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L'anno duemilatredici, addì **26 marzo** alle ore 15.30, a seguito di regolare convocazione trasmessa con nota prot. n. 17690 del 21 marzo 2013, il cui ordine del giorno è stato integrato con nota prot. 17946 del 22 marzo 2013 e con nota prot. n. 18230 del 25 marzo 2013, nell'Aula Organi Collegiali si é riunito il Senato Accademico per l'esame e la discussione degli argomenti iscritti al seguente ordine del giorno:

.....**o m i s s i s** .....

Sono presenti: il Rettore, prof. Luigi Frati, il Pro-Rettore Vicario, prof. Francesco Avallone, che assume la funzione di Presidente ed i componenti del Senato Accademico: prof. Stefano Biagioni, prof. Giorgio Spangher (entra alle ore 16.05), prof. Giuseppe Ciccarone, prof. Fabrizio Vestroni, prof. Renato Masiani, prof. Giuseppe Venanzoni, prof.ssa Luigia Carlucci Aiello, prof. Piero Negrini, prof. Roberto Nicolai, prof. Vincenzo Ziparo, prof. Eugenio Gaudio (entra alle ore 16.11), prof. Adriano Redler, prof.ssa Marina Righetti, prof. Giuseppe Santoro Passarelli (entra alle ore 16.20), prof.ssa Emma Baumgartner, prof.ssa Chiara Petrioli, prof. Francesco Quaglia, prof. Pierluigi Valenza, prof. Andrea Magrì, prof. Davide Antonio Ragozzino, prof. Alfredo Antonaci, prof.ssa Adelina Maria Teresa Borruto, prof. Giorgio Piras, prof. Fabio Giglioni (entra alle ore 17.33), prof. Renato Foschi, prof. Enrico Fiori, sig. Livio Orsini (entra alle ore 16.11), sig. Alessandro Delli Poggi, sig. Pasquale De Lorenzo, sig. Fabrizio Fioravanti, i rappresentanti degli studenti, Giuseppe Rodà (entra ore 16.35), Giovambattista Barberio, Francesco Mellace, Giuseppe Alessio Messano e il Direttore Generale Carlo Musto D'Amore che assume le funzioni di Segretario.

Assistono: prof.ssa Tiziana Catarci, prof. Antonello Biagini, prof. Bartolomeo Azzaro, prof. Federico Masini, prof. Giancarlo Ruocco e Prof. Giorgio Alleva.

Assenti giustificati: prof. Francesco Nesi e prof. Guido Valesini.

Assenti: prof. Felice Cerreto, sig. Beniamino Altezza, sig. Vito Trinchieri e il rappresentante degli studenti Paolo Piccini.

Il Presidente, constatata l'esistenza del numero legale, dichiara l'adunanza validamente costituita ed apre la seduta.

.....**o m i s s i s** .....

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Senato
Accademico

Seduta del

26 MAR. 2013

ACCORDO DI COLLABORAZIONE PER LO SVOLGIMENTO DI ATTIVITA' DI RICERCA E SVILUPPO NEL CAMPO DELLE INFRASTRUTTURE SULLA BIODIVERSITA' TRAMITE UNA JOINT RESEARCH UNIT (JRU) COMUNE DENOMINATA LW-ITA (LIFEWATCH ITALIA)

Il Presidente sottopone all'attenzione del Senato Accademico la seguente relazione predisposta dal Settore per le Convenzioni dell'Ufficio Progetti e Fund Raising dell'Area Supporto alla Ricerca.

Il Consiglio del Dipartimento di Biologia Ambientale nella seduta del 14.07.2011 (il cui stralcio di verbale è stato trasmesso all'Ufficio con nota del 15.11.2012), ha approvato all'unanimità la proposta avanzata dal Prof. Loreto Rossi di adesione ad un accordo di collaborazione per lo svolgimento di attività di ricerca e sviluppo nel campo delle infrastrutture sulla biodiversità tramite una Joint Research Unit (JRU) comune denominata LW-ITA (Lifewatch Italia).

Si rappresenta che Lifewatch è una infrastruttura europea di ricerca promossa con un bando ESFRI (il Forum Strategico Europeo per le Infrastrutture di ricerca, costituito nel 2002) del FP7 ed attualmente si trova in una fase di transizione per diventare un Consorzio Intergovernativo per le Infrastrutture di Ricerca Europee (LifeWatch-ERIC).

La partecipazione italiana a LifeWatch è particolarmente numerosa. In particolare una delle sedi dei quartieri generali è localizzata in Italia, a Lecce. A livello nazionale LifeWatch è strutturato come una Joint research Unit (JRU LifeWatch-ITA), inizialmente costituita da 9 membri: CNR, Stazione Zoologica di Napoli, Università di Bari, Firenze, Roma "Tor Vergata", Salento, Istituto Agronomico Mediterraneo di Bari (UNESCO), ARPA Puglia e comunità Ambiente.

Dalla costituzione ad oggi, il numero di adesioni alla JRU è in continua crescita ed attualmente le richieste di adesione già formalizzate o, comunque, accettate dalla JRU fanno riferimento alle seguenti Istituzioni: Presidenza della Repubblica (Riserva Nazionale dello Stato di Castelporziano), Accademia dei XL, Università di Ferrara, Milano Statale, Milano Bicocca, Palermo, Perugia e Trieste.

Risultano, inoltre, in fase di avvio le procedure per l'ammissione delle Università di Pisa ed Urbino.

All'interno della JRU sono attivi gruppi di lavoro per le componenti biomolecolare, tassonomica ed ecologica della biodiversità, per la componente modellistica e per quella ICT connessa alla natura di e-science dell'infrastruttura.

A livello europeo gli Stati Membri che si stanno impegnando per l'avvio del succitato Consorzio LifeWatch ERIC sono Belgio, Grecia, Italia, Olanda, Romania, Spagna, Svezia e Ungheria. Molti altri paesi, tra cui la Francia, sono comunque presenti in LifeWatch anche se molto

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Il Direttore
Dott.ssa Antonella Cammisa

probabilmente non aderiranno al Consorzio Intergovernativo all'atto della costituzione, ma chiederanno uno stato di observers.

L'accordo di collaborazione in parola, la cui durata è prevista quadriennale a far data dalla sua sottoscrizione, prevede lo svolgimento delle seguenti attività:

- Perseguire una più efficace valorizzazione delle competenze, delle basi di dati e delle risorse di calcolo di ciascuna delle Parti attraverso la loro condivisione;
- Coordinare le attività nazionali nella summenzionata fase di transizione e fornire supporto al MIUR e ad altri Ministeri nella organizzazione della adesione italiana a LW-ERIC;
- Svolgere azioni tese a rafforzare il contributo complessivo italiano nell'ambito di LW-ERIC;
- Promuovere un'azione di sistema per l'integrazione della ricerca scientifica italiana, favorendo nuove adesioni a LW-ITA con le modalità definite nell'art. 3.4 dell'accordo stesso;
- Rafforzare la ricerca scientifica italiana nel campo della biodiversità e promuovere la formazione;
- Promuovere il trasferimento tecnologico e svolgere attività di divulgazione scientifica e comunicazione nel campo della biodiversità;
- Progettare ed organizzare azioni pilota dimostrative del funzionamento di LW-ERIC, valorizzando le peculiarità di un contributo italiano;
- Promuovere nodi regionali di LW-ITA e coordinare la loro integrazione nella componente nazionale.

Per la realizzazione delle attività sopra elencate le parti della Joint Research Unit si avvarranno dell'operato dei seguenti Organi:

- Comitato di coordinamento
- Assemblea Generale
- Comitato di Gestione.

La JRU, per il finanziamento delle attività potrà avvalersi:

- delle risorse derivanti da proposte progettuali promosse direttamente dalla JRU;
- delle risorse derivanti da proposte progettuali promosse da Unità Operative della JRU;
- da fondi messi a disposizione da ciascuna delle Istituzione coinvolte nella JRU.

Riguardo a quest'ultimo punto, il Consiglio del sopracitato Dipartimento di Biologia Ambientale, nella seduta del 26.02.2013, ha stabilito che ogni onere finanziario derivante dalla partecipazione all'iniziativa graverà sui fondi di ricerca disponibili intestati ai docenti interessati.

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Allegati parte integrante: stralcio verbale Consiglio del Dipartimento di Biologia Ambientale, seduta del 14.07.2011;
bozza accordo di collaborazione;
stralcio verbale Consiglio del Dipartimento di Biologia Ambientale, seduta del 26.02.2013

Allegato in visione: Proposal for Italy's Contribution to LifeWatch

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Seduta del

26 MAR. 2013

DELIBERAZIONE N. 200/13

Il Presidente pone in votazione la proposta di delibera.

IL SENATO ACCADEMICO

LETTA la relazione predisposta dal Settore per le Convenzioni dell'Ufficio Progetti e Fund Raising dell'Area Supporto alla Ricerca;

ESAMINATO il testo dell'accordo di collaborazione per lo svolgimento di attività di ricerca e sviluppo nel campo delle infrastrutture sulla biodiversità tramite una Joint Research Unit (JRU) comune denominata LW-ITA (Lifewatch Italia);

CONSIDERATA la rilevanza dell'iniziativa e degli obiettivi prefissati nell'ambito di una collaborazione di assoluto valore;

CONSIDERATA la mancanza di oneri diretti e/o indiretti derivanti al bilancio universitario dall'atto in parola;

Con voto unanime

DELIBERA

di approvare l'accordo di collaborazione di cui in narrativa.

Letto e approvato seduta stante per la sola parte dispositiva.

IL SEGRETARIO
Carlo Musto D'Amore

IL PRESIDENTE
Luigi Frati

The E-Biodiversity Research Institute

Proposal for Italy's Contribution to LifeWatch

LIFEWATCH

eScience
and Technology Infrastructure
for Biodiversity
and Ecosystem Research

Preamble

What makes our planet different from all others is life. Gaia is a living planet (Lovelock, 1979; *Gaia, a new look of Life on Earth*). To some extent, and within the context of the abiotic drivers, life is self-organised into spatial and functional units, which we call ecosystems, nested within the Biosphere, the largest Earth ecosystem.

If the complexity of life can be summarised by the concept of Biodiversity, comprising also ourselves and our activities, then Biodiversity is self-organised within the Biosphere and the smaller nested ecosystems, determining all those ecosystem functions and services that our societies perceive as important benefits.

Biodiversity is in the highest priority in the political agenda at all levels because we are starting to realise the societal benefits that we get, as clean air and water, unpolluted foods, stable climate, natural medicines and globally safe environments, all of which depend on the self-organization of Biodiversity, which occurs at high level of spatial and functional hierarchy (i.e., ecosystems, landscapes, eco-regions and biosphere). Biodiversity is still not completely understood and described. In order to fill in the gaps of knowledge, scientific research on biodiversity has been developed into a huge number of disciplines and fields that are continuously producing great achievements in some particular field but also an increasingly high fragmentation of knowledge. There is a clear need for an integrative science on Biodiversity that merges all the expertise and knowledge required to address with a science-based knowledge the problems related to the societal and political need to maintain and enhance, when possible, the ecosystem functioning and services resulting from the self-organization of Life.

On a scientific ground, ecology and evolutionary biology are the sciences that might merge all disciplinary sciences and approaches to biodiversity organization, from molecular to economic and social sciences, into an integrative framework; the 'Ecosystem Approach' is an example of this integrative science applied to societal needs. From the technological point of view, the recent developments of Internet facilities and of ICT tools can supply the elements for an infrastructure that can strongly support the development of the required integrative science on biodiversity. An ICT infrastructure reduces the distance among scientific institutions and among scientists, facilitates the networking of scientists, supports collaborative research, reduces the fragmentation of data and enhances the efficient use of the achieved knowledge, decreases the cost of scientific research, increases significantly the efficiency in the use of research funds, speeds up the detection of gaps of knowledge and can inspire a wise policy of funding scientific research.

Italy is a biodiversity hotspot. The issue of biodiversity is a high priority in the political agenda at the national level since we have realised that our quality of life depends on biodiversity and the related ecosystem services and also because tourism is an important component of the economic balance in many Italian regions, due to their beautiful natural landscapes. However, scientific research on biodiversity suffers from all the flaws highlighted in the previous paragraphs: fragmentation of sciences, of research institutions and among scientists, fragmentation of knowledge and lack of actual availability of existing data, fragmentation of research funding and low efficiency if the use of available economic resources.

The commitment of Italy to LifeWatch, the European Research Infrastructure on Biodiversity, creates the conditions for the development in Italy of an E-Biodiversity Research Institute. The E-Biodiversity Research Institute will also serve as the distributed Italian LifeWatch Centre and will develop in addition the Service Centre part of the LifeWatch-Europe Common Facilities to be placed in the central European LifeWatch organization. The ICT Platform of the Institute will support the infrastructure to reduce the fragmentation in the scientific community, to promote the integration of the existing data and to enhance their

availability to the scientific community itself and to the whole stakeholder community. Research and Higher Education Institutions, scientific societies and federations, associations, NGOs and private enterprises will contribute to the development of an integrative science on biodiversity with their human capital, the established knowledge and the background of scientific information and data. At the National level, the E-Biodiversity Research Institute is aimed at supporting the scientific research in order to:

- Strengthen the knowledge on biodiversity;
- Deepen current understanding on biodiversity and its relationships with ecosystem services and societal benefits;
- Optimise the use of public research funding and increase the competitiveness of Italy in the acquisition of EU and other international research funds;
- Identify knowledge gaps in the current IT platforms on biodiversity, implementing them with the knowledge stemming from focused research programmes;
- Support biodiversity and ecosystem health management with science-based plans, strategies and realistic problem-solving approaches;
- Support different crucial sectors of the national economy and social security system, such as agriculture and fishery industries, tourism industry and the human health sector;
- Increase the awareness of the importance of preserving biodiversity, even when the scale of biodiversity organization requires investments outside the national territory [i.e., migratory birds; large pelagic fishes (tuna fish or sword fish); shared ecosystems];
- Support environmental policy for both legislative and governance aspects;
- Support the political and institutional level to develop national strategies to cope with climate change issues, the energetic problem, and waste management.

A national E-Biodiversity Institute based on the most advanced ICTs will bring benefits to all these aspects through the development of an integrative science on biodiversity. At the EU level, the E-Biodiversity Research will develop common facilities with LifeWatch and will attract an important component of EU LifeWatch funds, with a substantial reward to the national investment, as well as funds from the FP7 and FP8 programs aiming at reinforcing the established EU Large Research Infrastructures.

Structure of the E-Biodiversity Research Institute

The Institute is conceived as a distributed research infrastructure, part of the LifeWatch-EU, hosting the Central Service Centre.

In general terms, the mission of the E-Biodiversity Research Institute, which is an ICT infrastructure, is similar to that of more conventional physical infrastructures: providing access to the infrastructure facilities/capabilities, reinforcing scientific research and education, with a particular focus on young scientists in the early stage of their career and on the higher education programmes for new scientists on biodiversity, and connecting the most advanced science with societal requirements, supporting knowledge-based management and governance decisions at the administrative, economic and political levels. Specifically, the mission of the E-Biodiversity Research Institute is to reinforce scientific integrative research on biodiversity. The main focus is on scientific research on species, with their genetic and phenotypic traits, including behavioural ones, their niches and their interactions. However, tools and services produced by the E-Biodiversity Research Institute determine societal benefits in many fields of application, including among others (**Figure 1.1**):

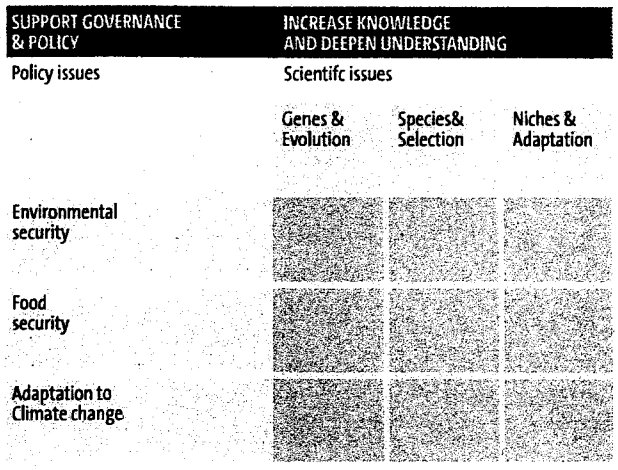


Figure 1.1
Integration of scientific and supporting policy issues of the E-Biodiversity Research Institute

Environmental Security, is the relative public safety from environmental dangers caused by natural or human processes due to ignorance, accident, mismanagement or design and originating within or across national borders (Millennium Project; www.millennium-project.org). All species react, either negatively or positively, to actual environmental danger. We may say that there is no pollution unless biology is harmed at some level. Since most species are smaller than we are, they are likely to be on average much more sensitive than us, and react at much lower levels of impact than those affecting our health. Species can be very sensitive and species traits can be very sensitive too; biodiversity changes can tell us a lot about the state of the environment and help us to maintain a safe environment. The focus of environmental legislation is shifting in all countries from the introduction of chemicals in the ecosystem and on their concentration to the species and ecosystem responses to potential dangers determined by the introduction of substances or by the alteration of ecosystem properties due to human activities. Knowledge on biodiversity and on its organization is increasingly supportive in identifying ecological indicators of stress, responding to the requirements on many different EU-Directives. Deepening our understanding of biodiversity responses to anthropogenic stresses will greatly contribute to set safer limits of acceptable concentration of potential pollutants in the air, water and soil, based on bio-availability and actual toxicity, rather than on un-specified concentrations. Ecological risk assessment based on species responses is becoming a powerful tool in environmental legislation.

Food security, which refers to the availability of food and the access to it. This issue is linked to food provision and deals with agriculture and fisheries. Biodiversity research has strong positive implications for the development of biological agriculture and for practices of natural selection of plant varieties that fit with different local abiotic conditions. Conservation of plant varieties within botanical gardens, seed and gene banks, is an insurance for the future of green

agriculture. A national strategy for the conservation of biodiversity of agricultural interest, produced by the Ministry for Productive Activities, acknowledges the importance of biodiversity research for a sustainable agriculture in the future. The plan focuses on the natural varieties, their traits, potential niche and optimal niche conditions, and on the genetic resources, of both plant and animal resources including microorganisms. The E-Biodiversity Research Institute can greatly contribute to support the need of sustainable agriculture by organising and making available the existing data on plant and animal varieties and supplying online services to analyse the vocation of different varieties to cope with natural local conditions through processes of niche compatibility analysis. Similarly, provisional information on the nursery areas and the interaction webs represent valuable services that the E-Biodiversity Research Institute will make available to support the fishery industry, including aquaculture, with advanced knowledge on sustainable exploitation.

Adaptation to climate change. Climate change is changing the environmental context within which species play their roles. While model-drawing scenarios of change for temperature, precipitation, water availability and sea level rise are increasingly more accurate and spatially defined, we know very little about the potential for species adaptation and the expected changes in species distribution, overall biodiversity and its organization. We are aware that the services provided by ecosystems and the related social benefits are going to change accordingly, but we do not know enough about the direction and the extent of these changes. Increasing the current knowledge on the actual biodiversity of the Biosphere, at the genetic, taxonomic and landscape levels, and deepening current understanding on species plasticity and adaptations and biodiversity organization are among the research priorities that the E-Biodiversity Research Institute can address supporting national and international policies of adaptation to global change. For particular ecosystem types and regional areas realistic strategies of mitigation of the global change impacts are among the services foreseen by the E-Institute.

E-BIODIVERSITY INSTITUTE	
Departments	**Functions**
Management and coordination	General coordination Financial and staff Management Legal issues Fund raising
IT services	Web portal development Web interface Interoperability and GRID functions E-learning platform
E-training & mobility	PhD programmmes Mobility of young scientists Research fellowship programmes
Biological research	LW research planning Virtual organization Data management Modeling and Tool development
Outreach and communication	Networking Press office organization Information products production

Figure 1.2
Structural organization of the E-Biodiversity Research Institute.

The E-Biodiversity Research Institute is organised into Departments (**figure 1.2**), which are functionally clustered into two major components: a Central Service, as a central common component operating in the LifeWatch-EU and hosted by the E-Biodiversity Institute, and a Research Unit constituted by distributed Virtual Laboratories, as national contribution to LifeWatch EU. The basic structure of the E-Biodiversity Research Institute within the larger LifeWatch-EU structure is shown in **figure 1.3**.

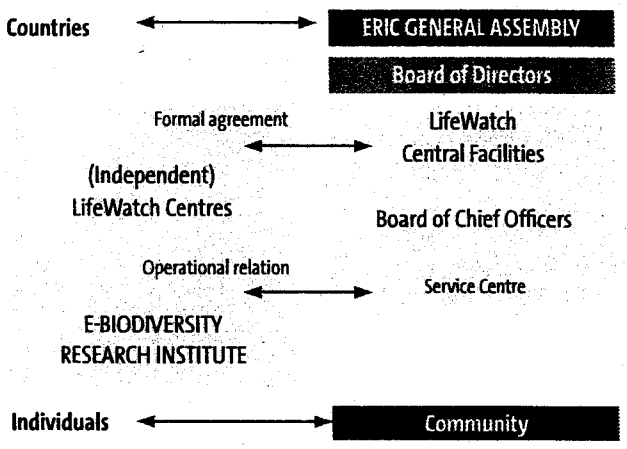


Figura 1.3
The E-Biodiversity Research Institute within the LifeWatch EU Infrastructure

The structural components of the Central Service Center are the Departments for Management and Coordination, E-Training and Mobility, Outreach and Communication, and IT Services. The Centre, whose organization and functioning is described in detail in sections 2.1.4, is devoted to run all activities of management and coordination of the E-Biodiversity Research Institute, of e-training and e-learning, networking with the data providers and data users communities. The Center will also supply communication, organization and IT services for the whole LifeWatch Infrastructure.

The Department of Biological Research is the core structure for the development of national research activities on biodiversity. It is organised into four Virtual Laboratories (biomolecular, collections, interactions, mediterranean), which focus on the provision of information and tools that are essential for deepening the knowledge on the species, their internal variability, their traits and their interactions with the abiotic and biotic components of the environments in which they live. The rationale, structure, products and impacts of the Virtual Laboratories are described in section 3.
The core activity of the Biological Research Department will be the development and implementation of a national cadastre of SPECIES & SPECIES FUNCTIONS. All laboratories are fully interconnected, even though two of them, i.e. COLLECTIONS and INTERACTIONS, are the building blocks of THE CADASTRE OF SPECIES & SPECIES FUNCTIONS.

Virtual laboratories will be implemented first of all with existing data, through facilities of data interoperability that will be developed in the Service Centre Department 'IT Interfaces'. Data selection, standardisation and quality control are essential components of the data implementation process within each Virtual Laboratory. As a first priority, databases resulting from robust experimental designs and testing clear and original hypotheses will be selected and entered as 'collections'. The selection process is aimed at integrating and making accessible those databases that are of the highest interest for the scientific community, which will take advantage of the available information and data to integrate them into larger experimental tests of innovative and interdisciplinary hypotheses. Data standardisation and quality control, both for the taxonomic identification and description and for the abiotic supporting data, are essential components of all ICT data platforms and will be essential components of each Virtual Laboratory.

The attractiveness of the data and 'e-experimental sets' stored in the Virtual Laboratories for the scientific community is ensured by the data elaboration and the process of filling in the gap of knowledge existing in the original datasets, e.g. by describing functional traits and limiting niche dimensions for every species (see sections 3.2.2 and 3.3.2 for the processes of trait and niche dimension selection), which will be the internal activity performed within the Virtual Laboratories. The information content of the data sets made available, will be much wider than the information content of the data sets originally included in the Virtual Laboratories, as they will be complemented through new data collection aimed at filling in the existing gaps.

At least other two kinds of major gaps in the data organised into the Virtual Laboratory ICT infrastructure call for new data collection:

1. *Collecting new data in order to complete a collection;* this activity is going to be based on the information already existing in the E-Biodiversity Institute data platform and will be driven by the most innovative development of the science of biodiversity, as well as by the requirements of implementation of the national legislation and EU-Directives, including the requirements of optimisation of the national monitoring programmes on different categories of ecosystems;

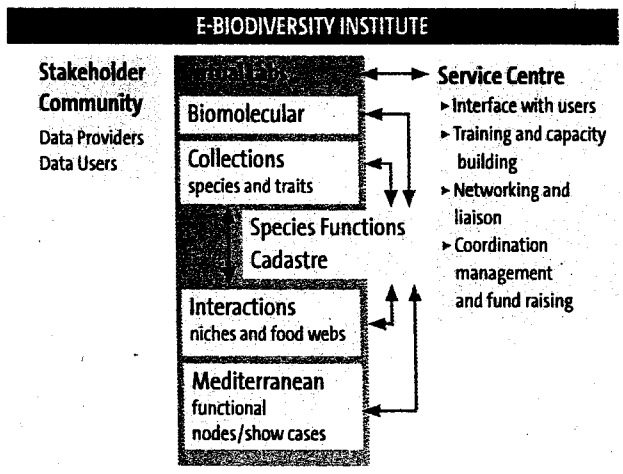


Figure 1.4
Organization of the Biological Research Department into a Virtual Laboratory structure. The inter-connections among laboratories and with LifeWatch-ERIC Service Centre, hosted by the Institute, are shown.

Collecting new data in order to cope with changing environments; it is clear to everyone that environmental conditions are continuously changing in most of the Biosphere. Climate changes are a main driver, affecting every ecosystem nested in the Biosphere. Human activities are a second major driver, generally but not necessarily more localised. Human activities may result in a threat for the ecosystem as well as a mitigation and recovery action. The changes in the agricultural practices that have occurred in Europe in the last 50 years have remarkably reduced the surface used for agriculture, strongly impacting the used areas but also allowing for a slow recovery of all the surfaces that were abandoned. Relevant information needs to be updated in order to provide useful information and produce those services that meet the requirements of the LifeWatch Stakeholder community.

The Scientific Committee and the Advisory Board of the E-Biodiversity Research Institute will highlight the priorities for new data collection, taking into account both the need of deepening the scientific knowledge and current understanding and the need to support science-based knowledge for the administrative and political stakeholders of LifeWatch. The stakeholder community needs that information and knowledge in order to ensure the optimal governance of natural resources (including biodiversity and ecosystem services) and define the policy allowing to achieve the win-win solution of a higher quality of life in a better environment. The Committee is in charge of advising the funding agencies on the priorities and eventually preparing an open call, to the whole national scientific community and to the international LifeWatch Community at large. Part of the financial commitment of Italy is directed at increasing the budget for the new data collections required to enhance the quality of data in the LifeWatch ICT infrastructure, through the distributed node constituted by the E-Biodiversity Institute.

The Stakeholder Community of the products and services of the E-Institute, and of LifeWatch is constituted by users at different levels, including National and International Institutions, Administration and Protection Agencies, Research and Academic Institutions, private enterprises and NGOs, students, citizens and local communities.

The staff of the E-Institute is represented, first of all, by the scientists, who will cooperate to the development of the Biological Research Department; a number of Institutions have already signed a cooperation agreement to constitute a LifeWatch Italy (LW-ITA) Joint Research Unit and have designed their resource allocation in compliance with their commitment to the development of the JRU activities (**Annex 1**). The involvement of a much larger scientific community with the support of the scientific societies, federations of societies, thematic research consortia and observatories will enlarge this component of the E-Institute staff and reinforce its effectiveness. A second component of the E-Institute is constituted by the Central Service Centre, hired with the financial support coming from LifeWatch-EU as in cash contribution. The latter contribution includes the Italian basic in-cash contribution with an additional site premium, required for the international agreement that Italy will host the LifeWatch Common Facilities.
In the full construction phase the financial support to the implementation of the Central Service Centre, including staff, is planned to be close to 5 million euro per year. It might be less if in the initial stage not all EU countries will commit to LifeWatch, determining a reduction of the cash flow and a delay in the LifeWatch construction time-plan.
A third component of the E-Biodiversity Research Institute staff, including both the Service Centre and Research Departments, will be constituted by personnel hired on the budget of the national commitment in order to complete the staff required to run the activities planned.

2 Service Centre

The main purpose of LifeWatch is to serve the biodiversity and ecosystem research community in its work to support the understanding and rational management of our ecosystems by policy makers, resource managers, the private sector and the general public.

The Service Centre, as a core component of the E-Biodiversity Research Institute, will deal with the provision of services to the user community so as to facilitate the use of the infrastructure, provide information and support with a particular focus to young scientists, foster the user engagement in the services' development, draw new communities of interest to the infrastructure. The interface with users is the 'Front Office' component of the Service Centre; management and coordination of the activities and coordination of the distributed centers are the 'Back Office' component (**Figure 2.1**).

The Service Centre staff will be selected to meet different kind of tasks, which will be described in detail in the sections below.

2.1 Access to the infrastructure

The rationale for establishing research infrastructures is to promote innovation and a better competitive position by offering new capabilities for researchers. In this regard, it is crucial for the ESFRI and the EC to promote excellence by enabling access to the infrastructures for the best researchers by various means. The EU regulation for establishing research infrastructures (ERIC) requires infrastructures to meet the condition of open access and provide (independent) selection procedures and criteria.

Many research infrastructures such as LifeWatch are offering their capabilities mostly through the Internet. The LifeWatch Service Plan indicates that users may also want to work with LifeWatch staff on developing specific capabilities (i.e. modelling algorithms) for their project. Capacity for such services is always budget limited but for LifeWatch it is very important to promote such access since this is a very strong driver for innovation and improvement of LifeWatch capabilities.

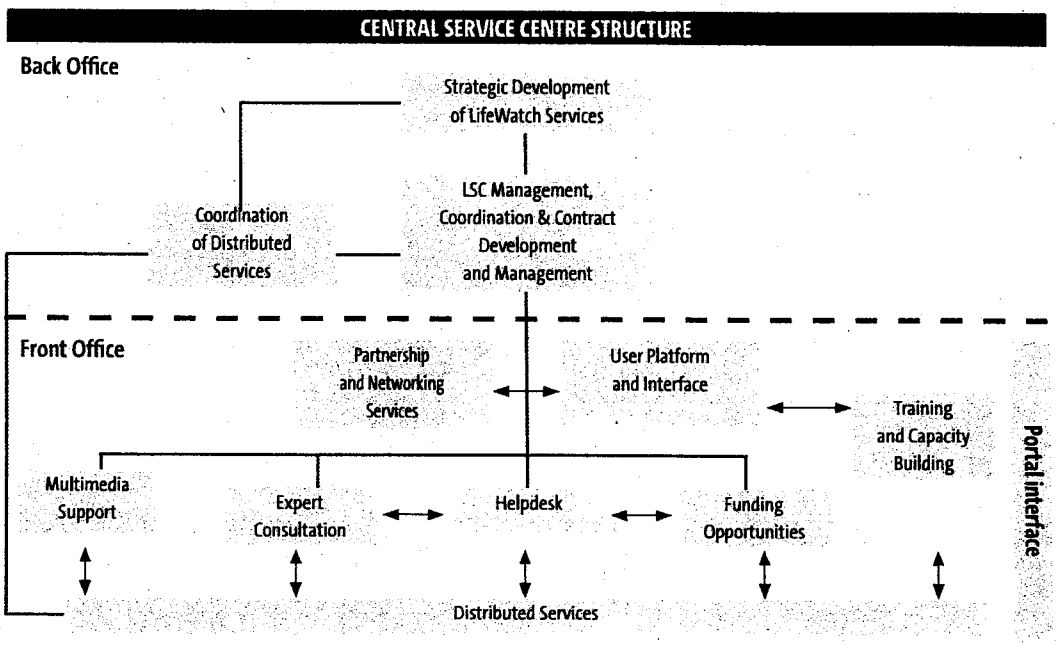


Figure 2.1 Structure and organization of the Central Service Centre

Defining the LifeWatch access policy, including user registration aspects, is a priority for the early construction phase. As funding countries increase and as the added value of collaboration is more evident, access policies will be reviewed on the basis of science, IT, LifeWatch developments and users' requirements.

2.2 The Service Centre implementation

The first activities of the start up phase will be focused on the establishment of the management office of the Central Service Centre and on the coordination between local and central services, crucial to construct an efficient network of service centres. After this, it will be important to start a communication campaign and, in parallel, monitor the users' response and engagement level through the user platform.

Following the start-up of the infrastructure capabilities construction, the service centre will facilitate the access to services through the establishment of a helpdesk, and coordinate the development and availability of e-learning capability to support initial services.

First services,which will be priorities for the activation in the construction phase, are those found more appealing for the user community during the LifeWatch preparatory phase, according to the results of a questionnaire on the users needs widely distributed: i.e., funding opportunities, e-learning, legal support etc. On the basis of the results obtained with the first release of services, the service centre will decide how to proceed with the establishment of the remaining services (training and fellowship activities, engagement of experts etc).

The critical activities will be those directed at monitoring the degree of users' satisfaction and a rational management of the central and distributed services that should define which services have to be delivered first, by whom (central and/or distributed service centres) and gaps to be filled by new services.

2.3 Management of the Service Centre

A team of Officers will manage the Service Centre. They are responsible for the management and co-ordination of Central Service Centre staff and their activities, for the coordination of distributed services, fund raising activities, business development and marketing. The back office will be the point of contact with the coordinating structure of the Italian E-Biodiversity Research Institute, as well as with the LifeWatch executive office and Statutory Seat that will have overall responsibility for coordinating all LifeWatch activities.

2.3.1 Management, co-ordination and contracts – back office

The office will be responsible, among others, for the following tasks: office management and coordination, periodic result assessment, risk management, quality management, records management, asset management, equipment maintenance, liaison with hosts and contract management.

The office will be in touch with any service provider to coordinate the activities and to check the efficiency.

2.3.2 Coordination of distributed services

As mentioned above, the LifeWatch Central Service is responsible for managing and coordinating the services provided by the distributed centers and service providers.

The facilities offered by the distributed service centers could be flexible and manifold. The distributed service centers would be generally classified in two typologies:

- Distributed service centres (DSC) providing general user support services; and
- Distributed service units (DSU) providing specialised services covering a thematic area (e.g. a field of biodiversity research) or a LifeWatch related service area (e.g. training, IT development).

The office will be responsible of the following tasks defining the details on a case-by-case basis:

- Selection and agreement of standards of service provision;
- Negotiations between LifeWatch and the distributed service centers;
- Guidance for the rational distribution of services on a geographical or thematic scale;
- Capacity building: help creating national facilities to fill gaps in servicing of user needs;
- Internal coordination within the LifeWatch component e.g., technical construction, scientific network community engagement etc;
- Help for distributed service centers to become operative;

- Management of central budget foreseen to finance distributed services;
- Coordination of tasks among all distributed service centers;
- Encouragement of cooperation and partnerships among distributed service centers;
- Co-ordination of training for providers of services.

The office will manage the provision of all the central and distributed services following the principles of rational distribution of resources, as well as the opportunities to take into account different realities and needs, the identification of the services target also on a market-based orientation and the opportunities of financing of LifeWatch activities by Member States or other parties.

2.3.3 Business development and marketing

The business development unit ensures that the value of the LifeWatch infrastructure is understood at national and European levels and develops opportunities and programmes that could fund LifeWatch research and development activities. In particular, this unit will be responsible of the development of a Business Oriented Marketing Plan.
This unit will work in strict cooperation with the Back office (to check the quality of products delivered by all the central and distributed units of the infrastructure), with the PR and Communication unit (to develop marketing activities for services and facilities provided by the infrastructure), and also with the Fund raising office (to attract on-going support).

2.3.4 Fund raising

The Fund raising office will support the Infrastructure in all the tasks related to the financing mechanisms: acquisition and management of commercial and public contracts, involvement in EU proposals and tenders and other financial opportunities, support for users on potential financial instruments and mechanisms at global, European and national level.

2.4 Interface with users

2.4.1 Helpdesk

The helpdesk will be responsible for on-line and off-line (by telephone and email) assistance to user community providing all the necessary information on the use of the infrastructure, the services and facilities offered, activities and collaboration opportunities. It will act as a first interface of the infrastructure with all the needs and requirements coming from the users.

The helpdesk will be in contact with all the other units to furnish updated information of services and functions of LifeWatch (including information on IT aspects, access to data and data use) but also to provide support on funding opportunities, contact with experts, contact with services providers etc.

In order to support its front-line services, the helpdesk is responsible for:

- Preparing protocols for furnishing assistance and answering to requests and questions;
- Preparing and managing standard answers;
- Updating the helpdesk services;
- Preparing and updating the FAQs;
- Planning and managing periodical meetings with helpdesk personnel in the de-centralised Service Centres;
- Escalation of requests/questions that cannot be dealt with by the helpdesk directly.

For its crucial importance, the helpdesk has been included in the first release of services/facilities to be provided during the construction phase of the LifeWatch Research Infrastructure.

2.4.2 Multimedia

The multimedia service will take care of the identification, implementation, management and innovation of multimedia services. Multimedia tools will be used by the Service Centre to offer the user community many additional types of information on biodiversity outside the usual concepts of digital data. These will include:

- Images and photos on habitats and species;
- Videos on habitats and species;
- Amateur images and videos;
- Sound recordings (e.g. birds and insects);
- Cartographies, e-maps; and
- Advice on digitisation of specimen data from natural history collections.

The multimedia tools will also be used to promote general education activities designed to improve the understanding of biodiversity of the non-scientific audiences.

2.5 Networking and liaisons

2.5.1 User platforms

The Users Platform is the means by which LifeWatch communicates with its user base, and vice versa. Engagement with stakeholders is therefore crucial to define the scope of the service provided, its method of delivery, as well as the nature of support from the Service Centre. It can take multiple forms: face-to-face forum, email lists, electronic forum such as bulletin board, news feed, threaded conversations and shared or collaborative electronic space.

The LifeWatch infrastructure is primarily a research infrastructure but it is planned to meet a range of other user needs. The Service Centre will establish and manage methods and procedures for interacting with key stakeholder groups. It will do this through a combination of top-down and bottom-up approaches.

- Top-down: will be through the establishment of a formal user-platform representing key European stakeholders, in particular from the world of science. User Platforms will be established to ensure that national and international users of the LifeWatch research infrastructure, especially from the European research community, have effective access to all infrastructure facilities. They will also provide advice to management on the prioritisation, development and resourcing of technical or non-technical services.
- Bottom-up: will be through the development of a range of social networking and participatory approaches enabling user groups to come together to address specific issues and needs. These groups may be short or long lasting according to needs.

The LifeWatch User Platform annual event will be a conference, run along similar lines to the well-regarded EGEE User Conference. The Annual Conference is going to be prepared by a series of periodic workshops, developed during the year on specific thematic areas and targeted to specialist stakeholder communities.

2.5.2 Public relations and communication

The success of LifeWatch clearly depends on its ability to engage with both the providers and users of LifeWatch services and to develop effective communication channels appropriate to different target audiences.
The communication strategy (Sier, 2009) outlines a strategy for the communication and general marketing of the LifeWatch 'brand'. Four high-level communication objectives are identified. They can be summarised as:

- Raise awareness of LifeWatch services and resources;
- Encourage potential users to become actual users;
- Enable LifeWatch, managers and providers to learn from users and improve the provision of services and resources; and
- Ensure the growth of the LifeWatch support base.

The PR unit will be responsible for collection and presentation of qualitative and quantitative information to demonstrate the vital role of LifeWatch and its added value using all the available communication channels (the website, E-mail / e-news service / RSS feeds / blog services, leaflets and flyers, talks and posters at events etc). LifeWatch should also make maximum use of the communication channels provided by other related networks, initiatives and organizations.

The public relations and communications unit will be responsible for developing, updating and implementing the LifeWatch external communication strategy, the strategic direction of communications (including direct communication with funders), the promotion and marketing of LifeWatch (branding, website, other e-communications, marketing materials, press relations and central events), the engagement with European and global level stakeholders and the management of certain content on the website (e.g. user forum, etc.)

2.6 Training activities

The purposes of the Training and Capacity Building Programme are:

- Familiarize user communities with the LifeWatch services and capabilities, enabling them to perform state-of-the-art research using LifeWatch services;

- Provide LifeWatch specific training to specific user communities;
- Attract wider user communities which may bring into the infrastructure new contributions from different research themes or other sectors;
- Engage users in the development of services, data and applications;
- Stimulate and foster bright young researchers to explore original ways of performing research via the infrastructure's facilities.

2.6.1 The LifeWatch e-Learning programme

This programme concentrates on preparing and collecting LifeWatch training material in the form of multimedia contents (hypermedia such as hypertext, audio, video, etc.). Material will be targeted at specific user groups to provide:

- Basic ICT training giving an introduction to the ICT technologies being used in the LifeWatch system;
- Conceptual level training to explain the purpose of the LifeWatch services, applications and tools and why these would be useful to them;
- Hands-on tutorials with step- by-step guides on how to use the system and utilise its different features;
- Basic introductions to biodiversity and ecosystem science; and
- State-of-the-art examples of best practice to stimulate activities pushed by new scientific research and policy frontiers within the scope of the LifeWatch.

2.6.2 LifeWatch Challenge Fellowship programme

The objective of the LifeWatch Challenge Fellowship programme is to enable the user community to conduct research in the framework of the LifeWatch infrastructure providing fellowships in the form of sabbaticals and PhD scholarships.

The fellowships can be targeted to interdisciplinary research on current and emerging issues (related to biodiversity, related sectors and also ICT issues), using of the infrastructure capabilities and also contributing to its development.
The fellowship programme will be organised in collaboration with various host academic and research organizations (e.g. research organizations, Pan-European Universities, etc).
The Scientific Committee and the Advisory Board of the E-Biodiversity Research Institute will oversee the procedures and will also be responsible for selecting research proposals.

2.6.3 LifeWatch Central Training Activities

The Central training activities will support more traditional methods by providing face to face training via, for example: summer schools, workshops (conducted on-demand in order to deliver specific/customised courses) and conferences (to provide opportunity for the biodiversity and ICT communities to engage on the current and new state-of-the-art research frontiers). This element enables the LifeWatch community to get familiar with the LifeWatch services and underpinning biodiversity research issues.

2.6.4 Distributed Training Activities

Distributed training activities will be aimed at under- and post-graduate levels in universities across Europe to facilitate understanding of the biodiversity issues and encourage broader use of LifeWatch.
Training will be delivered by local educational facilities using a curriculum or material that is developed in collaboration with the LifeWatch Service Centre.

To deliver these distributed training initiatives the LifeWatch Service Centre will:

- Enter into partnerships with selected Member States training facilities offering franchise agreements whereby the university institutions can offer LifeWatch accredited training programmes, and thereby benefit from the LifeWatch brand and associated investments;
- Engage with e-IRG (e-Infrastructure Reflection Group) and investigate and support the initiative for training and education in Pan-European Universities;
- Identify suitable eLearning material, which could be included in courses at undergraduate and/or postgraduate training levels; and
- Link training to opportunities for LifeWatch fellowships.

3 Virtual Laboratories

3.1 Virtual Lab 'Biomolecular'

3.1.1 Rationale

As for most branches of biology, biodiversity science is increasingly relying on molecular approaches. DNA sequences have become a primary source of information in biodiversity analysis along with morphological, biochemical, physiological and ecological data. Molecular methods may possibly overcome some of the drawbacks and limitations of 'classical' methods, such as spatial heterogeneity, lack of taxonomic knowledge, taxonomic ambiguity and, especially for microorganisms and protists, the inability to grow them in culture.

DNA provides relevant information about the history of the individuals that compose communities, and on their organization into hierarchically related groups, from populations to higher levels of the systematic classification. Crossing this information with geographical data allows to reconstruct how communities exchange individuals and how communities came about; by integrating genetic with geological information it is possible to infer how past environmental changes modified communities, and by crossing genotypes with phenotypes it is possible to identify at what level of hierarchical organization species lie. The second kind of information that can be derived from DNA sequencing is about organism functions, from the gene/protein level to biochemical pathways and their interconnections in individuals (Systems Biology) up to the population level, giving important hints on how organisms within communities interact and how communities respond to environmental changes (population systems biology). In addition, functional information can also be obtained by direct analysis of gene products in isolated species or strains and environmental samples (transcriptomics and proteomics).

Ideally, to allow their use in biodiversity studies, molecular sequence datasets should be attached to morphological, physiological, geographical and ecological information. The subsequent integrated analysis of sequence data is challenging and also requires appropriate scaling up of state of the art algorithms and software for managing and analyzing huge amounts of data. Furthermore, as molecular data are often produced by laboratories without the necessary expertise in large scale bioinformatics analysis, the tools for the data management and analysis should be easily accessible and user-friendly thus setting the stage for a new wave of biodiversity applied bioinformatics.

Existing large molecular datasets are generally at the species level and hardly cover the large inter-population and intra-population variation on which evolutionary processes and self-organization mechanisms of biodiversity are based. The Virtual Molecular Laboratory will focus specifically on these aspects, which fundamentally deal with individual plasticity and species and population adaptations to environmental changes and allow investigating the degree of connectivity of intra-specific populations as well as of the ecosystems where the populations live. The Lab ITC infrastructure will organise molecular data at the species level, mainly coming from major data providers but will focus on datasets that compare inter-population and intra-population data for selected species. Filling in gaps of particular importance dealing with these aspects can be selected as priorities of the overall Biological Research Department for new data collection programmes. A brief description of the in Lab facilities to handle new data collection taking profit from the expertise developed in Italy is also reported below.

3.1.2 Structure

The BioMolecular Virtual Lab will integrate know-how and trained infrastructures for molecular analysis and bioinformatics in order to provide the biodiversity community within the LW project with expertise and tools to produce, manage and analyze genetic

data. It comprises two highly integrated building blocks, a molecular laboratory infrastructure and a bioinformatics infrastructure.

Lab services. In-lab services are aimed at setting complete workflows for biodiversity applied molecular analysis, from sample preparation to sequence production, functional analysis and phyl-genetic inference.
A number of approaches have been developed to study diversity at molecular level, such as PCR based DNA fingerprinting methods (DGGE/TGGE, RFLP, RAPD, AFLP, SSCP, RISA/ARISA and T-RFLP) as well as PCR independent methods (G+C content, DNA microarrays, SNPs and DNA re-association analysis). The expansion of sequence information from genes to genomes has also influenced biosystematics, allowing phylogenomic analyses that involve the use of whole genome sequences to study evolutionary relationships. More recently, DNA barcodes, short standardized species-specific genomic sequences, are being used as a global standard for species identification and biodiversity studies.

At higher level of systematic classification, a clear consensus exists for each macro groups (see the different Tree of Life projects). For the species level, consensus exists for bacteria and for large macro groups in Eukarya, thanks to the Barcode initiatives (CBOL & IBOL). DNA barcoding aims at developing methods for species identification by limiting the analysis to small fragments of genomes. A fragment of a mitochondrial gene, cytochrome c oxidase 1 (cox1) has been proposed as the DNA barcode to achieve species-level resolution in animals, whereas 2-3 different fragments might be needed in other groups. As a measure of connectivity among populations, species specific STR (Single Tandem Repeat) and SNPs (Single Nucleotide Polymorphism) markers are available, and very recently Next Generation Sequencing (NGS) based approach to collect non species-specific SNPs data appeared.

The use of molecular methods has been of enormous importance in the identification and discovery of microorganisms (bacteria, archea, viruses, fungi and protists), in particular with the help of phylogenetic analyses of ubiquitous genes (often the Small Subunit rRNA gene sequences). Among microorganisms, bacteria contribute substantially to the total biomass on Earth and populate every terrestrial and marine environment, as well as humans and animals (e.g. gut); yet, the number of known species is relatively limited, and even less are those cultivable, while taxonomic definitions are often ambiguous. Similar problems affect also the knowledge of protists, which constitute the large majority of autotrophic and heterotrophic organisms in the aquatic environments.The innovative metagenomic approach might help overcome the problem of microorganism cultivation, allowing direct isolation of total DNA (metagenome) from environmental samples. The application of amplicon-based or shotgun metagenomics approaches by using high-throughput sequencing platforms can now provide extraordinary and unprecedented possibilities for the taxonomic characterization of environmental samples, as well as to investigate their population dynamics. Therefore, sequence-based analysis of the metagenome could virtually reveal all the resident species, including the uncultivable ones, as well as strains at subspecies level, which is of great importance, for instance, to discriminate between virulent versus non pathogenic strains. Moreover, metatranscriptomic approaches allow to uncover the functional potential which is actually expressed in specific environmental conditions without the need of species or strain isolation.

In the last twenty years the Biomolecular community has organized an informatics infrastructure for molecular data sharing the International Nucleotide Sequence Database Collaboration, that encompasses the three largest databases: GenBank, EMBL (now ENA) and DDBJ. These Databases (DBs) are recognized as primary DB because they store jointly the totality of public information on biosequence, their raw experimental data (i.e. trace), and few sequence related annotation.
The necessary limit on the type of annotation available and difficulties in maintaining update care in so generalist DBs, pushed first the genomic community to develop secondary DBs that referred to the primary ones but stored a more updated and more thematic annotation (i.e. flybase, wormbase, etc). At first, part of the biodiversity community set up an agreement with NCBI in 2005 (www.barcoding.si.edu/pdf/dwg_data_standards-final.pdf) in order to identify a subset of data with a more detailed and precise annotation on the identification of the biosequence source organism and a more standardized information on the experiment that produced them would be available. The document was later amended recognizing Catalogue of Life as an authority although not mandatory for

taxonomy. Similarly with the appearance of thematic DBs in the genomic community, the need for updated annotations (especially on the species identification field) and for a more efficient integration of genetic data with other types of data as outlined in our proposal of species cadastre, is fostering the appearance of specialised DB. Projects as BOLD or Marine Genomics offer examples of thematic integration of genetic data within a biodiversity context.
To overcome the narrow focus of specialized DBs but recognizing the dispersed nature of competence for correct annotation, we believe that the best DB infrastructure would be a distributed one in which local experts of a given subset of annotation would be entrusted to manage and edit specific sections of the DB. Furthermore users should be allowed to flag and comment dubious annotations in order to maintain a direct and diffuse control of data quality. The Biocase and the MBLAB projects partially implemented this view of the world, the former limited to taxonomic information and the latter limited to a small set of DBs.

In silico services. The in *silico* services are thought as a collection of modular services that could be used as building blocks for the analysis workflow. At first, services will be exposed only as web applications. In a second stage they will be exposed as web services and could be used by out-of-the-shelf workflow engine (i.e. Taverna) or by the workflow engine of the LifeWatch Research Infrastructure. These services, once built as web services, need to be advertised and exposed in public catalogue initiative (i.e. http://www.biocatalogue.org/) and link with social networks (i.e. http://www.myexperiment.org/), which expose the proposed workflow of analysis based on these services. It is fundamental that the entire community keeps good practice on the use of the services up to date. For instance, maintaining high standard for good practices in the use of phylogenetic tools is a complex task given the different fields of application.

The selection of services for the in silico component takes into consideration the following types of analysis:

- Phylogeography;
- Species identification in environmental samples;
- Functional characterization of environmental samples.

In common to the three paths, we identified services of Blast and DB queries. To be functional to biodiversity communities, the blast service needs to be able to work with user defined reference sequences and allow for job composed of hundred of thousand of queries. This is possible powering the services with the distributed EGI computing grid, as it was done in the LIBI project (http://www.libi.it/). Queries to gather genetic data for biodiversity studies need to be performed integrating information across genetic DB (GenBank/EMBL) and collection repositories (GBIF, but also National/local collection system with more detailed information), as was partially done within the MBLAB project (http://www.mblabproject.it).

Typical of the phylogeographic analysis path are the services of alignment, phylogenetic and phylogeographic inference. We selected those services because phylogenetic and phylogeographic approaches are still not fully integrated in modern biodiversity research. This is especially due to difficulties to handle large data sets and run complex analyses that require designing and selecting detailed models of evolution. Since the emergence of high throughput sequencing methods, sample selection, alignment, downstream analysis, and access to computing power for phylogenetic inference have become central problems in phylogenetics as these procedures often require individual and computational intense solutions.
In addition to the complexities residing in the tree shape itself, a great deal of complexity is added by the model of the character evolution that is applied in the tree, i.e. larger phylogenies employ a different substitution model with each individual partitions in the data set.

The phylogenetic service dedicate make particular attention to offer the same application for phylogenetic services powered using different computing strategies. In fact, the computational problems could be solved by GRID and PRACE services, e.g. do distributing computing (i.e. HTC) as available in GRID for statistical replication of entire analysis in ML bootstrap replicates, coalescent simulation as in ABC, or biological replicates in phylogenomic, meta-genomic and biogeography. For exploration of the parameter space (e.g. during tree searches) with large data matrices (both as character and taxa) computing, high levels of parallelization and large amount of RAM are necessary, available in HPC (High Performance Computing) facilities as PRACE. Finally, GPU computing, that will be soon available in different service provider (i.e. JST) will allow to implement and use in reasonably time complex evolutionary models that require large substitution matrices, like amino acid model with

variable substitution and stationary parameters or codon model (Suchard et al. 2009). New distributions that use GPU for well-known applications for phylogenetic inference (BEAST, MrBayes, etc), based on the GPU library Beagle (both for CODA and OpenGL GPU), are on the way to be distributed.

The service dedicated to species identification will offer either a fast and deterministic option (as those proposed in the CBOL website) or a slow, probabilistic and phylogenetic based option as those implemented within the MBLAB project.
The specific Meta-genomic services will include alignment-based methods and gene annotation tools that would allow to extract from environmental collection of sequences information necessary for assessments of ecosystem taxonomic complexity and functionality and for the management of naturally harvested- and invasive species, as well as for tracing the origin of pathogens. Well-defined workflows allow for the generation of reproducible, standardized and quality controlled metagenomic profiles, i.e., the cataloguing of the diversity of species and functional genes in a specific environment. These profiles give information on the condition and wealth of the habitat by assessing the taxonomic and functional composition of the resident community. These assessments can disclose processes like loss of biodiversity, changesin community composition, discovery of invading species, and any anomalies in metabolic activities of the community. Moreover, they can give information about potential causes for alterations of the community structure.

3.1.3 Products and Tools

While nucleic acids extraction from a high number of sources is a well-established procedure in most laboratories interested in biodiversity, there is no clear consensus on the approach, or good diffusion of standardized techniques for effective environmental sample extraction and processing, which are important potential bottlenecks in biodiversity studies. In addition, metatranscriptomics and high throughput technologies for transcript, protein and protein-protein interaction, as well as metabolite analysis are still in their infancy.

The in-lab services will set up efficient tools and procedures for:

- Extraction, processing and analysis of nucleic acids from isolated species and strains and environmental samples;
- DNA barcoding, including amplification, set up of NGS libraries and use of official markers from the CBOL consortium;
- Prokaryote strain identification and phylogenetic analysis;
- Development of approaches that facilitate high-throughput analysis;
- Development of high throughput or novel screening methods for the identification of products of commercial interest;
- Metagenomics and metatranscriptomics;
- Database system to archive, annotate and integrate data coming from the other virtual labs.

The in silico services will include:

- NCBI Blast powered by distributed computing units;
- Alignments tools (i.e. Muscle, PROMALS) and alignments quality control software (i.e Gblocks) powered by distributed computing units;
- Motif and Pattern search (e.g. PatSearch) powered by distributed computing units;
- Phylogenetic inference software with flexible model specification (i.e. MrBayes and RaxML) on distributed, parallel units, some of which powered with GPU system;
- Phylogeographic software ABC-based (i.e. Simcoal) powered by distributed computing units;
- Gene annotation software and predefined pipeline of software for gene annotation powered by dedicated computing farm;
- Species assignment with fast and deterministic method (i.e. logic programming) or slow and probabilistic (phylogenetic approach).

3.1.4 Applications and Impact

The combination of the lab and in silico services would allow to tackle the following questions in molecular biodiversity, functional to a more complete comprehension of the biodiversity as a whole targeting the scientific community as stakeholder and user community:

- Understanding how molecular variation is related to functional and physiological diversity, including evolutionary mechanisms of genome organisation and genome variation;
- Evolution and generation of diversity in the genomes of organelles and other extra-chromosomal genomes;
- Role of genome-environment interactions and their relationships with ageing, nutrition and stress;

- Understanding the genetic basis of quantitative variations;
- Improving the understanding of key pathways in different organisms, including pathogens (viruses, bacteria, parasites);
- Identification of novel metabolic and physiological pathways;
- Identification of potentially exploitable natural products.

The assessment of individual plasticity and species adaptation, intraspecific connectivity among populations living in different ecosystems and connectivity among the ecosystems themselves are going to have applications and impacts at the conservation, management, governance and policy levels, which have the natural resource managers, administrators and policy makers as target communities. Possible applications concern the formulation of conservation and management plans at different spatial levels, to design protected and managed areas, to draw realistic mitigation plans based on expected climate change impacts and adaptation strategies. Impacts are expected on the implementation of EU-Directives and national strategies. The former includes the Nature 2000 directive, which requires the development of the management plans for all the SCIs and SPZs at the EU level within 2012. The assessment of population inter-connectivity and ecosystem connectivity is essential to draw realistic management plans and allow the proper implementation of the EU-Directive avoiding the risks of procedures of infractions and strong biases in the management plans resulting in a low performance of the conservation procedures. The latter includes the national strategy to climate change adaptation, which greatly benefits from the assessment of the potential of species adaptation, particularly in sensitive groups and fragile ecosystems, such as coastal lagoons.

3.2 Virtual Lab 'Collections'

3.2.1 Rationale

Biodiversity data are available in Italy, but they are dispersed in many structures such as: Natural History Museums (at Universities or Municipal, Regional, Provincial), Research Institutes, Herbaria, Botanical Gardens, National Parks, Archives, Libraries, and private collections.

The dispersion of the information, coupled with the low percentage of data in electronic format and the scarce availability of on-line information, do not facilitate the availability and explotation of data for researchers and other end-users.

To enhance this great heritage, the virtual laboratory 'Collections' aims at:

- Making the already available digitalised databases interoperable and available online, with an interconnection with the data of the 'Ambiente 2010' portal, which is under construction at MATTM, avoiding duplication of data and services;
- Increasing the digitalization (and the ensuing online availability) of biodiversity data in the collections of Museums, e-Research Institutes, herbaria, Botanical Gardens, National Parks, Photographic Archives and private collections, also with the aim of filling the gap created by the absence of Italy from GBIF (Global Biodiversity Information Facility), which is the largest data bank for biodiversity data in the world;
- Integrating taxonomic geo-referenced data of single samples of the various species with information about their distribution, genetics (e.g. DNA barcode), biology and ecology, main identification features (e.g. identification keys), with the main reference publications (original descriptions, revisions, phylogenetic and biogeographical studies, etc.);
- Highlighting and emphasizing the importance of taxonomy (as the basis of ecological analyses and of ascription of bio-molecular data) giving it a new thrust with the training of young taxonomists (integrating classical and molecular taxonomies), e.g. by establishing a nationally distributed school (similar to EDIT - European Distributed Institute of Taxonomy) through courses, seminars, masters, graduate schools.

The COLLECTIONS LABORATORY will interact with the BIOMOLECULAR LABORATORY, for all aspects regarding those topics, and with the INTERACTIONS LABORATORY, for all aspects regarding species niches.

3.2.2 Structure

The Virtual Laboratory Collections aims at developing procedures for the application of informatics to taxonomy, including methods and tools for the digitization of the collections, the computerization of catalogues and the diffusion of social networks and informatics platforms to support taxonomic and nomenclatural work.

The Virtual Laboratory will mainly be an IT infrastructure, where several different kinds of data will converge on biodiversity and corresponding traits of individual species: taxonomy, morphology, life cycles, genetics, habitat, and historical distribution. This information, together with those regarding the description of the species niche along the most relevant dimensions and a number of strong interspecific interactions, as prey-predator, competitor-competitor, host-parasite, are going to be organised in the SPECIES AND SPECIES FUNCTIONS CADASTRE, which is the main deliverable of the E-Biodiversity Research Institute. An internal Scientific Committee and an external Advisory Board will recommend priorities in the trait selection and description in order to maximise the content of information of the CADASTRE while ensuring the completeness of the data-base for the selected traits. The selection of traits has obvious complementarities with the niche dimension selection, developed in the Virtual Laboratory Interactions and with the main drivers of each ecosystem type.

Protocols will be identified for the digitization of public and private collections, living organism collections in national parks and protected areas, SCIs/SPZs in the network Nature 2000, ecosystems and ecosystem types. Thanks to the computerization of these data, it will be possible to apply models to assess biodiversity changes over time.

It is essential that LW-ITA, among its priorities, aimes at the establishment of an Italian network on taxonomy, i.e. an infrastructure which follows the principles of the EU Network of Excellence (NOE) EDIT and offers new tools to researchers, including taxonomists, ecologists, geneticists, etc., with the final goal of developing the study and the protection of biodiversity. In this way, LW-ITA could also contribute to overcome the very complex situation of museum collections in Italy. Differently from other European countries, in Italy there is no National Natural History Museum, although there are several structures of variable size distributed across the territory and often belonging to distinct administrations. Thanks to the role played by the Natural History Museum of the University of Florence, which is the main naturalistic museum in Italy and member of the CETAF (European Consortium including the main Natural History Museums), LW-ITA will promote the digitization of the largest part of available information on Italian biodiversity collections, making them easily and readily accessible.

3.2.3 Products and Tools

A. Interoperable databases gathering data from museum collections, private collections, and collections of living organisms in natural protected areas, living ecosystem and ecosystem types.

The first step is a recognition and integration of the existing databases. To this end, it is particularly important to create a link to the 'Sistema Ambiente 2010' funded and under-construction at the MATTM, which includes the classification and the integration of the different sources and archives of data on observations and collections on biodiversity. For the digitization of new data, priority will be given to selected areas or species groups, according to the criteria reported above. The database selected for entering the Collections Lab covers a wide range of data collections; they include e-experiments on key topic, accessible to the scientific community in order to test innovative and integrative theories, and model study cases, supplying applications to address issues relevant to the conservation, recovery or improvement of societal benefits, as well as the to meet the requirements of national and EU legislation or environmental strategies. Examples of databases filling in the requirements of both stakeholder categories are the following:

- Existing Long term Ecological Research (LTER) biodiversity databases;
- Databases from protected areas and public institutions (National and regional parks, monitoring programmes, SCIs/SPZs of theNature 2000 etc);
- Integration and new digitization of data collected within selected research projects.

B. Online catalogue of the scientific literature on individual species and their traits based on both already existing electronic documents and ex novo digitization of selected texts. Within the catalogue, the information retrieval will be performed through software (OCR type) adequate to the identification of the selected key words. A link should be activated to international projects of on line libraries, such as BHL, BHL-Europe and Europeana.

C. Identification of case studies, e.g. selected geographical areas or groups of species on which this VL will focus as a start. These areas will include key terrestrial or marine regions and/or species groups for which more or less complete databases already exist, such as

protected areas, long term observatories, partially or totally digitized data collections etc.

D. Training of young taxonomists, allowing mobility among structures where the study material is located, and promoting their work through the establishment of IT platforms tailored on taxonomy and nomenclature work.

A very critical aspect that strongly constrains the study of biodiversity is the fast disappearance of taxonomists, which is likely to limit also the full exploitation of the huge amount of bio-molecular data that will predictably be available in the next years. The Virtual Laboratory Collections aims at covering a pivotal role as a reference point for the training of new professional careers of 'modern taxonomists', who will build up expertise on classic morphological analyses coupled with advanced molecular, microscopy and bio-informatics techniques.

3.2.4 . Applications and Impacts

The applications of this VL will necessarily be related with those of the other Virtual Laboratories in LW-ITA.

The planned bio-informatics platform which will gather all data on individual species and their traits will allow stakeholders to perform complex searches and relate biological data to abiotic factors (e.g. geographic and climatic) in order to study the changes occurring over the time and formulate hypotheses on future scenarios, based on expected or hypothesized changes and trends.

The care for the training of a new generation taxonomists through the establishment of a taxonomy school distributed over the territory (among Museums, universities, research institutions and parks) is particularly important in this Virtual Laboratory. This learning structure will be integrated by specific Summer schools for interested students (similar to those organized by EDIT), which will couple classes, active field research and data analysis.

A higher mobility of young undergraduate, graduate, post-doc students and researchers will also have an important impact on their training and on the standardization of methods and diffusion of knowledge among laboratories. An example along these lines is provided by the EU project Synthesis, which funds the travel and subsistence costs at different museums and laboratories in relation with taxonomy projects, which are selected by a specific evaluation panel.

3.3
Virtual Lab 'Interactions'

3.3.1 Rationale

Species do not live in isolation; their occurrence in space and time within ecosystems is the result of a network of interactions with the abiotic and biotic ecosystem components; interactions can be classified as horizontal, i.e. those of species with the abiotic components and with the species occurring and commonly competing at the same trophic level, and vertical, i.e. those of species with other species, which may be preys or predators. Species niche and food web topology are the available analytical tools to describe potential and actual interactions.

Biodiversity is organised through these interactions, which determine species performance under different climates and physical/chemical conditions as well as species fitness within every particular guild and community, according to the relative performance of every single species compared to the performances of all other coexisting species. The former interactions can be described as a filtering process, where potential colonisers are selected for or against according to the degree of compatibility between their requirements for environmental conditions and the local values for climate and physical/chemical parameters (hereafter, reported as 'environmental niche'); the latter can be described as a process of integration of conflicting requirements in the context of inter-specific coexistence, where adaptation and co-evolution play key roles. Every change in the abiotic context, resulting directly or indirectly from anthropogenic activities, is likely to affect the whole interaction network supporting biodiversity, with effects on biodiversity that might be difficult to understand. These changes include ecosystem degradation due to anthropogenic pressures but also ecosystem recovery due to the positive impacts of the increasingly effective national and international environmental legislations; they include land use changes, natural resource exploitation, and climate changes.

Understanding how biodiversity is organised at the different levels of spatial scale from the local scale of single ecosystems to the eco-regional and continen-

tal scales is of paramount importance to define the most adequate international and national policies, governance structures and management activities to protect biodiversity and those ecosystem services and societal benefits that in most cases are strictly related to biodiversity. Actually, most biodiversity conservation issues depend on the available knowledge on the interaction network and on the actual understanding of the mechanisms of inter-specific coexistence in the different types of ecosystems.

Lots of information on species niches, resulting from large national monitoring programmes and international projects collecting data on both species composition and key parameters of the environmental niche, are potentially available but they are not yet organised with a species niche based approach; much poorer information are available on the trophic links among species, even though the technical innovations recently introduced in the field is stimulating a growing experimental attention and masses of new data are becoming available.

The goal of the Virtual Lab Interactions is to organise and make available the existing information of species niches and trophic links and to promote basic research in the field in order to cover the huge gaps of information on species niches and detailed trophic structure of ecosystems. The Lab aims to build a system where species niches and trophic links, the latter within 'food web based nodes', can be stored and made available to the full range of analysis of the potential interaction network; the Lab also aims to provide access to tools to synthetically describe and integrate interactions and address application of the basic knowledge in different fields.

The intense monitoring of the coastal marine environment performed in the last fifteen years, when Italy was supplying almost 50% of data on the marine environment to the European State of the Environment, the development of Carta della Natura on more than one tenth of the Italian territory and the funding of huge research projects on target ecosystems and processes from the places Italian Ministry of Education, put Italy in pole position to build up within LifeWatch a Virtual Lab Interactions, that fully integrates with the other LifeWatch Virtual Labs. These potentially available data represent a first building block of information that places Italy in the condition to play a key role in the development of this infrastructure on species niches and trophic links, generating catalogues of potential interaction networks of paramount importance to fuel basic and applied research on biodiversity organization and conservation, ecosystem functioning and health assessment. The implementation of the Virtual Lab 'Interactions' in the LifeWatch construction phase will allow extending the niche catalogue to a broader array of species and ecosystem types and to fill in a denser catalogue of food web based trophic links for a large number of ecosystem types.

3.3.2 Structure

As the species niche is an n-dimensional space, the construction of an interactive catalogue of species (or population or individual) niches has no chance of success unless niche dimensions are properly selected. Selected dimensions need to encompass all dimensions critical for the species performance and fitness still keeping the number small enough to be tractable.

A similar process is required to define trophic links, since most species may ingest almost everything that has a body size (or particle size) compatible with the trophic apparatus of its individuals. It is well known, for example, that freshwater benthic invertebrates ingest diatoms, which mostly do not digest, and digest different types of organic matter because of the enzymes that some of their preys produce. Even in this case a selection process of trophic links as well as an evaluation of the associate uncertainty is required.

The structure of the Virtual Lab 'Interactions' has three building blocks: an ecological infrastructure, an IT infrastructure, and a Quality Control operational service.

The ecological infrastructure is defined by the conceptual structure, use-inspired, of the species niche and trophic link overall data platform. It involves:

- The selection process of niche dimensions, based on a guild and ecosystem type classification;
- The selection process of trophic links;
- The planning of the degree of data aggregation required in order to build up e-study cases of particular relevance to be used as test material for the most update theoretical advances in the field;
- The planning of the degree of data aggregation required in order to up e-study cases of particular relevance to be used as test cases for the

application of bio-monitoring tools, conservation actions, recovery actions or other applied niche based biodiversity management issues.

A Scientific Committee and an Advisory Board are in charge to build up and boost the ecological infrastructure of the Lab and to define all QC procedures that need to be performed on data and metadata eligible to enter the platform.

The IT infrastructure has two parallel components: the Species Niche Interactive Catalogue and the Trophic Link Interactive Catalogue. The former is species-oriented, being strictly related to the other Labs, with a bi-directional relationship with the Lab 'Collections'; the latter is food web-oriented, being strictly related to the other Labs. The IT infrastructure is a distributed infrastructure, which involves:

- Information management procedures, including data standardisation procedures;
- Information processing procedures;
- Inter-operability procedures of the existing and distributed databases and data portals.

A Scientific Committee and a Technical Team are in charge to construct and keep working the IT Infrastructure.

The Quality Control operational service is a key component of the Lab, which will be run by the technical Team. Quality control checks involve the fulfilment of criteria for the inclusion of data in the Lab IT infrastructure, the control of metadata specification, the definition and evaluation of the data uncertainty protocols.

3.3.3 Products and Tools

In a changing environment, as we are experiencing because of the growing manageable and un-manageable pressures on the different ecosystem of the Biosphere, species performances at local sites and species distribution on a larger scale are expected to occur. Whenever changes are directional, as in the case of climate change, target species are expected to be severely threatened and biodiversity is globally expected to decrease, even though at the high latitudes local increases are very likely to occur. Ecosystem functioning and resulting services and societal benefits are also already changing at all scales.

Despite the fact that inter-specific coexistence have been for decades, and still are, a main issue of ecology, why are there so many species in the Biosphere and how biodiversity can increase locally even when limiting conditions are well ascertained are questions not yet completely answered, or un-answered. On the other hand, most of the knowledge on inter-specific coexistence has been built by addressing very small subsets of guilds and communities, focusing on pair-wise species interactions or on a reduced number of species niches, loosing the full picture.

The Virtual Lab 'Interactions' is supplying organised information on potential and realised interaction networks, which are not available so far. They offer ground for testing ecological theory on biodiversity organization at different type of ecosystems and for different species guilds. They allow a wide range of stakeholders to perform powerful analysis of niche relationships and to address expected niche responses and biodiversity changes along directional gradients of changes in the environmental niche. As changing environmental niches is a critical issue, the species niche organised data-sets and e-experiments are going to be products of paramount importance for scientists, who may plan e-experiments, test theories and perform applications to local study cases, for administrators, who may use the available knowledge to build changing scenarios at the local level, plan mitigation or recovery strategies and test the strategies on model study cases, for private companies exploiting natural resources, who can acquire information on target species niche and improve the natural resource management.

The interactive catalogues and the e-study cases are the main products that the Lab is making available to the Stakeholder community.

When the construction phase will be completed and the Lab is operational, it will also make available not only niche modelling tools specifically focusing on species coexistence but also on the biodiversity ecosystem functionin, on ecosystem services and the biodiversity organization indicators of the ecological status of ecosystems.

3.3.4 Applications and Impacts

Niche models address a wide range of biodiversity conservation issues and ecosystem conservation and recovery issues both in terrestrial and aquatic ecosystems. Niche derived models are already applied

to assess ecological status (RIVPACS) and the impact of dams (MWF) in inland aquatic ecosystems; they are widely used as environmental evaluation models (EEM) for biodiversity conservation programmes, species re-introduction and ecosystem recovery plans. More recently, they are used for focused recovery of specific target groups in aquatic ecosystems of the EU level, in order to fulfil the requirements of the Water Framework Directive to achieve a good status for all biological relevant components (the WFD Biological Quality Elements, BQEs) within the 2015.

Niche models represent the most affordable tools to address expected biodiversity changes with related changes in the environmental niche. They are a key tool to incorporate species responses and biodiversity responses in the models of climate changes producing biodiversity change scenarios; similarly, they are key tools to address species responses and biodiversity responses to land-use changes. At the local level, niche modelling can be applied to evaluate the performance of biodiversity management plans as well as of ecosystem recovery plan and ecosystem re-construction.

These applications of products and tools of the Virtual Lab 'Interactions' is going to have relevant positive impacts on the implementation of international and national policies, governance structures and management activities in order to protect biodiversity and those ecosystem services and societal benefits that in most cases are strictly related to biodiversity.

3.4 Virtual Lab 'Mediterraneo'

3.4.1 Rationale

The Mediterranean area, with its peculiar and complex geographical features, represents a unique environment. It is considered a hotspot of biodiversity, mainly because of among seasons and among habitats, landscapes and ecoregions differences, which result in high and biodiversity.

A high diversity of habitats and a richness of endemism characterize the terrestrial and freshwater biota; endemism is especially related with plants, amphibian, reptiles and freshwater fishes (http://www.biodiversityhotspots.org/xp/hotspots/mediterranean/Pages/biodiversity.aspx).

Transitional and coastal Mediterranean waters are also biodiversity hotspots and they have continuously supplied valuable ecosystem services and societal benefits to the Mediterranean societies at least across the last 5,000 years. The deep-sea biodiversity of the Mediterranean is increasingly shown as rich and original. The geographical position and the physiographical characteristics of the Mediterranean Eco-Region contribute to the high-realized biodiversity. In fact, the Mediterranean Eco-Region is a huge functional ecotone between climatic areas, biogeographical regions of species evolution, terrestrial freshwater and marine ecosystems. As an ecotone, the Mediterranean area is a particularly open ecosystem, highly exposed to species invasion and colonization, which are presently interacting with ecosystem functioning, services and the societal benefits that had a major role in the development of both the Mediterranean culture and scientific thinking. Understanding biodiversity, its organization and relationship with ecosystem functioning and deriving benefits or environmental problems for the socio-economical components is high in the political agenda of National States and International Institutions and Organizations. Indeed it has clearly been realized that the Mediterranean is a functional Ecosystem unit, within the framework of the Ecosystem Approach, that cannot be handled at a national or lower level geographical, administrative or political scale.

LifeWatch is the largest biodiversity research infrastructure in Europe matching the strengthening of ecological research on biodiversity with societal requirements. The development of a Mediterranean Virtual Institute in LifeWatch, as Nationally-based transnational Lab, is needed to allow for an application of the scientific knowledge to support the sustainability of the quality of life at all spatial and administrative levels.

Italy is the best candidate for building and developing a Virtual Research Laboratory on the Mediterranean. Geographically, Italy has a strategic position in the Mediterranean area, as it covers an extended latitudinal range, and encompasses a large amount of geomorphologic variations. The complex orographic and environmental characteristic in Italy result in rapid transitions at small spatial scales. The sea surrounding the Italian peninsula and the major islands (Adriatic, Ionian, Tyrrhenian, Ligurian Seas, and Sicily Channel) are also different in terms of hydrography and include a variety of differently impacted coastal environments,

from pristine to eutrophic, with steep inshore-offshore gradients and open ocean waters relatively close to land. The marked seasonality contributes to the environmental variability, which is at the base of the high biodiversity of the whole area. Historically, the Zoological Station of Naples has been the first large Biodiversity Research Infrastructure in the world, being founded few years after the publication of Darwin's 'The origin of the species' and being deeply inspired by the ecological and evolutionary thinking of Ernst Haeckel, who only a few years before opened the field to the science of ecology by introducing the new word in the scientific community. Since then biodiversity in the Gulf of Naples has been studied, making that marine ecosystem one of the densest nodes of biodiversity knowledge in the world; yet huge gaps still exist in the species number and ranges over wide areas, especially in the southern and eastern regions of the Mediterranean sea. In addition, the diversity of microorganisms, protists and many invertebrates remains poorly studied despite their pivotal role in the productive processes and trophic webs in the sea.

Italy has both the skill of the scientific community and the IT infrastructure to build and develop a Virtual Research Laboratory 'Mediterraneo'. Over the years, the Italian research community has been involved in several national and international projects addressing biodiversity in Italy as well as over the whole Mediterranean area. Species distribution data have been gathered along with abiotic and biotic parameters. For example, over the last years relevant information has been gathered within the national projects SIDIMAR, MIUR Prisma, Prisma2, SINAPSI and VECTOR and in the international efforts ALTERNET, MARINE GENOMICS, MARBEF, POEM, PROSOPE, SESAME, BOOM etc. Italy has a major role in the ERANET CIRCLE-MED, has built an infrastructure to merge all abiotic and biodiversity data, mainly for the terrestrial environment, in the applied framework of Carta della Natura. Moreover, Italy has funded a National Research Center devoted to the study of climate change in the EuroMediterranen eco-Region (CMCC), which is one of the European nodes for abiotic and climate data organization and management as well as for regional scenario-building. In addition, the network LTER- Italy and other thematic networks have allowed to draw together a variety of terrestrial, freshwater and marine sites where biodiversity is observed on the long-term scale.
Finally, Italy is also the leading country in the preparatory phase of the ESFRI EMBRC, which will link marine laboratories across Europe for a more effective use of marine resources.

The available biotic and abiotic datasets, along with the existing level of networking within the scientific community and with the institutions and administrations at national and international levels, offer a unique opportunity to relate biodiversity to environmental features and to use the data in models and projection of biogeographical ranges (realized niche, envelop models etc.) as well as in the development of model application and scenario building that address societal demands of knowledge-based management and governance of ecosystems and their services. Examples of application of the biodiversity knowledge that can be developed in the 'Mediterraneo' Lab include the development of model application and scenario building for:

- Biodiversity responses to climate change;
- Cascading impacts of climate change on ecosystem functioning and societal benefits;
- Land-use change impacts on biodiversity and cascading ecosystem functioning;
- Performance evaluation of the mitigation and recovery actions required in the implementation of the EU-Directives (e.g. WFD recovery of good ecological status; MSPD recovery of good environmental status; Nitrate Directive);
- Optimization of protection measures and conservation strategies of biodiversity at the different level of geographical, administrative and political scales in the Mediterranean.

A detailed description of the benefits resulting from applications that can be developed by the 'Mediterraneo' Lab and the related impacts are described in the following section 2.4.4

3.4.2 Structure

The Mediterranean Virtual Laboratory is the ecosystem level Lab of the E-Biodiversity Research Institute. It is merging spatially defined 'Collections' of biodiversity data at the ecosystem level with abiotic data and pressure data at the same spatial and functional scale, constituting functional nodes of data aggregation; these functionalnodes represent the highest level of data aggregation of the E-Biodiversity Virtual Institute, being organised in the framework of the 'Ecosystem Approach'.

At the national level, the Institute for the Environmental Research (ISPRA) has organised the data on the anthropogenic pressures along all Italian coast and pressures data on all Water Districts are being organised in the implementation of the Water Framework Directive. The national projects listed in the previous sections had well developed data storage, organization and management system for the huge collections of abiotic data. National and regional monitoring plans are also a major source of abiotic data for a wide range of Italian ecosystems.

The MediterraneanVirtual Laboratory has a reticulate structure connecting the functional nodes, around which basic and cross-cutting questions on biodiversity and biodiversity cascading implications at the ecosystem level can be addressed by a variety of stakeholders, using the available data, the suitable statistic and modelling tools produced.

The structures of Mediterranean Virtual Laboratory functional nodes are similar to those of the other Virtual Labs, having an ecological infrastructure, an IT infrastructure and a Quality Control operational service as building block, and interact bi-directionally with other Labs, mainly with the Collections and Interactions Labs.

The ecological infrastructure is defined by the conceptual, problem-oriented structure, of the 'Ecosystem Approach'. It is based on a collection of species data integrated with a collection of abiotic data and anthropogenic pressures data at the same spatial scale. To this end, the Mediterranean Virtual Laboratory interacts with the Collections Lab, by exchanging bi-directionally collections of species and receiving collections of species and species functional traits; the Mediterranean Virtual Laboratory also interacts with the Interactions Lab by delivering species collections and ecosystem abiotic parameters and receiving species niche descriptions and metrics. The Mediterranean Virtual Laboratory is an integrative Lab, which, being problem-oriented, involves a selection process of the environmental components, including pressures, closely designed on the functional node properties and the available scenario of their evolution.

A Scientific Committee and an Advisory Board are in charge to supervise the selection of the functional nodes, among those proposed for the inclusion in the Mediterranean Virtual Laboratory infrastructure, as well as of the essential abiotic components required, with the principle of parsimony. These processes include:

- Evaluation of the key Mediterranean issues dealing with biodiversity and suggestion for a focus on specific topics in the ecological infrastructure;
- Calls for ideas and proposals of possible functional nodes;
- Evaluation and selection of functional nodes proposed, based on amount, quality and accessibility of data;
- Selection of the environmental parameters to be integrated in the infrastructure;
- Identification, analysis and proposal of appropriate biodiversity indicators (single species, structuring species, non-taxonomic and taxonomic indexes) to be produced;
- Identification, analysis and proposal of the problem-oriented tools to be implemented and made accessible ;
- Proposal of showcases directly developed in the Mediterranean Virtual Laboratory, as developed example and training materials for the wide stakeholder community.

The IT infrastructure has two parallel components: the functional nodes Biotic DB and the functional nodes Abiotic DB. The former is species-oriented, being common to all functional nodes and strictly related to the other Labs, with a bi-directional relationship with the Lab 'Collections'; the latter is problem-oriented with functional node specificity, being strictly related to the other Labs, with a bi-directional relationship with the Lab 'Interactions'. The IT infrastructure is a distributed infrastructure, which involves:

- Information management procedures, including data standardisation procedures;
- Information processing procedures;
- Inter-operability procedures of the existing and distributed databases and data portals.

The Quality Control operational service is a key component of the Lab, which will be run by the technical Team. Quality control checks involve the fulfilment of criteria for the inclusion of data in the Lab IT infrastructure, the control of metadata specification, the definition and evaluation of the data uncertainty protocols. In the Mediterranean Virtual Laboratory, quality control will focus specifically on the data entering the functional node Abiotic DB, leaving quality

control on the biotic data to the Collections Lab, as regards species taxonomy, and to the Interactions Lab, as regards species interactions and trophic links.

3.4.3 Products and Tools

Environmental issues, determined by the increasing density and extent of anthropogenic-based resource exploitation, are all mediated by the interaction of biodiversity with the abiotic ecosystem components. In the ecosystem approach perspective, all environmental issues are biologically based, yet our knowledge mainly relies on the abiotic component and on that part of the biotic component describing anthropogenic pressures, i.e., our impact on the abiotic component. The biodiversity role on mitigating, compensating or emphasising environmental issues is much less known. Understanding the biodiversity role needs integration of biodiversity and ecosystem abiotic data over a large number of study cases in order to analyse the patterns of variation and search for common patterns highlighting causal deterministic mechanisms.

The Mediterranean Virtual Laboratory is actually integrating the two sets of data on an Eco-Regional scale and the functional node approach generates study cases, which are the main products of the MVL. The reticulate structure of functional nodes is the integrative product of the MVL, offering research opportunities to the scientific community and a consistent basis of information to build knowledge-based conservation plans of biodiversity and ecosystem management and governance plans.

The Mediterranean Virtual Laboratory is structured in order to develop tools and test procedures where biodiversity data are used in an ecological context. Tools include a wide suite of models and statistical procedures in order to implement the problem-oriented approach of this Virtual Lab. A toolkit for the interpretation of biodiversity changes over spatial and temporal gradients across different environmental typologies can be implemented. In this context, indications can be obtained on fundamental biodiversity issues in the Mediterranean area including:

- biodiversity loss,
- alien species,
- impact of climate change and acidification,
- harmful species,
- fisheries decline,
- effects of anthropic activities.

At the end of the construction phase, when the Lab will be fully operational, it will also provide ecosystem modelling tools specifically applicable to describing the relationships between biodiversity and ecosystem functioning and services under different environmental conditions. To this aim the Mediterranean Virtual Laboratory takes advantage of the products and tools of all other laboratories from the E-Biodiversity Research Institute.

3.4.4 Applications and Impacts

The Mediterranean Virtual Laboratory is conceived as a collection of showcases. Therefore, it represents the Laboratory that is most directly linked with the whole Stakeholder community of LifeWatch.

The study cases, which are fully e-developed within the Mediterranean Virtual Laboratory, include a number of e-experiments addressing key interdisciplinary issues and showcases of biodiversity responses to a wide range of anthropogenic and natural pressures in the Mediterranean EcoRegion(s). The applications of the show cases are developed in order to have impacts on the implementation of the EU-Directives and the Italian environmental legislation, as well as on the implementation of new political efforts to protect and manage biodiversity and the related ecosystem services and societal benefits. The positive impacts of the activities developed inside the E-Biodiversity Research Institute on the issues of environmental and food security and global change adaptation are going to be realised mainly through the Mediterranean Virtual Laboratory.

4 Start-up Plan

4.1 Networking the scientific community

The relevance and overall impact of an infrastructure is measured by the value that the users assign to it, by the density of requests of use and by the willingness of users to pay. Therefore, the first priority for the E-Biodiversity Research Institute is to network the scientific community within LifeWatch. To this aim, early in the start-up phase the following actions will be performed:

- To provide information on LifeWatch, its past, present and future developments, to the scientific societies, the European Federations and Associations, the Research Consortia and the Data Provider Platforms that have the study of biodiversity in their missions;
- To invite these scientific organizations to develop formal links with LifeWatch and to delegate a member to enter the Scientific Committee;
- To organise the participation of the LifeWatch Community to the Conference of these scientific organizations.

As part of the 'User Platform' interface of the Service Centre, networking the scientific community is not important only in itself but in its capacity to actually link the infrastructure to its User communities, designing together the content of the infrastructure in order to be most effective in supporting the Users' activities.The research community needs to be effectively involved to contribute raising the attention on the most promising and innovative theories and hypothesis. In order to achieve the objective, the service Centre will prioritise:

- The development of the User Platforms interfaces in the LifeWatch portal;
- The organization of e-Dahlem type workshops;
- The development of Dahlem type workshops with thematic groups of delegates of the scientific organizations that have been developed formal links with LifeWatch.

In the start-up plan we give a high priority to the development of a range of social networking and participatory approaches enabling user groups to come together to address specific issues and needs and determine:

- Which services the biodiversity managers, the local administrators and the policy makers are expecting to find in the LifeWatch Service Centre;
- Which information the citizens want to have about biodiversity and its impact on the quality of life;
- Which support the education system in Europe is expecting from a large IT research infrastructure on biodiversity.

4.2 Coordinating with the Start-up of LifeWatch-ERIC

LifeWatch is starting the construction phase in a transition period with a restricted number of Founding Fathers, three of which, are going to take the responsibility to host the Central Common Facilities . These countries are Italy, Netherlands and Spain.

- Spain is hosting the Statutory Seat and it is leading the ICT core, which is incorporated in the Statutory Seat;
- The Netherlands is hosting the LifeWatch IT Research and Innovation Centre leading the Virtual Lab and Innovation Lab development to secure a phased application integration;
- Italy is hosting the Service Centre leading all the activities connected to developing services and supporting end-users.

The three countries hosting the LifeWatch Common Facilities agreed that the start-up activities to establish the LifeWatch Common Facilities are based on a collaborative international spirit. The final steps for the establishment of the legal LifeWatch ERIC will be pursued, together with the other country members in the Stakeholders Board. The LifeWatch staff will be

appointed after an open recruitment process.

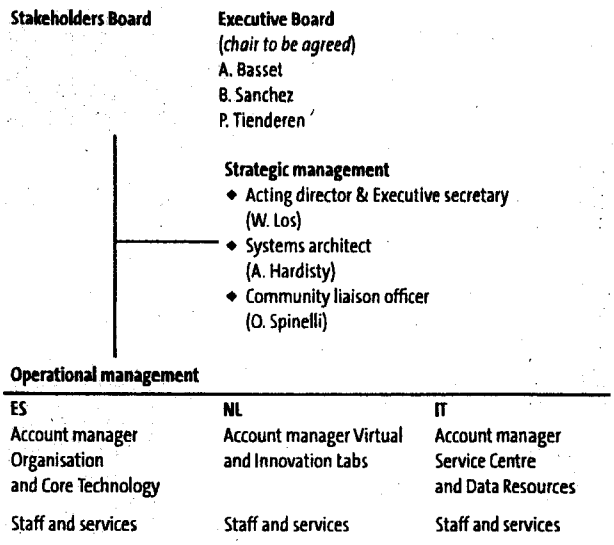
Accordingly, the three countries have agreed an allocation of activity and responsibilities on the basis of the plan drafted by the steering group of the preparatory phase and reported below.

The start-up activities are (for the purpose of this document) organized in three domains: (A) General management and administrative activities, (B) External relations and service activities, and (C) Technical construction. It is proposed that each leading country responds to this document with concrete proposals for managing its part of the start-up activities in these three domains based on the task division amongst the countries as suggested in the next pages.

The start-up organization should act as a single body and with a clear common interim-management. As such it is proposed that each country nominates an interim manager for one of three start-up domains, and that the three involved members of the Stakeholders Board agree on whom of the three will act as interim director. The interim director is responsible for the start-up organization and its outputs, and reports to the 3 involved members of the Stakeholders Board.

4.3 Temporary start-up organization

The following interim organization follows the Jira construction project STARTUP. This construction project describes the required initial activities to start construction and to populate a construction team within one year.



Country	Expressed interests	Start-up tasks	Outputs (deliverables/month)
IT	◆ Central Service Centre ◆ External network coordination	1. Interaction with national and network stakeholders 2. Directing, planning and coordination of the service organization (central + coordination distributed service tasks/centers) (SERV) 3. Negotiating Service Level Agreements 4. Formal establishment of Data Resources Platform (SCSUPP) 5. Preparation of MoUs with data resources + related protocol development (DATAGEN) 6. Establishment of related organization structure, annual planning, job descriptions and recruitment (together with NL and ES)	1. Meeting schedule/structure, agreements with networks/countries 2. Construction team, division of tasks in SERV, distributed service centers identified 3. Service Level Agreements for distributed service centers 4. Data Resources Platform 5. MoU, protocols and agreements for DATAGEN projects 6. Local HRM support for start-up phase
NL	◆ LifeWatch Exchange, connecting data and tools ◆ Innovation Lab	7. Directing, planning and coordination of e-Science workflow strategy 8. Development start-up activities (ICTSERV, RESTASKS, related TECH) 9. Interaction with distributed ICTSERV & RESTASKS construction 10. Design of Innovation Lab + grant proposal preparations (incl. BTCN start-up strategy) 11. Establishment of related organization structure, annual planning, job descriptions and recruitment (together with IT and ES) 12. Establishment of Contracts office 13. Supervising the Jira database as management tool	7. E-science / virtual labs implementation plan 8. E-Science Technical team in place 9. Distributed ICTSERV & RESTASKS projects identified with action plans 10. INNOLAB designed and BTCN plan 11. Local HRM support for start-up phase 12. Staff and facilities for contracts office 13. Transfer of JIRA to technical experts + regular updates
ES	◆ Core ICT Infrastructure ◆ Facilitating central organization, including legal affairs	14. Facilitating and managing central organization (ORG) 15. Managing internal and external (paper and web-based) communication 16. Directing and finalizing legal arrangements, agreements and contracts 17. Directing, planning and coordination of core technical construction (TECH) 18. Establishment of related organization structure, annual planning, job descriptions and recruitment (together with IT and NL)	14. Organizational and staffing scheme 15. Communication officer part time serving LW 16. Legal team, arrangements with external advisors 17. Core technical management organization in place 18. Interim management in place, including integrated HRM unit

4.4
Organising the Central Service Centre

The Central Service Centre is going to be organised in the start-up phase based on a collaborative international spirit. Components of the Service Centre, dealing with the strategic selection and development of services, the legal affairs and contracts, the coordination of the distributed services are going to be coordinated with the other LifeWatch Central Centres: i.e., the Statutory Seat and the IT research and Innovation Centre.

The organization of the Central Service Centre was designed during the preparatory project and is now going to be developed and fine-tuned in the start-up phase.

Definition of the services required by the different typology of stakeholders, organization of the working team, staffing and accomplishment of the agreements among partners represent the first priorities.

On the operational level, the Helpdesk will be the first interface of the Service Centre that will become available as soon as the new Lifewatch portal is developed by the ICT staff.

4.5
Organising the Biological Research Department

4.5.1 Establishing the start-up nodes for the Virtual Labs

The first operational nodes of the Virtual Laboratories in the E-Biodiversity Research Institute are going to be made up by the JRU partner institutions and the connected laboratories, initiatives and networks.

The connected nodes include the Universities of Bari, Florence, Rome 'Tor Vergata' and Salento, the National Research Council, with the Life Science and Earth & Environment Departments, The Zoological Station of Naples, the Mediterranean Agronomic Institute of Bari, the Environmental Agency of Puglia and Comunità Ambiente. Moreover, the LTER-Italy (Long Term Ecological Research) nodes, a number of SItE (Italian Ecological Society) nodes and of the CoNISMa (National Consortium for the Marine Sciences) are included through some of the JRU partners.

4.5.2 Developing the inter-operability within Virtual Lab

Interoperability of the Virtual Laboratories is going to be developed under the responsibility of The Netherlands, leading the IT research and Innovation Centre. The interoperability development will take into account the ITC core technology, that is going to be developed by Spain within the context of the Statutory Seat.

The interoperability of the E-Biodiversity Institute virtual labs will be coordinated with a collaborative international spirit. At the national level, interoperability is going to be developed with the international standards of LifeWatch in order to make possible the realisation of the two Show-Cases. A check of data availability and data standards is going to be addressed first of all within the JRU partnership.

4.6
Develop a model Showcase

Virtual Labs are designed in order to facilitate the development of integrative researches on key scientific issues by using already existing evidences, which are organised, reinforced with additional information and made accessible. Since LifeWatch is a Research Infrastructure aimed at producing knowledge and deepening understanding on biodiversity in order to support the development of actions, including legislative actions, to protect, recovery or manage biodiversity and the related ecosystem services, scientific issues have to be linked to environmental policy issues.

Alien species, particularly when invasive, represent a major issue when dealing with biodiversity. Anthropogenic activities have highly facilitated the alien species colonisation of almost all categories of ecosystems. They have a role both as vectors of invasion for alien species and as 'mutualists', by perturbing communities and ecosystems creating empty niches or altering the competitive equilibria. Alien species were until very recently considered a major threat to biodiversity and community organization, being potentially able to disrupt the inter-specific equilibrium and to cause short-term instability and native species extinction and biodiversity loss, in the long-term. However, recent evidences and the expected outcome of climate change are giving a different picture to alien species invasion and require a deepened understan-

ding of long-term impact of alien species on biodiversity, ecosystem functioning and service provisioning.

A better knowledge on characteristics of both alien species and ecosystem susceptibility to invasion are required. The construction of a large research infrastructure, which organise data-sets from different sources, covering a wide spectra of taxonomic groups and ecosystem categories, opens up the possibility to improve our current knowledge and map the fragility of ecosystems to alien species invasion.

Ecosystem susceptibility to invasion and the taxonomic origin of invaders are the main subjects of a model study case developed in the E-Biodiversity Research Institute. The study case is entitled: 'Ecosystem fragility to alien and invasive species: mapping ecosystem vulnerability and threats to biodiversity and service provisioning in Italy'.

The study case is developed through an inter-operability exercise on a set of databases covering collections of species along a ideal transect ranging from the deep regions of the Southern Adriatic-Ionian Sea to the high altitude woodlands in Central and Northern Italy. Coastal marine ecosystems, lagoons, lakes and rivers, prairies, woodlands and caves are ecosystem categories available in the distributed databases. Plants and animals, plankton, benthos and nekton are some of the considered guilds.

A simplified data set is required for every collection, reporting only the taxonomic list of species with a single species trait, alien or native, expressed in a binary way. Optional traits are average individual body mass and the species role (expressed in a binary way) in the ecosystem services.

Ecosystem fragility will be evaluated from the proportion of native and alien species; similarly the vulnerability of taxonomic or functional groups will be evaluated from the proportion of native and alien species within every group. The accessibility of data stored in distributed databases will allow mapping ecosystem vulnerability on the layer of ecosystem types in Italy. Bio-molecular data on selected species and species groups will provide services with the observation of individuals and populations.

By using the simple traits selected for the analysis, estimates of the scenario of change for ecosystem services in the different types of ecosystems will be performed.

The study case is easily expansible to ecosystems in other EU countries, covering a wider range of ecosystem types and taxonomic groups. The extension of the study case to countries on North-South and West-East gradients is particularly relevant in order to search for geographical patterns of ecosystem fragility and to preferential pathways for alien species invasions.

4.7 Financial plan for the start-up phase

The LifeWatch-ITA preliminary financial plan for the first 5 year commitment period is reported as Annex to this document (**Annex 2**).
The start-up period of LifeWatch implies a commitment of the national nodes at two different levels. At the national level the general organization of the national LifeWatch organization has to be developed; at the EU-level, the setup of the Common LifeWatch Centres has to be defined and coordinated among the countries that share the responsibilities. Since Italy is one of these countries, both lines of activities have to be developed and funded during the start-up phase.

Activities are organised into four main groups: Management & Coordination, Service Centre, Virtual Laboratories and Show Cases (Table 4.1). The overall budget required for the start-up period is 750.000,00 euro, one third of which is granted by the JRU partnership, as in kind contribution.
Management & Coordination, accounting also for the overheads, requires 22,0% of the overall budget, the start-up of the Service Centre requires 32,0%, the interoperability and organization of the Virtual Labs 20,0% and 26% is devoted to the realisation of two Show Cases agreed in the group of founders of LifeWatch.

Most of the budget is due to personnel expenses, accounting for the 61,6% of the overall budget; however more than 50% of the cost of personnel is covered by the JRU partners as 'in kind' contribution to the development of the start-up phase.
The Common Centre activities, involving all Service Centre activities and the Show-Cases, are based on a collaborative international spirit.

VOICES OF COST ACTIVITIES	PERSONNEL	TRAVEL	MEETINGS AND CONFERENCE	CONSULTANCY	OTHER	CONTINGENCY	TOTAL
Management & Coordination							
General Coordination	86000	10000			10000	40000	146000
Service Centre Coordination	10000						10000
Virtual Laboratory Coordination	10000						10000
Service Centre							
Networking/meetings [1]	20000	3000	50000	20000			93000
Executive planning of services	27000						27000
Distributed Centers & agreements	20000	3000	5000				28000
Data resource Platform	45000	3000	15000				63000
MOU, protocols agreements	20000				10000		30000
Virtual Laboratories							
Setup Interoperability [2]	50000			20000	25000		95000
VL setup [3]	24000	2000		20000	10000		56000
Show Cases							
Alien species [4]	104000	3000	10000	10000	15000		142000
Wetlands	46000	4000					50000
TOTAL	462000	28000	80000	70000	70000	40000	750000

Table 4.1

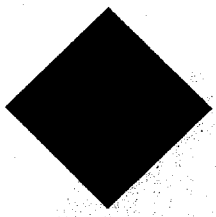
Financial plan for the start-up phase. The required budget is allocated per activity and voices of costs.

[1] Consultancy: brochures, posters and publications;

[2] Other costs: Software/Hardware;

[3] Consultancy: groups of taxonomists,which may be external to the JRU;

[4] Consultancy: groups of experts, collection of new data.



Annex 1
Protocol of intent formalising
the Joint Research Unit defined as:
LifeWatch-ITA

Cooperation agreement to develop research activities in the field of Biodiversity infrastructures Through a joint research unit (JRU) defined as LW-ITA (Lifewatch Italia)

With the following agreement among the under listed parties:
Consiglio Nazionale delle Ricerche (CNR)
represented by the President and legal representative,
Prof. Luciano Maiani,
Università degli Studi di Bari 'Aldo Moro'
represented by the Rector and legal representative,
Prof. Corrado Petrocelli,
Università degli Studi di Firenze
represented by the Rector and legal representative,
Prof. Alberto Tesi,
Università degli Studi di Roma 'Tor Vergata'
represented by the Rector and legal representative,
Prof. Renato Lauro,
Università del Salento
represented by the Rector and legal, representative
Prof. Ing. Domenico Laforgia,
Stazione Zoologica Anton Dohrn Napoli
represented by the President and legal representative,
Prof. Roberto di Lauro,
Istituto Agronomico Mediterraneo di Bari (IAMB)
represented by the Director and legal representative,
Dott. Cosimo Lacirignola,
Agenzia Regionale per l'Ambiente in Puglia
represented by the General Director and legal representative,
Prof. Giorgio Assennato,
Comunità Ambiente
represented by the Manager and legal representative,
Oliviero Spinelli.

Premise

Whereas

The European strategy for Research foresees the construction of an infrastructure dedicated to the study of biodiversity, and called LifeWatch consisting in:

- A network of observatories, institutions, research groups on biodiversity;
- Innovative tools for generating and processing data on biodiversity, as well as their integration, interoperability and accessibility;
- A distributed system of virtual laboratories which, among the issues of interest to biodiversity resarch, will develop highly innovative interdisciplinary research and will make available organized data, new methods and procedures, advanced tools for numerical analysis and modeling;
- A service center that provides access to data, applications and computing systems and organize advanced training courses;

On January 31, 2011 the preparatory planning phase of the LifeWatch infrastructure, based on European Commission funding, will be concluded and, at the same time, a transition phase will be activated in order to create foreseen – in accordance with Regulation (EC) No 723/2009 of the European Council on the Community legal framework applicable to a European Research Infrastructure Consortium (ERIC) – the legal entity that will handle the construction and operation of the infrastructure, on the basis of the contributions and guidance of the member states which will join the initiative;

Italy expressed its support to LifeWatch through the participation of numerous public and private institutions to the infrastructure's preparatory phase and through the increased involvement of national scientific community, as well as through the signing of official documents of accession by the Ministry of Education which include, on 5 August 2010, a Memorandum of Intent " prodromal to intergovernmental agreements of ERIC and the simultaneous assignment of a national representatives in the" Stakeholder Board, the body responsible for coordinating the transition from planning to the start of the construction of the infrastructure;

Parties have competences consistent with the objectives of European research infrastructure LifeWatch and have developed significant interdisciplinary research on biodiversity characterised by a strong international character. The parties have cooperated with the European consortium that managed the preparatory phase of LifeWatch and joined a series of activities organized in collaboration with the Department of Life Sciences of the CNR, who has played the role of coordination;

The Parties, recognizing the high scientific, social and economic value of research on biodiversity and its role in the international political agenda, express their interest in the strengthening of scientific research in this interdisciplinary topic.

The Parties have collections and databases on biodiversity, and perform activities of various kinds, which may be part of the national contribution to the construction and operation of LifeWatch;

The convention scheme for grants of the 7 th Framework Programme for Research and Innovation (FP7) foresees the JRU (Joint Research Unit) as a partnership among different legal entities - generally of the same nationality - based on a special agreement which not create an independent legal entity;

A JRU can not join contracts with the European Union but, under Clause 23 of the conventions scheme of FP7, a member of the JRU may be contracting and reporting the work done by other members of the JRU and transfer their contributions on the basis of the JRU.

It is agreed as follows

Art. 1 Premises

1.1 The premises are an integral and substantial part of this document, and they represent a prerequisite and inseparable section.

Art. 2 Subject

2.1 In the transition phase - that goes from the preparatory phase of LifeWatch to the construction of the intergovernmental consortium that will manage the construction and operation phases of the infrastructure LifeWatch (hereafter LW-ERIC) - the parties shall establish a formal collaboration through the establishment of a Joint Research Unit LW-called ITA.

2.2 LW-ITA aims to promote and facilitate the participation of Italy to the contruction of the LifeWatch infrastructure, encouraging a broad participation of the scientific community, and optimal returns on investments in our country;

2.3 LW-ITA will realize the coordination of activities and support the organization of the Italian contribution to the intergovernmental consortium LW-ERIC through the recognition and systematization of resources of members of the JRU potentially accountable as a contribution 'in kind' to the LW-ERIC which the parties undertake to identify within thirty days from the accession to LW-ITA;

2.4 LW-ITA will work to achieve specific agreements, subsequently defined between the parties and any others, aimed at the Italian participation in the intergovernmental consortium LW-ERIC and, where required, to implement the measures referred to in article 3.

2.5 LW-ITA will also perform activities relating to the construction of infrastructure, defined in specific plans jointly defined, and, in particular, will be able to participate in FP7 European projects including activities aimed at the construction of the research infrastructure or at its use;

Art. 3 Activities and obligations of the Parties

3.1 The activities under this Agreement will be the subject of further specific and periodic work plans of the Joint Research Unit, agreed between the Parties;

3.2 Activities that may be carried out as part of this agreement are aimed at:

- Pursue a better appreciation of the shared skills, databases and computing resources of each party
- Coordinate the national activities in the transition phase and provide support to the MIUR and other Ministries in the organization of the Italian membership in LW-ERIC;

- Undertake actions aimed at strengthening the overall contribution of the LW-Italian in ERIC;
- Promote a systematic action for the integration of the Italian scientific research, encouraging new accession to LW-ITA with the procedures laid down in art. 3.2;
- Strengthen the Italian scientific research in the field of biodiversity and promote education
- Promote technology transfer and perform activities of scientific dissemination and communication in the field of biodiversity;
- Planning and organizing pilot demonstration of the operation of LW-ERIC, highlighting the peculiarities of an Italian contribution;
- Promote regional nodes LW-ITA and coordinate their integration into the national component;
- Consolidate, strengthen and expand the Italian contribution to the European research infrastructure on biodiversity LifeWatch participating in the calls of the Seventh Framework Programme and in other calls dedicated to infrastructures at trans-national, national or regional level;
- Any other action related to what isreferred to in Article 2.

3.3 The Parties have the right to terminate this agreement, stating the reasons.

3.4 Other public institutions or consortia of research-dominated public or private bodies active in research and development in the field of biodiversity and of the overall purpose of the JRU, can adhere to the Joint Research Unit LW-ITA with separate acts, subject to acceptance of all Parties to this Agreement and with the approval of a majority of two thirds of the representatives of the parties in the General Assembly, under Article 6.

Art. 4 Management of the activities

4.1 To carry out the activities referred to in Article 3 by the Joint Research Unit, the Parties agree to use the work of the following offices:
- Coordination Committee;
- General Assembly;
- Management Committee.

Art. 5 Coordination Committee

5.1 The Parties delegate the coordination of the activities of the JRU LW-ITA to the CNR;

5.2 The Coordinating Committee is the body is in charge of coordinating all activities of the JRU LW-ITA;

5.3 The Coordinating Committee is made up of 5 members:
- The Coordinator;
- The Joint Research Unit Manager;
- The Coordinator of the administrative and accounting activities;
- Two members appointed by the General Assembly.

5.4 The Coordinator is appointed by the CNR;

5.5 The Coordinator:

5.5.1 Represents the JRU to third parties unless specified in Article 6.5.5;

5.5.2 Chairs the General Assembly;

5.5.3 Designates, with the agreement of the parties, the Joint Research Manager and the Coordinator of the administrative and accounting activities;

5.5.4 Designates three additional members of the General Assembly, with the agreement of the Life Sciences and Earth and Environment Departments of the CNR;

5.6 The Joint Research Unit Manager:

5.6.1 Chairs the Management Committee;

5.6.2 Represents the JRU in operational activities;

5.6.3 Participates to the General Assembly, without voting rights unless where the right to vote shall not be conferred by the representation of a Party;

5.7 The Coordinator of the administrative and accounting activities

5.7.1 Will take care, in consultation with the Manager JRU, of the drafting of a administrative and accounting regulation of the JRU to be approved by the General Assembly;

5.7.2 Will coordinate the administrative activities and reporting of any funding received by the JRU to carry out the activities referred to in Art. 3;

5.7.3 Will collaborate with a unit of administrative personnel appointed by each Party in accordance with the terms of the plan defined by the Parties refferrig to their own resources engaged in the activities of the JRU and reported in Annex 1 to this Agreement;

5.7.4 Participates to the General Assembly without voting;

5.8 The JRU Manager and the Coordinator of the administrative and accounting activities, if employees of one of the administrations that contribute to the formation of the JRU, will perform as part of their employment contract.

Art. 6 The General Assembly

6.1 The General Assembly is the highest governing body of the JRU LW-ITA;

6.2 The General Assembly is composed by one member, with voting rights, appointed by each party, even when it joined after the establishment of the JRU in accordance with Article 3.4 above, with the exception of the National Research Council which, according to it in Art . 5.4.4, is given the opportunity to nominate

up to three members in relation to the national dimension of the Authority and its functional organization in Departments; members may participate to the General Assembly without voting rights, as defined in Art. 5.5.3 and 5.6.4 or according to specific requests of the General Assembly itself;

6.3 Parties are free to determine the duration of the mandate of its representation that can be revoked and replaced at any time by registered letter sent to the Coordinator of the JRU by the legal representative of the institution that had made the appointment;

6.4 The Parties shall identify their representatives in the General Assembly together with their accession to the constitution of the JRU. The composition of the General Assembly at the time of formation of the JRU is then annexed (Annex 2);

6.5 The General Assembly may:

6.5.1 Propose to members agreements and Memorandum of Understanding with other JRU, organizations or public and private entities that have a positive and significant impact on the aims and activities of the JRU defined in previous articles;

6.5.2 Approve requests for new membership. The General Assembly votes effectively with a majority of two thirds of its members, in the event of a tie vote, the vote of the Coordinator prevails;

6.5.3 Adopt regulations and guidelines and take the necessary decisions to ensure the effectiveness of the JRU in pursuing its objectives;

6.5.4 Elect the Members of the Management Committee from among its Members;

6.5.5 Approve the participation of the JRU to calls for submission of project proposals, identifying the leading body among the constituent parts of the JRU according to the skills required in the notices, as defined in the next art.8.2;

6.5.6 Approve periodically a JRU program of activities;

6.5.7 Approve by consensus the plan and financial reporting performed;

6.5.8 Vote on all matters brought to the attention of the Assembly by the Management Committee or by a representative of at least 30% of the Parties;

6.5.9 Prepare and approve the minutes of meetings;

6.5.10 Approve the JRU annual activity report submitted by the JRU Manager;

Art. 7 The Management Committee

7.1 The operating organization and implementation of activities under this Agreement is guaranteed by the Management Committee;

7.2 The Committee acts as delegate of the General Assembly;

7.3 The Management Committee is composed of eight members elected by the General Assembly and the Joint Research Unit Manager, appointed in accordance with art. 5.4.2;

7.4 The Committee's task is to identify and define the activities referred to in Article 3 and to ensure a correct and coordinated course solving every problem that might arise and overseeing all technical and operational aspects;

7.5 The Committee is chaired by JRU Manager and vote on all matters concerning the activities of the JRU with a simple majority of its members;

7.6 The Committee may comprise functional groups of work, which may include the participation of external experts to the Committee, and identify its own rules of operation.

Art. 8 Financial resources

8.1 The JRU, for the financing of the activities may use:

- revenues from the project proposals made directly by JRU;
- revenues from the project proposals made by units of the JRU;
- funds provided by each of the institutions involved in the JRU;

8.2 The relationship between the parties relating to any request for contributions will be governed by specific agreements signed and approved by the General Assembly which in turn will identify a Project Leader for the purposes of planning for which contribution is requested;

8.3 To optimize the performance of activities, the JRU can promote, through the institutions involved, post-graduate and post-doc fellowships.

Art. 9 Knowledge, equipment and intellectual property rights

9.1 Each Party remains the owner of the prior knowledge that are made available to others for the activities development. The expertise developed jointly constitute the common property of the Parties which may use them to their institutional objectives.

9.2 Each Party owns the properties purchased with the contributions which the JRU may provide in project activities; it is understood that the goods thus acquired will be available to the project and its future developments.

9.3 Each Party is also the owner of any right of exploitation, including that one to patent, arising from activities carried out individually, in the case of activities carried out jointly by the Joint Research Unit LW-ITA any rights of exploitation, including that one to patent, pertain jointly to the parties involved.

Art. 10 Miscellany

10.1 The partnership, the appointment of the Partner Leader, the establishment of a Joint Research Unit and anything else done by the Parties or the leader subject does not lead to the establishment of any association, company, consortium or similar relation among the Parties, each of which maintains its own legal and economic autonomy for the purposes of management, tax, social security contributions.

10.2 The Parties may also specify with further agreements the rules provided in this Agreement. Any changes or additions to this Agreement will not be enforceable unless made in writing and with the unanimous consent of all Parties; for this purpose by this Act the representatives of each party in the General Assembly are delegates to the signature of further agreements, changes or additions to this Agreement.

Art. 11 Jurisdiction

11.1 For any dispute concerning the interpretation, application and enforcement of this Act, the parties state the exclusive jurisdiction of the Court of Rome.

Art.12 Validity of this act

12.1 This Act shall enter into force upon its signing and shall cease any effect four years after the conclusion.

12.2 This act will remain valid until the completion of activities foreseen by any projects acquired by JRU LW-ITA and not yet been completed prior to the expiration of this act.

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Dott. Cosimo Lacirignola
Agenzia Regionale per l'Ambiente in Puglia,
Prof. Giorgio Assennato
Comunità Ambiente,
Oliviero Spinelli

Annex 2

Financial Plan for the 5 years commitment

Management & Coordination E- Institute						
General Coordination	146.000,00	146.000,00	146.000,00	146.000,00	146.000,00	**730.000,00**
Service Centre Coordination	100.000,00	100.000,00	100.000,00	100.000,00	100.000,00	**500.000,00**
Virtual Laboratory Coordination	100.000,00	100.000,00	100.000,00	100.000,00	100.000,00	**500.000,00**
Service Centre						
Management						
Management	425.500,00	410.500,00	460.500,00	598.500,00	733.500,00	**2.628.500,00**
Networking/meetings	93.000,00	100.000,00	100.000,00	100.000,00	110.000,00	**503.000,00**
Executive planning of services	27.000,00	30.000,00	30.000,00	32.000,00	35.000,00	**154.000,00**
Distributed Centers & agreements	28.000,00	30.000,00	30.000,00	32.000,00	35.000,00	**155.000,00**
Data resource Platform	63.000,00	63.000,00	63.000,00	63.000,00	63.000,00	**315.000,00**
MOU, protocols agreements	30.000,00	30.000,00	30.000,00	30.000,00	30.000,00	**150.000,00**
Services provision						
Support services	972.000,00	1.208.000,00	1.555.000,00	1.911.000,00	2.115.000,00	**7.761.000,00**
Training and Capacity building	2.330.600,00	2.568.200,00	2.935.200,00	2.945.200,00	2.706.000,00	**13.485.200,00**
PR/ Communication	115.000,00	105.000,00	105.000,00	165.000,00	206.000,00	**696.000,00**
Distributed services	800.000,00	1.050.000,00	1.333.333,00	2.683.333,00	3.933.333,00	**9.799.999,00**
Virtual Laboratories						
Setup Interoperability	95.000,00	250.000,00	350.000,00	100.000,00	100.000,00	**895.000,00**
VL setup	56.000,00	250.000,00	250.000,00	250.000,00	250.000,00	**1.056.000,00**
Show Cases*						
Alien species	142.000,00	142.000,00	142.000,00	142.000,00	142.000,00	**710.000,00**
Wetlands	50.000,00	500.000,00	750.000,00	750.000,00	750.000,00	**2.800.000,00**
	5.573.100,00	**7.082.700,00**	**8.480.033,00**	**10.148.033,00**	**11.554.833,00**	
						42.838.699,00

*Titles refer only to the first year of activities; different showcases will be launched from year 2 to 5 and an increasing budget is allocated to showcases along the line two. Line one refers to showcases of LW-ITA and we may expect a showcase per year

The Italian contribution to LifeWatch will be twofold. The major part of the effort will be dedicated to the construction and management of the LifeWatch Service Centre and the following provision of support services. Moreover Italy will contribute to LifeWatch also engaging many national scientific bodies (Universities, research centers etc) into the development of show cases and virtual laboratories. The show cases will be individuated on the basis of scientific priorities and cooperation among member states.
Therefore, on a financial point of view, the major percentage of the budget will be invested to the construction and management of the Service Centre and to the provision of services: on a total of 42.838.699 mil, 36.147.699 mil will be dedicated to the Service Centre as common operations and 6.691.000 mil to the development of show cases and virtual laboratories. The budget will be distributed as follows:

Costs	Total
National priorities	
General coordination	730.000,00
Virtual laboratory coordination	500.000,00
Virtual laboratories	1,951.000,00
Show cases	3.510.000,00
	6.691.000,00
Common operations	
Service centre coordination	500.000,00
Service centre management	3.905.500,00
Services provision	31.742.199,00
Total	**42.838.699,00**

The national contribution will finance the development of show cases and virtual laboratories and one/third of the costs related to the Service Centre.

CONTRIBUTIONS	
National	
National priorities	6.691.000,00
Common operations (Ita)	12.049.233,00
Site premium	4.098.466,00
Total	22.838.699,00
LW Europe	20.000.000,00
Total	**42.838.699,00**

The financing sources have been identified as follows:

SOURCES	
National contribution	**22.838.699,00**
National committment	12.740.233,00
Other programs	3.000.000,00
LW Ita partners	3.000.000,00
Site premium	4.098.466,00
LW Europe	**20.000.000,00**
LW Europe income	20.000.000,00
Total	**42.838.699,00**