



**European Cooperation
in the field of Scientific
and Technical Research
- COST -**

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COST 117/14

MEMORANDUM OF UNDERSTANDING

Subject : Memorandum of Understanding for the implementation of a European Concerted Research Action designated as COST Action TD1408: Interdisciplinarity in research programming and funding cycles (INTREPID)

Delegations will find attached the Memorandum of Understanding for COST Action TD1408 as approved by the COST Committee of Senior Officials (CSO) at its 191th meeting on 12-13 November 2014.

MEMORANDUM OF UNDERSTANDING

For the implementation of a European Concerted Research Action designated as

COST Action TD1408

INTERDISCIPLINARITY IN RESEARCH PROGRAMMING AND FUNDING CYCLES (INTREPID)

The Parties to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 4114/13 “COST Action Management” and document 4112/13 “Rules for Participation in and Implementation of COST Activities”, or in any new document amending or replacing them, the contents of which the Parties are fully aware of.
2. The main objective of the Action is to better understand how to achieve more efficient and effective interdisciplinary research in Europe as to strengthen our ability to address contemporary global challenges characterised by increasing complexity and uncertainty.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at EUR 44 million in 2014 prices.
4. The Memorandum of Understanding will take effect on being accepted by at least five Parties.
5. The Memorandum of Understanding will remain in force for a period of 4 years, calculated from the date of the first meeting of the Management Committee, unless the duration of the Action is modified according to the provisions of Section 2. *Changes to a COST Action* in the document COST 4114/13.

GENERAL FEATURES

Initial Idea:

21st century challenges are characterized by high potential impact, complexity and uncertainty. Understanding and addressing these types of challenges is an essential pre-requisite for meeting sustainability objectives and policies, and it can only be achieved through greater interdisciplinarity. This in turn requires significant changes to research programming and funding cycles at the national, European and international levels.

The overall aim of the COST Action INTREPID is to better understand how to achieve more efficient and effective interdisciplinary research in Europe, in order to enhance our capacity to meet Europe's grand societal challenges. It identifies three challenges, combining theoretical and practical dimensions: 1) reflecting and learning about interdisciplinarity; 2) building networks and collaboration among different research communities and the funding community; 3) enabling interdisciplinarity beyond structural, institutional and cultural barriers.

In order to encompass the entire life cycle of research programming and funding, from the strategic and abstract dimension of policy framing, to the practical dimension of project selection and implementation, the INTREPID COST Action will draw on examples and experience related to urban development. This broad area is characterised by multiple, interrelated, and interdependent challenges, which require a collaborative effort between disciplines.

The INTREPID COST Action brings together communities of researchers, and research policy makers, contributing to advance our understanding and effective application of interdisciplinarity. A range of activities is designed to draw upon the network's knowledge of barriers, as well as success and good practices, leading to the building of a critical mass of researchers and funders working to strengthen the European Research Area's capacity for interdisciplinarity.

Keywords: research programming and funding, interdisciplinarity, transdisciplinarity, multidisciplinarity, social sciences, natural sciences, urban development, sustainability, transformation, research policies, research evaluation.

A. CHALLENGE

A.1 Challenges related to objective

Interdisciplinary research and collaboration are recognized as a precondition to solve the problems and grand societal challenges confronting societies and the planet today. Increasing complexity and the joint effects of human induced changes challenge sustainability, creating both opportunities and threats. However, despite frequent calls to foster interdisciplinary research, active collaboration including knowledge exchange to date remains rare largely due to the transaction costs involved, and the lack of incentives.

The INTREPID COST Action is predicated on the idea that decisions that funders make have a major impact on how interdisciplinary research is shaped, the extent of integration, and ultimately its effectiveness. The overall aim of this Action is to create a pan-European reflection on the role and opportunities of interdisciplinarity in research programming and funding life cycles: defined here as a series of stages, elements and dimensions, including definition of the political agendas, policy statements/priorities, research programmes, funding calls for projects, ex ante evaluation, selection and excellence criteria, ex post assessment of output, outcomes and impact. The Action will develop insights into how to achieve greater and more effective interdisciplinary research in terms of urban development in Europe so as to strengthen our ability to respond to 21st century challenges, enhancing science's capacity to respond to society's need to transform.

Explaining the INTREPID Action challenge

The INTREPID Action seeks to address the nexus between societal complexity, sustainability, and interdisciplinary research, and proposes to do so in the context of urban development: a major challenge for the 21st century, and an arena of knowledge in need of “sustained reflection on our understanding” of its multiple realities, made more problematical given that no single disciplinary perspective is able to cover all the different aspects of the urban situation. Addressing the above nexus in the context of urban development requires a shift in objectives and established intellectual traditions conflicts with dominant conceptions of the nature of scientific knowledge and inquiry, since currently, interdisciplinary research is not considered ‘real science’ and the knowledge produced is seldom accepted as such.

The definition and common understanding of interdisciplinarity, and related ideas of ‘multi’ and ‘trans’ disciplinarity, remains both contested and subject to superficial rhetoric rather than conceptual clarity. These three concepts all pertain to the idea of linking disciplines for the purpose of researching

complex problems, however, their purpose and reach is fundamentally different. The COST Action will adopt the following understanding of the term ‘interdisciplinarity’: “a synthesis of knowledge, in which understandings change in response to the perspectives of others”, and a concept that “occupies the broadest position on the spectrum”.

Relevance of interdisciplinary research and funding as an object of study: analysis of status quo

Interdisciplinarity has been on the scientific agenda for a long time and many institutions claim it is a research priority. The Standing Committee for the Social Sciences (SCSS) of the European Science Foundation (ESF), the “grand challenges” articulated by the European Commission, and national and international funding bodies - all identify the collaboration between social sciences and life sciences as a key cross-cutting challenge for the 21st century.

However, although interdisciplinarity is increasingly central to research agendas, and recognised as a precondition for sustainability, its effective implementation in research projects remains the exception to the rule. Genuine progress towards greater unity of knowledge is often marginalised in actual projects and agendas. Cooperation in producing knowledge is uneven and weak in its ability to shift research agendas towards a new comprehensive approach to research. United Nations Educational, Scientific and Cultural Organization (UNESCO) reminds us that deep rooted divisions between disciplines lead to incomplete understanding of global changes affecting human societies. If the inevitable linkages within and across the different domains of the social, human and the natural sciences, are not taken into account in forming scientific inquiries, it will be impossible to generate the necessary system knowledge to sustain societal developments.

Asymmetries of power, authority and funding levels characterise and undermine attempts at interdisciplinary collaboration. Thus, those who have the power to make it possible need to recognise that far from thriving, it remains at risk and largely peripheral to the core of academic endeavours, notions of excellence, and related funding. Academic cultures are actually decreasing their capacity for interpenetration. Analysis of research funding reveals that “repeated attempts to promote research...also across the primarily discipline- based research councils” has had scarce results. Limited consensus among research councils and science administrators on how to operationalize and measure it in practice are important obstacles.

Studies in this area show that questions of funding have received considerably less attention in the literature compared with other institutional factors that inhibit interdisciplinarity such as career progression prospects, publishing constraints or appropriate training. For them there is a need to recognize that research funders are “key arbiters of research and knowledge practices”. Funders’ support is critical to achieve the potential value-added of interdisciplinarity and research councils

therefore have key roles to play in shaping large scale interdisciplinary research initiatives. The decisions and intentions of funders have a major impact on how interdisciplinary research is shaped, the extent of integration, and ultimately its effectiveness. The activities in this Action will fill an important gap in our current understanding of interdisciplinary research by evaluating the whole life cycle of programming and funding research into urban development, all the way to project implementations (i.e. beyond proposals) at a time when it is most needed.

Interdisciplinarity in EU Framework Programmes

An analysis of the Fifth EU Framework Programme (FP5) is illuminating: despite the exhortation of a closer collaboration between the natural and the social sciences, as a means to build science that better contributes to the comprehension and potential resolution of complex social problems, they find that project results fell short of these objectives. Interdisciplinarity has indeed gained clear expression in calls, and acclamation at the level of discourse, but it remains a challenge still to be met, for science and society.

As sustainability discourse has gained visibility and become central to policy formulation in most areas, there were forceful attempts in Sixth EU Framework Programme (FP6) and subsequently Seventh EU Framework Programme (FP7) to stimulate the research communities to address the economic, environmental and social dimensions of scientific and technological progress. This primarily translated in a new set of “rules of the game” that called for the explicit representation in project proposals of the socio-economic dimension of the envisaged research, and introduced explicit evaluation criteria to appraise the socio-economic relevance of the projects (ex ante) and their socio-economic impacts (ex post). Its scope and achievements were limited however by (i) the fact that interdisciplinarity was primarily conceived of as connecting natural sciences and Social Sciences and Humanities (SSH) in a multidisciplinary way and, more importantly (ii) the structure of the FP work programme, which still reflected the traditional thematic subdivisions of scientific research.

Interdisciplinarity in Horizon 2020

Horizon 2020 (H2020) introduces significant innovation through the Societal Challenges, which become the drivers of research and innovation priorities and actions. As a result, all research proposals will be bound to adopt an interdisciplinary approach.

The determination to strengthen the emphasis on research excellence seems to be at odds with the fact that there is currently hardly any mention of the necessary contributions the Social Sciences and Humanities to all the grand societal challenges. This has led to calls for interdisciplinarity to feature much more strongly in the assessment of research programming. The Vilnius Declaration, which

describes the value and benefits of integrating social sciences and humanities, also points out that accurate research evaluation that values the breadth of disciplinary and interdisciplinary approaches is required to tackle the most pressing societal challenges.

Why interdisciplinarity is still marginalised

This somewhat contradictory state of affairs has motivated plenty of discussions in conferences, workshops, research projects and policy reports. However the transition from analysis and discussion to promoting solutions and empirical research remains limited.

Beyond the rhetoric disincentives and (in)formal sanctions are the reflection of the ethos of science today: science is a short term enterprise which values above all the quantity of published materials in top journals of each discipline. Genuine interdisciplinarity requires close and continuous collaboration during all phases of a research project, collaboration which is rarely allowed. As disciplinary integration is a long term effort and implies great investment of time and energy, incentives are needed to compensate for the risks taken. Interdisciplinary researchers risk having less rewarding careers, often seen as neither theoretically challenging nor novel.

Some scholars argue that the whole institutional organization of university and research centres, as well as career trajectories, are conceived in a way that motivates and compensates narrow disciplinary orientation. Academic organisations, like any other organisations, are arenas of power, and the disciplines are a territory conquered (sometimes with great difficulty). As a result it is only rational that professionals hold on to them, not least in a time of increasingly precarious careers within academia (and beyond). An interdisciplinary career, driven by scientific curiosity and creativity, is often a more strenuous and risky trajectory.

Ultimately, the value of crossing the boundaries through interdisciplinary work needs to be recognised and rewarded, and this can only be done if the life cycle of programming and funding accompanies an emphasis on its benefits with an honest acknowledgement of the true and full costs of interdisciplinary research – financial, institutional and personal. In terms of the life cycle of research programming and funding specific to the urban development theme, scholars warn that the institutionalised view on what can be recognised as knowledge, and what cannot, may prevent a broader and more complete understanding of urban problems and their solution(s). This theme provides an excellent arena for exploring the multiple challenges of integrating diverse sources of knowledge, of multiple disciplines and actors, in an attempt to make sense of deeply interconnected and interdependent problems and solutions: both theoretical and practical.

A.2 Specific Action objectives

This brief overview of practice to date identifies the scientific challenges at the heart of the INTREPID network. Funding for research holds significant power over the destiny of interdisciplinary inquiry, and is therefore at the centre of this COST Action. The Action will look in greater depth at the entire programming and funding life cycle of research (defined above), as a proxy through which it can explore the relevance and priority that institutions give to interdisciplinarity (beyond declarations of good intentions), and their effectiveness in promoting it.

The Action will also seek to address the nexus between societal complexity, sustainability, the shape and formation of knowledge, and the programming and funding of interdisciplinary research. In order to encompass the entire life cycle of programming and funding (from the most strategic and abstract dimension of policy framing, to the most practical dimension of project selection and implementation), INTREPID will draw on examples and experience related to one key area: urban development. As illustrated above, this area is characterised by multiple, interrelated, and interdependent challenges, making it the perfect setting for a collaborative effort between disciplines. The dimension of governance in urban themes is especially dependent on the capacity to frame problems and solutions through interdisciplinary lens.

The overall aim of the Action is to better understand how to achieve greater and more efficient interdisciplinary research in Europe so as to strengthen Europe's capacity to respond to 21st century challenges, and meet H2020 goals, with particular reference to the urban dimension. To do this, INTREPID addresses three major challenges:

Challenge 1 – Understand Change: Reflecting and Learning

Challenge 2 – Critical Mass: Building Networks and Cooperation

Challenge 3 – Enable Change: Enabling interdisciplinarity.

Each will contribute to answer key questions, including: How is the process of funding research in pan-European, and other leading and emerging areas of academic research related to the concept of interdisciplinarity? How is interdisciplinarity prioritised and operationalised in research policy? What are the obstacles (structural, and Institutional and cultural) to efficient and effective interdisciplinarity and how can they be overcome? How can the transformative potential of interdisciplinary research be unleashed? How can this Action measure interdisciplinarity and its benefits? Which quality indicators to use in interdisciplinary work?

Each challenge addresses closely interrelated objectives:

CHALLENGE 1 - UNDERSTAND CHANGE - reflecting and learning

- Create a shared set of concepts and conceptions of multi, inter and trans disciplinaryity used in the life cycle of research programming and funding by policy makers, scholars, funding agencies and establish a common language across research communities and programme owners and a shared glossary in order to facilitate collaboration and mutual understanding throughout the Action;
- Identify and learn from the diversity of current practices (on urban planning and development) in promoting and managing interdisciplinarity, from institutions located in pan-European, and other leading (e.g. USA, Australia) and emerging (e.g. Brazil, Uruguay) areas of academic research;
- including: examine whether there are links between national research/institutional cultures and the way in which interdisciplinarity is promoted and monitored in research programmes;
- Discuss and identify alternative goals, criteria, indicators that can guide reviewers of funding programmes in their evaluation of interdisciplinarity.
- Collate expert opinions and perceptions through a “SWOT analysis” (Strengths-Weaknesses-Opportunities-Threats) of interdisciplinary approaches to funding of research in the area of urban development;

CHALLENGE 2 - CRITICAL MASS - building networks and cooperation

- Drawing together researchers who have worked on EU, national and private funded research (on urban issues), so as to build on past investments and experience, deriving new insights;
- Connect research and funding communities using different languages and methods, overcoming common obstacles to the operationalization of interdisciplinarity and sustainability – focussing on the key theme urban development;
- Build an interdisciplinary group of scientists that will promote self-reflection, shared learning, stimulate discussion, with the aim of deepening understanding of the opportunities and obstacles affecting access to funding and research practice.

CHALLENGE 3 - ENABLING CHANGE - enabling interdisciplinarity: beyond structural, institutional and cultural barriers

- Build on the previous elements to identify how to overcome barriers to mainstreaming interdisciplinarity (a) throughout the funding cycles under scrutiny by the Action, (b) within Partner’s Higher Education Institutions (HEI)/research institutions and c) within Partner’s funding agencies;

- Explore institutional and practical implications of mainstreaming interdisciplinarity in the following areas. (a) The programming and funding cycle – with particular focus on five criteria for effectiveness: locus of interdisciplinarity, catalysis, inspiring leadership, active management, and learning and continuity; (b) Higher education institutions/research institutions in partner countries; questions will include: how to routinize effective systems for interdisciplinarity; how to build capacity for interdisciplinarity; how to introduce active management of interdisciplinarity; how to move beyond interdisciplinary research and scholars being perceived as ‘second tier’; (c) Funding agencies in partner countries; questions will include: what barriers do they confront when defining research programs with a strong interdisciplinary component? How can funding strategies be re- framed to improve their interdisciplinary component in urban development?
- Develop proposals for new types of innovative research programmes and projects related to urban development that would greatly benefit from a highly interdisciplinary approach;
- Make recommendations and develop practical guidelines for funders and HEIs/research institutions in partner COST countries, on how to address and resolve barriers and create opportunities including, in particular: measures/criteria for the evaluation of interdisciplinarity.

A.3 INTREPID Impact: timeliness, innovation and benefits

Timeliness

INTREPID builds on a widely shared perception that interdisciplinarity (and transdisciplinarity) as a step towards unified knowledge, is quite simply a necessary condition for the sustainability of progress and wellbeing in Europe, and beyond. There is an urgent need to significantly improve the way research programming and funding conceives of interdisciplinarity.

Innovation

The INTREPID COST Action builds on a wealth of research, including the COST Action C20, framing the challenge of interdisciplinarity in multi-dimensional terms through the life cycle of research programming and funding. It will bring together different research communities and practitioners and it will combine competences in a variety of skills e.g. managing higher education programs, conceiving and managing funding programmes and business incentives, foresight analysis, innovative pedagogic skills (e.g. scenario centred planning), qualitative analysis, stakeholder outreach and targeted dissemination. As such the reflection conducted in this network will itself be a

laboratory of interdisciplinary work as well as of the linkage of science and practice in the issue of the life cycle of funding.

Benefits

By increasing our understanding of what it is, how it works, what obstacles reduce its practice and efficiency, this COST Action will make an important contribution to strengthen the European Research Area (ERA), Europe's capacity to successfully engage with the grand societal challenges of the century, and to promote innovation and excellence. The Action will have both short term and long term impacts as detailed below.

The Action will result in outcomes leading to short to medium term impact and long-term implications:

- Improved capacity to measure interdisciplinary research within funding agencies and academic institutions, based on indicators;
- Scenario analysis of possible futures for academia to embrace interdisciplinarity;
- Recommendations directed to HEI/research institutions to improve effective and genuine interdisciplinarity Recommendations for policymakers involved in research policy and politics, and for funding agencies and key stakeholders, by means of guidelines and policy briefings;
- Publications – including a Special Issue synthetizing the main findings of the whole Action for Challenges 1 and 3, a series of Workshop Reports and related dissemination material, and interdisciplinary training material developed using a scenario-centred-learning approach.

The Action will take care of the organization and delivery of:

- Two training schools, bringing together early stage researchers, public officials, HEI and funding agencies managers to discuss and share experience with interdisciplinary research and reflect using scenario analysis methodologies on the potential for mainstreaming interdisciplinarity in those institutions;
- Three workshops to: 1) learn from the diversity of current practices in Interdisciplinary funding in institutions located in pan-European, and other leading (e.g. USA, Australia) and emerging (e.g. Brazil, Uruguay) areas of academic research; 2) collate expert opinions and perceptions through a SWOT analysis of funding interdisciplinary approaches to research in the area of urban development; and 3) discuss and identify alternative goals, criteria, indicators that can guide reviewers of funding programmes in their evaluation of interdisciplinarity.
- Two conferences that will lead to a special issue of an international journal;
- A number of Short-Term Scientific Missions (STSMs), which will strengthen the network through exchange visits while simultaneously allowing grantees to deepen the understanding of Challenges 1 and 3 above, gather and analyse data from a range of stakeholders, to be fed to the Training Schools and Wokshops, and to contribute towards produce peer reviewed publications.

- A website with open access to the material produced by the network.

The Action will strengthen the European Research Area by establishing a new network of professionals which is intended to become a platform for:

- Promoting better understanding of the context of programming and funding life cycles for interdisciplinary research;
- Fostering a necessary dialogue, and the exchange of knowledge and of good practice: with and amongst funding agencies, and between them and institutions participating in the Action;
- Creating the base for participating to future Horizon 2020 calls;
- Implementing cooperation and knowledge exchange among experts in different disciplines, notably sustainability science, urban studies, geography, hydrology, geology, anthropology, engineering, sociology, political science. Making a comparative evaluation of national, European Union (EU) and pan European-wide practices.

B. ADDED VALUE OF NETWORKING

The INTREPID COST Action brings an innovative perspective to the rapidly growing interest in interdisciplinary research, by focusing its activities on the life cycle of interdisciplinary research programming and funding, defined as: a series of stages, elements and dimensions, including definition of the political agendas, policy statements/priorities, research programmes, funding calls for projects, ex ante evaluation, selection and excellence criteria, ex post assessment of output, outcomes and impact. The activities will bring together and benefit from a unique network that is Pan-European and international, interdisciplinary and multisectoral.

The network is conceived to address the challenges to interdisciplinarity in the life cycle of research programming and funding, outlined in Section A, and to meet the horizontal objectives listed under Challenge #2 (Critical Mass: Building Networks and Cooperation), which are meant to enable the pursuit of Challenge #1 (Understand Change: Reflecting and Learning), and #3 (Enable Change: Enabling interdisciplinarity).

The gap: scarce reflection on the life cycle of research funding

The literature has been focusing mostly on challenges of conducting interdisciplinary research at the project level, but the strategic management of interdisciplinarity at the national programme level is limited there is almost no work documenting the life cycle of interdisciplinarity and the obstacles confronted from policy level to research project level. Underlying it is the lack of consensus on how to measure interdisciplinarity in practice. Research conducted by the Global Research Council demonstrates a number of weaknesses regarding peer review guidelines of 19 national funding

agencies. A 2006 special Issue of Research Evaluation highlights a number of difficulties related to evaluation of interdisciplinary research.

As demonstrated in Section A, financing interdisciplinary research is faced with specific difficulties, as it requires, for instance, longer duration projects, higher coordination costs, more frequent face to face contact, and the frustration accumulated in large part of the interdisciplinary research community. A number of scientific articles and reports identify major barriers and develop recommendations for how research funders can improve the effectiveness of interdisciplinarity, but the problem persists.

Meanwhile, the challenges to the success and sustainability of urbanisation in Europe require even greater effort to frame and solve problems in interdisciplinary terms: despite a substantial, general increase in wealth and welfare, social problems, environmental problems and economic inequalities have not been significantly reduced. This requires sustained reflection on our understanding and on the notion of knowledge itself related to the urban challenge. Moreover the main goal of H2020 initiative is to improve Europe's innovation capability and capacity. Therefore strengthening the "pathway of problem solution", the "pathway of scientific innovation" by allowing interdisciplinary research ("integrative research pathway") would result in transferable knowledge that can be (re)-integrated into the societal and scientific practice.

A network that enables innovation through interdisciplinarity

INTREPID's three challenges and network composition are conceived to seek innovative and effective solutions, bringing together interdisciplinary scholars, urban research scholars and research funding agencies and practitioners. It is precisely through the creation of the conditions that characterise COST activities that progress can be made towards interpreting and solving some of the persistent obstacles to effective interdisciplinary research. The INTREPID COST Action will benefit from a reasonably long duration (4 years) and the provision of financing for regular face-to-face meetings that will make it possible to add value to such discussions, and to find conceptual and practical solutions to cultural and institutional obstacles. Other contexts gathering researchers from different disciplines with practitioners exist but a COST Action provides the ideal structure for the creation of tacit knowledge on issues that have been on the table for long, but remain essentially unresolved, leading to no significant impact on how the research programming and funding cycles deal with, and implement, interdisciplinarity.

This network is meant to create a motivating and favourable context for reflection, learning and dissemination of conceptual and practical advancements in the mainstreaming of interdisciplinarity

within the life cycle of programming and funding in urban studies. It is expected that the Action will act as a pilot initiative to be extended to other areas.

The diversity of funding policies in Europe and beyond –learning and reflecting in in a diverse context

Policies and funding priorities between various countries are widely different. This is partly due to the fact that the main drivers are fundamentally different between countries. In this COST Action partner countries and institutions will face a wide variety of funding policies in what concerns interdisciplinarity. For instance, in Portugal and Spain the funding agencies for science do not have a domain that is specifically dedicated to “Interdisciplinarity”, as a potential choice for those who submit a proposal.

In Norway great emphasis is given to interdisciplinarity and a number of its programs are based on multi and interdisciplinary approaches. Brazil has recently included an “Interdisciplinarity” domain, and even though it is currently insufficiently funded, the research community has shown a growing interest in it. Higher education and research institutions, as well as funding agencies, are unanimous in its relevance for the development of science.

Good practices of interdisciplinary programs in Europe

With regards to higher education institutions (HEIs), the levels of implementation of interdisciplinarity also vary. Section A highlighted the shortcomings and barriers to the implementation of interdisciplinary research. However, Europe also includes cases of excellence, which the network will be able to share through some of its partners, as well as seek from elsewhere, inviting experts in order to learn and build stronger understanding, practices and recommendations for dissemination.

Good practice of interdisciplinary programs beyond Europe

With much of the literature on the practice of interdisciplinarity emanating from the United States and a well-established and growing emphasis on interdisciplinary and cross-directorate programmes within USA funders (e.g. National Science Foundation), INTREPID seeks to draw on expertise from established centres of excellence (including the USA and Australia) and from emerging countries (including Brazil) in order to both learn from good practice, and to create a strong and long-term collaboration between academics and stakeholders actively pursuing interdisciplinary scholarship:

One such example would be the Comparative Assessment of Peer Review (CAPR) project funded by the National Science Foundation – Science and Innovation Policy (NSF SciSIP) programme, which

examined policies for interdisciplinarity and societal impact within six research funding agencies worldwide. Another example is the Dynamics of Coupled Natural and Human Systems Program (CNH) at NSF. The program funds proposals for research that advances basic scientific understanding of the dynamics of a natural system, the dynamics of a human system, and the ways in which each of these sets of dynamics affects the other. Interdisciplinarity is explicitly required in all proposals and is also inherent in the review process. Moreover the CNH is co-administered by the Directorates of Biology, Geosciences, and Social, Behavioural and Economic Sciences.

The sharing of experiences (good and bad practices) in such international context (inside and outside EU) will enrich the reflection of this COST Action and consequently the recommendations to overcome obstacles to interdisciplinarity (and will help build international support for this kind of research).

Interdisciplinary themes like urban studies require reflection through a heterogeneous networks

INTREPID will bring together researchers and staff persons from funding agencies from many different disciplines – sustainability science, urban studies, architecture geography, hydrology, geology, anthropology, engineering, sociology, economics, political science, conservation biology, ecology, knowledge management, computer science, business administration, archaeology, development studies and integrated water resources management. As such this COST Action gathers groups of individuals looking at interdisciplinarity from different but highly complementary perspectives: those researching within the framework of studies of science which have a broad outlook of the subject; those researching it in the context urban studies, who have more concrete/specialised knowledge of a subject; and those practicing it as funders.

It is recognised that innovation requires combined knowledge from many disciplines in order to succeed in reaching the promised impact. Interdisciplinary research is committed to the creation of new knowledge as it is driven by tension between specialisation and the triggering interplay between disciplines. However, Europe is struggling to be innovative and this is due to many different issues such as academic, policy and industry silos as well lack of communication among the different disciplines. Urban development, INTREPID's focus, is exemplary in this sense. The study of urban development too often falls into the cracks between disciplinary fault lines. Since academia becomes ever more specialised and thus lacks the traditions for synthesis of various aspects of the research required to develop a more rounded understanding of the urban context. These are findings that relate to both North and Southern European contexts, making a compelling case for better and more targeted research programming, funding, implementation and communication, involving science, policy and

stakeholders. However this will not happen unless a paradigm shift takes place in understanding multifaceted issues from these three perspectives. This paradigm shift must take place at EU, national, regional and even local levels.

The COST Action is open to researchers of different levels of experience, ranging from early career researchers to senior researchers. Some of the Action members have experience as participants, or even coordinators, of large interdisciplinarity projects in both the areas of urban and water studies and in projects that pursue the science – policy link, knowledge management and communication initiatives among research, policy and industry. Moreover INTREPID's network combines competence in a variety of skills e.g. managing higher education programs, conceiving and managing funding programmes and business incentives, foresight analysis, innovative pedagogic skills (e.g. scenario centred planning), qualitative analysis, stakeholder outreach and targeted dissemination. Working with a heterogeneous community is certainly a challenge and implies a higher risk but the potential benefits/breakthroughs are greater.

All these characteristics of this pan-European Network (including varied disciplines, types and levels of experience and skills) are a warrant that human and physical resources will be leveraged to bring about relevant outputs from the COST Action activities aimed at tackling Challenges 1 and 3: reflecting and learning, and enabling interdisciplinarity in research programming and funding life cycles.

Long term impact of a reflection born in a COST network

In short, INTREPID will bring together different research communities and practitioners. The reflection conducted in this network will itself be a laboratory of interdisciplinary work as well as of the linkage of science and practice in the issue of the life cycle of funding, a dialog which has not been fruitful so far. Moreover, as a result of this network, communities of researchers that have been working apart but sharing common interest will be bridged. Researchers in the fields of urban studies commonly acknowledge the need to work interdisciplinary, but then, due to a number of obstacles do not find a favourable context to do so. This COST Action has the mid-long term goal of building a critical mass of researchers and funders prepared to work in truly interdisciplinary contexts and committed to putting interdisciplinarity in the funding and research agendas, specifically in this area of study. Ideally a broader research agenda with improved interdisciplinary concerns will develop from this COST Action.

Network reach

INTREPID envisages a build-up of collaboration and dialogue with stakeholders over the whole Action lifetime, linked to the Actions listed in Section C. Each milestone aims to strengthen the current network while simultaneously searching for broader collaboration through the invitation of experts (researchers as well as funding agents and policy makers).

C. MILESTONES AND DELIVERABLES: CONTENTS AND TIME FRAMES STRATEGY

Objective 1 (A.1) - Type: Development of a common understanding/definition of the subject matter

1. Joint peer-reviewed publication, open access.
2. Science and Technology Coordination, Short-Term Scientific Missions (STSM).
3. Science and Technology Event or Meeting, Action Workshop.
4. Documents to be used as Input to Stakeholders, to users/practitioners.

Objective 2 (A.5) - Type: Development of knowledge needing international coordination: new or improved theory/ model/ scenario/ projection/ simulation/ narrative/ methodology/ technology/ technique

1. Stakeholders Outreach, including Unwritten Inputs and Dissemination, to end users/practitioners.
2. Science and Technology Event or Meeting, Action Conference.
3. Science and Technology Event or Meeting, Action Workshop.
4. Internal and External Communication, Production of dissemination material for distribution.
5. Science and Technology Coordination, Short-Term Scientific Missions (STSM).

Objective 3 (A.7) - Type: Input to stakeholders (e.g. standardization body, policy-makers, regulators, users)

1. Science and Technology Event or Meeting, Action Conference.
2. Science and Technology Event or Meeting, Action Workshop.
3. Science and Technology Event or Meeting, Training School.
4. Stakeholders Outreach, including Unwritten Inputs and Dissemination, to the government sector.
5. Documents to be used as Input to Stakeholders, to the government sector.

Objective 4 (B.13) - Type: Bridging separate fields of science/disciplines to achieve breakthroughs that require an interdisciplinary approach

1. Science and Technology Event or Meeting, Action Conference.
2. Science and Technology Event or Meeting, Action Workshop.
3. Science and Technology Coordination, Short-Term Scientific Missions (STSM).
4. Internal and External Communication, Website.
5. Science and Technology Event or Meeting, Training School.

C.1 Milestones for Action Challenges and Objectives

Year 1 focuses around Challenge 1 objectives (Understand Change: Reflecting and Learning). All steps are designed to contribute to Challenge 2 objectives of achieving critical mass by building networks and cooperation. Challenge 3 objectives will build on the activities developed in Challenge 1 and it is focused on enabling interdisciplinarity in the funding cycle with a strong emphasis on scenarios for the production of a roadmap for effective interdisciplinary research and funding for urban development in the 21st century.

Every effort will be made to align Working Group (WG) meetings with the activities entailing meetings, including workshops, training and conferences. Furthermore, the Management Committee (MC) will endeavour to plan these events, wherever possible, so that they coincide with high profile events linked for example, to Horizon 2020 and to the European Innovation Partnerships (relevant urban development).

Table 1: Planned Action activities over a period of four years

Challenges and Objectives	Strategy associated to the Categories of Action Objectives*	Activities Year 1	Activities Year 2	Activities Year 3	Activities Year 4
CHALLENGE 1 REFLECTING AND LEARNING List of C1 objectives:					
C1.a Learn from the diversity of current practices State of the art in Interdisciplinary funding in institutions located in pan-European, and other leading and emerging areas of academic research; Based on an analysis of the	A1	Action workshop.1 Documents to be used as input to stakeholders	STSMs	Joint Peer reviewed publication STSMs	STSMs

policy cycle of funding (from policy statements to project implementation) assess what role has been attributed to interdisciplinarity and how it has been taken into account in evaluation processes		Short term Scientific Missions - STSMs			
C1.b Collate expert opinions and perceptions through a SWOT analysis of interdisciplinary approaches to funding research in the area of urban development;	A1	Action workshop.2 STSMs	Documents to be used as input to stakeholders STSMs	STSMs Joint Peer reviewed publication	
C1.c Discuss and identify alternative goals, criteria, indicators that can guide reviewers of funding programmes in their evaluation of interdisciplinarity.	A7		STSMs.	STSMs Action workshop.3 Stakeholder outreach Documents to be used as input to stakeholders	Joint Peer reviewed publication Stakeholder outreach
CHALLENGE 2 BUILDING NETWORKS AND COOPERATION List of C2 objectives:					
C2.a Draw together researchers who have worked on EU, national and private funded research, so as to build on past investments and experience , deriving new insights ;	B13 A5	STSMs Action workshop.1 & 2 Stakeholder outreach	STSMs Training school.1 (interdisciplinarity) Action Conference. 1	STSMs Action workshop.3	STSMs Action Conference. 2
C2.b Connect research and funding communities using different languages and methods, overcoming common obstacles to the operationalisation of interdisciplinarity and sustainability – focusing on the key theme urban development;	B13	Action workshop.1 & 2 Stakeholder outreach	STSM Training school.1 (interdisciplinarity) Action Conference. 1	STSM Action workshop.3 Training school.2 (foresight)	Action Conference. 2
C2.c Build an interdisciplinary group of scientists that will promote self-	A1 B13	Website Conference of	Website Conference	Website Conference	Website Conference

reflection, shared learning, stimulate discussion, with the aim of deepening understanding of the opportunities and obstacles affecting access to funding and research practice;		attendance	of attendance	of attendance	of attendance
CHALLENGE 3 ENABLING INTERDISCIPLINARITY List of C3 objectives:					
C.3.a Building on the previous elements, identify barriers to mainstreaming interdisciplinarity (a) throughout the funding cycles under scrutiny by INTREPID, (b) within Partner's higher education/research institutions and c) within Partner's funding agencies;	A7	STSMs	STSMs Stakeholder outreach	STSMs	STSMs
C3.b Explore institutional and practical implications of mainstreaming interdisciplinarity in: the programming and funding cycle and Higher education/research institutions in Partner countries.	A1 A5	STSMs	STSMs Stakeholder outreach	STSMs Education and/or training material	STSMs
C3.c Develop examples of innovative research programmes and projects related to urban development that would greatly benefit from a highly interdisciplinary approach; Develop a roadmap for achieving interdisciplinarity research in Higher education/research institutions and funding agencies	A5 B13	STSMs	STSMs	STSMs	STSMs Production of dissemination material for distribution
C3.d Make recommendations and develop practical guidance for funders and Higher education institutions in partner COST COUNTRIES, on how to address and resolve barriers and create opportunities ; (including, in particular: measures/criteria for the evaluation of interdisciplinarity).	A7		STSMs Training school.1 (interdisciplinarity) Stakeholder outreach	STSMs Training school.2 (foresight) Stakeholder outreach	STSMs Production of dissemination material for distribution Action Conference. 2

* The categories of Action objectives relevant to INTREPID are the following ones:

- A1 = Development of a common understanding /definition of a subject matter
- A5 = Development of knowledge needing international coordination
- A7 = Input to stakeholders
- B13 = Bridging separate fields of science/disciplines to achieve breakthroughs that requires an interdisciplinary approach

C.2 Deliverables

The COST Action combines three of the four kinds of knowledge envisaged by this framework namely tacit knowledge, codified knowledge and societal applications. Table 2 shows how each of the ten deliverables address a wide variety of target groups. For instance, Training Schools will share knowledge with the target groups (trainees occupying different positions in the research programming and funding cycles, from higher education institutions representatives, staff from public and private funding agencies and policy makers), thus contributing to the Enabling Interdisciplinarity objective (linked to Challenge 3). These schools will thus play an important role in addressing and solving barriers and creating opportunities for interdisciplinarity in COST participating institutions. The participation of early stage career researcher will be highly encouraged. Wherever possible COST Action meetings, workshops, training schools and conferences will be timed back-to-back with a large event in order to attract the widest possible audience and reduce costs.

The Action will:

- Organise workshops and conferences in relation to the European Innovation Partnership (EIP) for Smart Cities and Communities. Communicate INTREPID’s findings and suggestions and collect feedback for further consideration.
- Organise a satellite-meeting aimed at building on the findings of COST Action C20 on Urban Knowledge, targeting urban experts from the social, economic, political and cultural perspectives, aiming to co-produce elements of an interdisciplinary research agenda in collaboration with final “users”.

Table 2: INTREPID’s deliverables over four years

DELIVERABLES	TIMING (Y=YEAR)	DESCRIPTION
Action Workshop	Y1	1st Action Workshop: Learn from the diversity of current practices State of the art in Interdisciplinary funding in institutions located in pan-European, and other leading and emerging areas of academic research; Based on an analysis of the policy cycle of funding (from policy statements to project

		implementation) assess what role has been attributed to interdisciplinarity and how it has been taken into account in evaluation processes.
Action Workshop	Y1	2nd Action Workshop: Collate expert opinions and perceptions through a SWOT analysis of interdisciplinary approaches to funding research in the area of urban development; it will provide a thorough, cross-country, analysis of the current status of funding of interdisciplinarity in urban development research; learning about best practice from institutions located in pan-European countries. The work will include both historical and forward- looking perspectives.
	Y3	3rd Action Workshop: Discuss and identify alternative goals, criteria, indicators that can guide reviewers of funding programmes in their evaluation of interdisciplinarity. It will provide new insights and guidance material for the evaluation of interdisciplinary research and related funding.
Short term Scientific Missions (STSM)	Y1-Y4	A minimum of 16 STSMs will permit selected COST partners to build on findings from the 1st and 2nd workshops, and, through targeted missions, access specific information from key stakeholders (including: science policy and decision-makers, higher education institutions, funding agencies – public and private, funding programme evaluators). Generally speaking STSMs will contribute to all Strategy Objectives (Table 1) and in particular to develop 1) a deeper understanding of institutional and practical dimensions that motivate or impede mainstreaming interdisciplinarity, 2) innovative research programmes and projects for urban development, and 3) recommendations and guidance for funders and higher education institutions. STSMs will also have the important role of feeding in information for Training School 2.
Training school	Y2	1st Training School: experience in training next generation

		<p>scholars in interdisciplinarity, and will result in:</p> <ul style="list-style-type: none"> - sharing of problems and lessons learned about the pursuit and timely completion of an interdisciplinary PhD - career advice (career path challenges facing interdisciplinary junior academics, awareness of non-academic jobs and potential applications of research to policymaking and other stakeholder areas) understanding different languages, methods, cultures variety of motivations for, and different modes of, interdisciplinarity maintaining an interdisciplinary approach within discipline- focused institutions and academic reward mechanisms common interdisciplinary research management challenges.
	Y3	<p>2nd Training School: This activity delivers a set of scenarios for research and higher education institutions that embrace inter and transdisciplinarity, overcoming structural, institutional and cultural barriers (Challenge 3); the production of a roadmap for more effective interdisciplinary research and funding on urban development will be envisaged.</p>
Action Conference	Y2	<p>First Action Conference: this focuses on Challenge 1, and will provide new insights into the obstacles and solutions aimed at strengthening interdisciplinary research's effectiveness.</p>
	Y4	<p>Second Action Conference: focuses on Challenge 3, and will result in a Statement of Recommendations for effective mainstreaming of interdisciplinarity in research and funding for urban development (moving beyond barriers). The scenarios roadmap for more effective interdisciplinary research and funding for 21st century challenges coming out from Training School 2: urban development will be presented to discussion among the wider community.</p>
Documents to be used as input to stakeholders	Y1-4	<p>Deliverables resulting from these actions will provide the following type of documents to be used as input to stakeholders: guidance and policy briefings (e.g. criteria and indicators that can guide reviewers of funding programmes in</p>

		their evaluation of interdisciplinarity); recommendations, scenarios and roadmap(s).
Production of dissemination material for distribution		Leaflets will be produced based on outputs of Actions Workshops and Action Conferences to be distributed among the COST Action target groups.
Joint peer reviewed publication		A special issue presenting the main findings of the whole Action, aimed at responding to Challenge 1 and Challenge 3.
Education and/or training material		Interdisciplinary training material will be developed using a scenario-centred- learning approach. Within scenario- centric resources, trainees carry out tasks, activities and reasoning processes aimed at building the desired skills. The active and engaged learning techniques inspire learners to obtain a deeper knowledge of the subject.
Stakeholder outreach	Y1-4	INTREPID envisages a build-up of collaboration and dialogue with stakeholders over the first three years, linked to the actions listed above. This dialogue will be easier and more fruitful due to the presence of staff from funding agencies in the network as Action participants. In Year 2 and 4, these will lead to Dissemination material (above).
Website	Y1-4	A website which will be a key instrument for communication and promotion of ongoing research, workshops and events. It will <ul style="list-style-type: none"> - provide open access to the material produced by the network e.g. an online glossary; event calendar; information dissemination to diverse targeted audiences i.e. researchers, policy makers, funding bodies; policy briefs - link to other initiatives and networks in order to bring closer the INTREPID approach with the stakeholders that are producing, sharing and consuming interdisciplinary learning

		<p>resources</p> <p>- a learning platform will be developed and customized to the requirements specified in terms of user's interaction, and resource management. Platforms such as Joomla and Drupal, and specialized e- learning platforms such as Moodle and Dokeos will be evaluated in relation to the needs of the Action.</p> <p><u>A LinkedIn account will also be setup for wider communication.</u> The LinkedIn account will also be used for creating a dynamic network of researchers, funding bodies and policy makers and implementers. Research gate will also be used.</p>
Conferences attendance	Y1-4	All partners will be encouraged to attend conferences to disseminate this COST Action's activities, to collect information to be disseminated among the Action participants and to contribute to Challenge 2.

D. ACTION STRUCTURE AND PARTICIPATION – WORKING GROUPS, MANAGEMENT, INTERNAL PROCEDURES

D.1) Action Structure and Working Groups (WGs)

INTREPID's Action Structure includes the Management Committee (MC) and a core management structure composed of a Core Group and three Working Groups organised around INTREPID's three core Challenges and related objectives, which provide a solid basis for the planning and implementation of the Network's aim. Targeted implementation will be the responsibility of specific committees (for STSMs, dissemination/editorial and Stakeholder involvement) and local organisers (for Workshops/Conferences and Training, Schools). The Action structure is summarised as follows:

- Action Management: Management Committee, supported by the Action Core Group;
- Three WGs contributing to the progress towards the Action objectives;
- Targeted implementation: STSM Committee, Dissemination/Editorial Board Committee, Stakeholders' involvement committee, plus local organisers of Action Workshops/Conferences and Training Schools

Working Group 1 – Reflecting and learning

This Working Group will adopt a top down and bottom up approach to find out what is happening in terms of scholarly and practice debates on and around conceptions of interdisciplinarity research. Furthermore, based on an analysis of the policy cycle of funding (from policy statements to project implementation), it will assess what role has been attributed to interdisciplinarity and how it has been taken into account in evaluation processes. This WG is in charge of coordinating and implementing the initial Milestones during Years 1 and 2 that are meant to give the Network its fundamental overview of the status quo strengths, weaknesses, opportunities and threats. The bottom up approach will involve engaging with key stakeholders (see Table 2 above), and representatives from institutions in participating COST countries.

Working Group 2 – Building networks and cooperation

This Working Group will coordinate and bring together the activities and results of WG1 and WG3 in order to maximise the Network's impact in terms of building new alliances across Pan-European COST countries and leading (e.g. USA and Australia) and emerging (e.g. Brazil and Uruguay) nations capable of strengthening Europe's practice of interdisciplinary inquiry. The focus will be on urban development challenges. WG2 will also promote consistency as well as dialogue across participants. WG2's role will be to derive broader conclusions and to coordinate the dissemination strategy. To reduce costs, it will meet back to back with the Management Committee.

Working Group 3 – Enabling interdisciplinarity

This Working Group builds on the initial inputs from WG1 and focuses on understanding and finding ways of overcoming barriers to interdisciplinarity. This Working Group will have a strong participation of researchers with decision making capacity in HE or research institutions and of funding agency staff. While WG1 members will be required to have a strong knowledge of the state of art of Interdisciplinarity in research programming and funding cycles, in Working Group 3 hands on experience will also be needed to meet the objective of Challenge 3.

D.2 Plans for Network Enlargement

Through the milestones in years 1 and 2, the Action will be extended beyond the initial network connecting research communities using different languages and methods, and contributing experience both in terms of exploring challenges and good practice that can be shared. Particular attention, given

this Action's overall aim, will be devoted to include additional funding agencies from the public and private sectors. A few scientific and funding agency experts not participating in this COST Action, but whose expertise is deemed useful, have also already agreed to participate in Action deliverables such as workshops, conferences and training schools. All these steps are expected to build a community around interdisciplinarity in research programming and funding cycles that so far has failed to gather the necessary critical mass.

A clear and effective definition of roles and operating procedures is a fundamental prerequisite for the successful implementation of the Action. Next the Action structure and Working Groups, which will be the basis of the effective implementation of the work plan, are described.

D.3 Management

The MC will have a Chair and a Vice-Chair. A Core Group and three Working Groups will be formed, each with a leader and secretary appointed by the MC at the first meeting. The WGs are coordinated by specialists in the field and will set specific research themes/questions and pursue annual objectives. Representatives will be identified who will be responsible for STSMs, gender balance, interaction with relevant COST Actions, interaction with relevant programmes and research projects. These representatives will be asked to report at each MC meeting and share responsibilities with the MC and Core Group for the timely and effective running of the activities. The MC will receive input for decisions from the Core Group, and through WG leaders will ensure that the network activities will be organised and prepared so as to obtain relevant and high quality debates, to establish and maintain links with the stakeholders (including: research programme directors in HE/research institutions, staff and policy makers of public and private funding agencies), to promote adequate publicity to the network developments and results, through dissemination activities.

The MC, supported by the Core Group, will do all the "traditional" and coordination activities implied in the management of the day to day of the network's activities and ensure the overall coordination of the planned activities, notably for what concerns the timely finalisation of the deliverables, the achievement of all milestones and the smooth flowing of information among participants and between participants and the COST Association.

COST funds will be used to finance meetings, travels, dissemination materials, trainers and trainees of both training schools and grantees of Short-Term Scientific Missions. For the achievement of other activities needed to accomplish the Action objectives the network will rely on nationally or institutionally funded research projects and resources (e.g. Employee time, institutional infrastructures and equipment).

As shown in Tables 1 and 2, various activities will be carried out in parallel. Each WG will comprise researchers involved in research projects funded by national university or institutions, stakeholders, international organizations.

Relevant experts will be invited to ensure that all relevant disciplinary perspectives are aired. Participants will be selected via open calls, reviewed by members of the Management Committee.