allows subsequently to modify and/or to refine the definition of such options.

The project foresaw, through Training and culture building, training activities for key actors as well as dissemination events to a non-specialist public.

The seminars to local authorities, fishery and tourist operators (locally and in Slovenia) were centered on specific themes related to the anoxic phenomena in the Adriatic sea, their chemical and physical description, the effects on fisheries and health risks, and their short-term forecasting through the use of oceanographic models developed within the project framework.

The 2 Rimini citizen days and the 7 classes of students from high schools in Rimini, Bologna, Trieste and Slovenia constituted the dissemination activities towards project goals.

*Targets groups in public and private research*

Research Institutes involved in Marine Research in Italy and Slovenia.

*Key players in research execution*

CNR (National Research Council), ARPA (Regional Environment Protection Agency), National Biology Institute of Slovenia.

*Key players in initiative implementation*

local administrations and to socio-economic operators.

*Modality of implementation: how is the transnational dimension incorporated into the initiative*

Transnational dimension is incorporated by participation to the research, financial support and results sharing with the Slovenian National Institute of Biology, by seminars involving Slovenian authorities, fishery and tourist operators and outreach involving Slovenian High Schools.

*Content (instruments used)*

All of the following activities are eligible for funding:

1. Personnel cost
2. Funding mobility costs of researchers (travel costs etc.)
3. Joint development and or sharing of infrastructure or facilities
4. Funding for scientific and technological meetings or workshops

*Funding sources and amounts*

The project is jointly funded also by CNR, local administrations and socio-economic operators, MIUR- FIRB.

*Results achieved*

The project foresaw, through Training and culture building, training activities for key actors as well as dissemination events to a non-specialist public.

The seminars to local authorities, fishery and tourist operators (locally and in Slovenia) were centered on specific themes related to the anoxic phenomena in the Adriatic sea, their chemical and physical description, the effects on fisheries and health risks, and their short-term forecasting through the use of oceanographic models developed within the project framework.

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### **5.3 Conclusion**

The joint R&D initiatives regulated through governmental and ministerial agreements between countries are the more common cases of bilateral and multilateral scientific collaborations among Italy and foreign countries. Within these initiatives are included many projects and direct research programs. The case studies present three typology of initiatives.

EMMA (5.2.2) is a one example of such initiatives. The Italian commitment in the project is witnessed by the direct leadership of the National Research Council which has been strongly involved in the preparation and implementation of the Project from the very beginning. A European consortium has also been created in order to manage an Italy based excellence research structure able to fulfil the goals of this challenging project.

On the other hand, “Anoxia” Project (5.2.3) is an example of a bilateral project born on a national base, aiming at creating a connection between environmental research, local authorities and socio-economic operators and turning scientific knowledge into operational strategies able to prevent and reduce the causes of anoxic events. This project was opened to bilateral collaboration with the National Biology Institute of Slovenia, because of evident scientific reasons, and received a small funding from EU, but is still mainly supported by Italian research institutions and local authorities. These projects (exemplified by the bilateral agreement between Italy and Hungary – 5.2.1) manage most of the international activities of Italian public scientific institutions and of the Italian companies.

## 6. Conclusions

The overview and the specific case studies presented can point out as Italy tends towards the opening up of its research also by the setting up of specific programmes. The Italian recruitment system for researchers and professors is open to foreign as much as to nationals. For instance any EU citizen can enter a research position in any public research institutions with exactly the same requirements as an Italian citizen. At the same time the involvement of Italian researchers in international programmes is quite widespread. It must be said though that in some cases the level of attractiveness of National projects it is not so relevant to foreign researchers and professors as either the amount of financing is not very high or the rules and regulations barriers may discourage from applying.

The priorities of the European Union and of the Lisbon strategy are the backbone of the actions undertaken by the Italian government towards the internationalization of the university and R&D system. The willingness and propensity of Italian higher education and research institutions towards internationalization though has to face strong budget cuts that are constant in the last 10 years, and often the funds devoted to internationalize the system are among the easiest to cut. Nevertheless the level of cooperation activities and of commitment of either universities and research bodies is high.

Specific programmes for mobility, such as the “Return of the Brains” one, address directly researchers, in this case to encourage the return of Italian researchers from abroad and to attract foreign researchers to Italy offering them a position in Universities.

Although the capacity of attraction of the country does not reflect its high potential and its present role in the international activities. Some simple indicators may contribute to justify this claim. The propensity to participate in European Programmes is high in Italy, recent data show that in the Sixth Framework Programme, as well as in other major funding instruments co-ordinated at European level, Italy shows a high participation rate. Italy is the fourth country in Europe after Germany, UK and France, for Number of institutional participations in research infrastructure projects funded by FP6.

Again Italy is in the fourth position among Member states for co-authorships in publications: researchers from European countries cooperate most frequently in this order with colleagues from the US, Germany, the United Kingdom, France and Italy. Regarding patents, data show that considering a five-year period (1999-2003), the institutions in the United Kingdom alone represent more than one third of the total number of patents applied for by higher education institutions in EU-27 (34.6 %) but the six most active countries over the same period were, in decreasing order: the United Kingdom, Germany, Belgium, France, the Netherlands and Italy, that contribute to almost 90 % of the total (88.8 %) number of patents applied for by higher education institutions.

As for cooperation in research, Germany, France, Italy and the United Kingdom were, in this order, the main cooperation partners for third countries in the last FP5 and FP6.

These only data show how the Italian scientific community is well entrusted in the international arena, which gives a measure of its quality and of the potential of the Country. The impact of Italian research either in terms of publications, citations and patents is good and the low inflow of foreign researchers is not adequate to the real capacity of Italian research to offer cooperation at the forefront.

Although in its total numbers the country still fails to attract enough foreign scholars, the single institution capacity of attracting researchers may be very high particularly in some fields (e.g. physics) or in some universities. The main weakness of the Italian research system in the internationalization of its activity is not due to the quality of research, which is witnessed by international indicators, such as citation indexes and patents, but to the general lack of financing which affects the system.

As for the opening up of universities, Italian and foreign universities and research centres acknowledge a considerable increase in the collaboration agreements. Either joint study programs, implementation of scholarship exchange of professors, researchers, students and direct cooperation in research programmes are widespread in the Country even if, obviously, at different pace.

In universities the presence of foreign students and PhDs is increasing. The university courses taught in English language still are not widespread all over the nation and the latest survey carried out by the Conference of Rectors states that 8

universities offer “Laurea” programmes (first-cycle, 180 credits), 14 universities offer “Laurea Specialistica” programmes (second-cycle, 120 credits), 24 universities offer “Dottorati di Ricerca” programmes (PhDs), 34 universities offer “Master Universitari” (professionally-oriented post-graduate courses), 20 universities offer summer/winter schools all taught in English.

The opening up of universities and the implementation of partnerships with foreign counterparts is mainly regulated via the use of intergovernmental bilateral agreements on science and technology. Framework cooperation programmes, Academic exchange agreements, Inter-university cooperation, Contracts, Consortia, Agreements on joint Graduate schools, Students or professors exchange regulate the flows of people and the carrying out of projects. Both Universities and research centers, through their international relation offices, access these funding sources. Direct funding is possible through international bilateral cooperation in research and technological innovation through the activities regulated by the Ministry of Foreign Affairs. These activities are very lively in many Universities and research centres.

Although the international vocation of the research system is strong, the National R&D Programmes are mainly directed to national research contractors either public institutions or private firms. Foreign partners can access the national funding (i.e. PRIN -Funding for Research Projects of National interest- FISIR -Integrated Special Fund for Research Activities- FAR -Funding to facilitate Research Activities - FIRB (Funding to supplement Basic Research) passing through a national partner that can re-directed part of financing to a foreign partner. The actions undertaken by national government and single institutions are in line with the strategic priorities of the European Union and the Lisbon Strategy aiming at attaining the common goals, but still many difficulties have to be faced mainly relating to the severe budget cuts on university and research activities. Priorities on internationalisation of the research system have to face the diminishing research budget. It should be considered that the financial incentives to promote international cooperation that Universities, CNR as well as others public research institutions, receive from central government are limited and not always sufficient to face the big challenges that cooperating with strong foreign competitors presents.

The initiative of research groups and sometimes also of individual researchers can often overcome the difficulties given by the paucity of financial resources and make



the Country enter the international arena with success. An important role is played also by the Italian researchers working abroad that can keep strong relationships with Italian research institutions.

European initiatives are in this respect essential to promote cooperation and facilitate the national participation.