Proposal full title: **European Native Seed Conservation Research Infrastructure**
Proposal acronym: **ENSCRI**
Type of funding scheme: **Combination of Collaborative Project and Coordination and Support Action for Integrating Activities**

Work programme topics addressed: **INFRA-2008-1.1.1**

Name of the coordinating person: Mr Simon Linington

List of participants:

Participant no.	Participant organisation name	Country
1 (Coordinator)	Royal Botanic Gardens Kew	United Kingdom
2	National and Kapodistrian University of Athens	Greece
3	Freie Universitaet Berlin, Koerperschaft des oeffentlichen Rechts	Germany
4	Botanický ústav Slovenskej akadémie vied	Slovakia
5	Eötvös Loránd University	Hungary
6	Budapest Zoo & Botanical Garden	Hungary
7	Università degli Studi di Cagliari	Italy
8	CIHEAM - Mediterranean Agronomic Institute of Chania	Greece
9	Universidad de Córdoba	Spain
10	The Provost, Fellows and Scholars of the College of the Holy and Undivided Trinity of Queen Elizabeth near Dublin (hereinafter called TCD)	Ireland
11	Conservatoire et Jardin botaniques de la Ville de Genève	Switzerland
12	Jardin Botánico Viera y Clavijo del Cabildo de Gran Canaria	Spain
13	Helsingin Yliopisto	Finland
14	Fundação da Universidade de Lisboa - Jardim Botânico da Universidade de Lisboa	Portugal
15	Universidad Politécnica de Madrid	Spain
16	National Botanic Garden of Belgium	Belgium
17	Agricultural Research Institute - Ministry of Agriculture, Natural Resources and Environment	Cyprus
18	Frederick University Cyprus	Cyprus
19	Universititetet i Oslo	Norway
20	Museum National d'Histoire Naturelle	France
21	Università degli Studi di Pavia	Italy
22	Dipartimento di Biologia dell'Università di Pisa	Italy
23	Institute of Botany, Bulgarian Academy of Sciences	Bulgaria
24	Fundació Jardí Botànic de Sóller	Spain
25	Museo tridentino di scienze naturali	Italy
26	Universitat De Valencia Estudi General	Spain
27	Botanical Garden - Center for Biological Diversity Conservation, Polish Academy of Sciences	Poland
28	University of Vienna	Austria

1. Scientific and/or technical quality, relevant to the topics addressed by the call

1.1 Concept and objectives

Europe's wild plant diversity is one of the continent's key natural resources. However, this resource is threatened by development and climate change. There are sound scientific, economic and moral arguments as to why this resource should be conserved *ex situ* (held off site from where it grows) and then made more accessible both for this and future generations. These arguments are enshrined in EU policy. Seed banks offer the most efficient and effective means of *ex situ* plant conservation for wild species. Until the establishment of the European Native Seed Conservation Network (ENSCONET) as a Co-ordination Action under FP6, the European seed bank infrastructures worked in isolation at a local or national level. ENSCONET has brought cohesion to these infrastructures and developed plans for the enhancement of the overall infrastructure by the capture of genetic diversity not currently held. The European Native Seed Conservation Research Infrastructure (ENSCRI) now wishes to activate these plans and through a more centralised and simplified access system increase the accessibility to the overall infrastructure for European research, industry and biodiversity and restoration projects. In doing so, it will actively seek out potential users to refine the collecting plans and thereby ensure user needs are met. It will also offer the opportunity to seed, conservation and other scientists to access one of the best infrastructures of its kind in the world.

ENSCRI has a significant role to play in meeting the EU's objectives for both the environment and sustainable development. The European Commission biodiversity strategy (1998) COM(1998) 42 Theme 1 considered conservation and sustainable use of biological diversity. As part of that theme, the Commission was recommended to encourage within and outside the community adequate *ex situ* conservation of both wild species and genetic resources of wild crop relatives and to encourage zoos, aquariums, botanical gardens, gene banks and other collection-based facilities to keep species.

This support for *ex situ* conservation was also made clear in the European Commission Biodiversity Action Plan for the Conservation of Natural Resources (2001) COM(2001)162 final. *Ex situ* conservation was recognised as one of the most important roles of botanic gardens in the conservation and sustainable use of biodiversity. Their *ex situ* collections provide material for integrated conservation (involving a combination of *ex situ* and *in situ* conservation techniques). Their activities are also relevant for: the reintroduction of species into damaged habitats and to enhance populations as part of ecosystem management; for research and education; for selecting material for introduction into the nursery trade as well as pharmaceutical and crop protection industries; local agriculture; amenity planting; and local forestry.

The European Commission communication 'A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development' (2001) COM(2001)264 final made clear that economic growth, social cohesion and environmental protection must go hand in hand. The loss of biodiversity, which *ex situ* conservation can prevent, was recognised as one of six main threats to sustainable development in Europe.

The seeds that ENSCRI collects will play a vital role in underpinning Europe's life sciences revolution based on an interaction between the public and private sectors. The future of the European Union was visualised by the Lisbon Strategy (2000) that set the goal for the Union "to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion". The role for the life sciences in supporting the Lisbon Strategy was made clear in the European Commission communication 'Life sciences and biotechnology — A strategy for Europe' (2002) COM(2002)27 life sciences and biotechnology were identified as probably the most promising of the frontier technologies that can provide a major contribution to Europe becoming the leading knowledge-based economy. They were seen to offer opportunities to address many of the global needs relating to health, ageing, food and the environment, and to sustainable development.

The mid-term review of the Strategy on Life Sciences and Biotechnology (2007) COM(2007)175 confirmed the above in its conclusions: “The potential of biotechnology to support EU policies is real and has been proven by numerous practical examples. Consequently, there is a strong need to continue promoting the development of life sciences and biotechnology in the EU, in particular by increasing research and promoting competitiveness”.

The European plant diversity assembled and made accessible by this infrastructure project will play a key role in supplying the biodiversity building blocks and complex, often novel, molecules for the life science revolution. Plant-based fuels are taking on a new significance in the race to find alternative energy supplies to fossil fuels. Use of seeds in habitat repair and restoration is a burgeoning technology that will ensure the sustainable delivery of ecosystem services in natural, modified and man-made habitats. Furthermore, there are traditional uses of seeds from seed banks storing wild species which continue to be important such as the supply of crop wild relatives to the agricultural sector and the development of new varieties for horticulture. Seed collections are used to support a wide array of higher education research and both secondary and higher education generally. Uses can also be unforeseen such as supporting forensic testing and blood typing. Therefore, it is vital to Europe that it underwrites and increases the controlled access to high quality collections of native plant germplasm. The supply will feed and nurture the core of the continent’s science base. Without it, as yet unforeseen opportunities may not be capitalised upon. Consequently, the European Research Area will be enhanced by having a stronger infrastructure to support wild species seed conservation.

ENSCRI’s bottom-up approach is illustrated by the fact that it will be composed of 28 partners each of which has excellent knowledge of their respective floras; this will give the most significant coverage of nine of Europe’s ten bio-regions (as recognised by the European Environment Agency, EEA) and is important for logistic reasons. The partners comprise a wide array of expertise and experience that will make this overall infrastructure a world leader. The infrastructure will be enhanced by the support of some very carefully targeted research and it will give a focus to seed conservationists not just within the consortium but also to others in Europe and elsewhere who are keen to develop their expertise in this area. It will link to associated infrastructure and networks for instance in the areas of bio-informatics, crop seed conservation and environmental specimen banking. In providing the supply roles outlined above, it will play an invaluable role as an interface between the safeguarding of germplasm *in situ* and the desire for access to germplasm of wild species. Access to collections will be promoted and yet will be provided within the spirit of the Convention on Biological Diversity to which the EU is a signatory.

In summary, the objectives of ENSCRI are to build on the work of ENSCONET by:

1. Strengthening the overall European wild species seed conservation infrastructure by the addition of a large number of population samples available for research use and conservation
2. Providing a wider and more efficient access to and use of the Infrastructure, and thereby contributing to the vitality of the European Research Area. This includes making high quality germinable collections representing this plant diversity and the expertise and facilities of the network available
3. Supporting the infrastructure through specific research on the constraints to germination and on overcoming the limitations caused by certain short-lived species. In turn, these underpin the success of the conservation work
4. Further integrating European activities by maintaining a strong networking component that manages and co-ordinates the work and pays particular attention to maintaining high standards of work, the management of data, training and external communication.

We believe that ENSCRI will make a valuable contribution to sustainable European development where environmental protection, social cohesion and economic growth go hand in hand.

1.2 Progress beyond the state-of-the-art

Seed conservation is the long-term banking of seeds thereby providing easy access to plant germplasm for current and future generations. It is particularly useful as a tool for the *ex situ* (off site) conservation of plant populations or species that are threatened in their natural habitats. For most seed-bearing species, seed banking is the most effective form of *ex situ* conservation. The Millennium Ecosystem Assessment predicted that the global number of plant species is projected to be reduced by roughly 10–15% as a result of habitat loss over the period 1970–2050. This is partly based on the logic that if only 12% of the Earth's land surface area is effectively conserved *in situ*, the rest is vulnerable to human impact. Furthermore, this prediction takes no account of the uncertainty brought about by climate change. Consequently, seed banks are a key tool in preventing loss of plant diversity by removing it from the threats and in maintaining the potential opportunities that using the germplasm may provide. However, their value extends beyond this to the provision of assemblages of samples that are central for comparative research and trialling.

The use of seed banks for the conservation of wild species started in the late 1960s, building on the experience of crop germplasm storage. However, crops are selected to be genetically homogeneous and are grown under conditions that produce uniformity at the time of harvest. Hence a considerable amount of the knowledge regarding the procedures (collection, cleaning, drying, packaging, cooling and monitoring) assumes considerable uniformity within and between seed lots. Since the 1960s, our knowledge about these processes for wild species has advanced as we more understand the complexity that is imposed by the expression of genetic heterogeneity within and between seed lots. As an example, recent studies have shown the need for care when applying a single drying regime to seed lots containing individuals with differing seed maturity. Equally, the great seed longevity (potentially hundreds of years) inherent in many arable crop species is not universal for non-domesticated species. Recent studies have shown that seeds of species in certain families and from certain ecological backgrounds might live only a few decades while others may live thousands of years. This has implications for the technology which should be adopted, yet relatively little is known. Comparatively little is known about how many species produce seeds that are desiccation intolerant and are therefore incapable of being banked long-term. In Europe, the numbers are estimated to be quite low. However, perhaps the biggest challenge confronting wild species seed banking is simulating conditions that cause the seeds to germinate in the wild and become established as seedlings. Seeds that cannot be germinated 'at will' cannot be reliably turned back into plants. The literature on wild species' germination has very incomplete taxonomic coverage and is often difficult to replicate due to the variation in germination between different seed lots of the same species (plasticity). Added to this, there is still much to learn about successful seedling establishment.

With the future of many of Europe's plant species (an estimated 21% of the 12,000 species are threatened) depending on seed banking as an insurance policy at the very least, these gaps in our knowledge need to be closed and quickly. Equally as urgent is the collection of samples that represent Europe's native plant genetic diversity. The collections that exist in Europe were collected over many years prior to the project in an *ad hoc* fashion with conservation rather than use as the objective and with methods of collecting and storing of quite mixed quality and efficiency. On the basis of the ENSCONET collaboration, the implementation of improved methods is now possible.

The network draws on key European expertise in wild species seed banking including a number of the continent's main seed research laboratories. It is this expertise that will guarantee that progress is made beyond the current state-of-the-art.

1.2.1 The ensemble of the "networking activities" will enhance the services provided by the research infrastructures

The ENSCRI project builds on the ENSCONET FP6 Co-ordination Action that has integrated 24 partner institutes within Europe that are involved with seed banking. The ENSCRI networking activities will incorporate four new partners. In total, 28 institutes from 18 countries will be involved.

A key element of the networking will be an annual meeting. This has worked well in the ENSCONET project by ensuring that all members can exchange significant and relevant data, have opportunities to build collaborative projects and can meet face-to-face at least once a year when opportunities and difficulties can be aired and the way forward collectively agreed. Because all but four partners were members of the ENSCONET project, there is already a spirit of co-operation forged from joint project development and problem solving. Further to this, there is continuity between ENSCONET and ENSCRI with two of the original members remaining within the N1 Management Team.

The budget incorporates significant opportunities for exchange visits and joint collecting. This will enable joint problem solving and the appreciation of the different problems that impinge on the various parts of the overall infrastructure.

Contact with the scientific community and the public will be made through both the activities of the N6 External Communication work package and the extensive individual contacts of the partner organisations. Every member of ENSCRI will belong to this work package, thereby facilitating active participation from all in this critical area. This is an important lesson from ENSCONET, namely that involvement of all is required in active communication. Furthermore, sufficient time needs to be allowed for this activity.

Key to the external communication will be the development and maintenance of a lively web-site. This will act as the 'first port of call' for general access to information about the project's activities. Equally as important will be the annual publication of a bulletin that will carefully target the scientific community and policy-makers. This work package will be led by RBGK which has considerable experience in the area of public relations.

The other five work packages under networking set the framework for the Access and Research components of the Infrastructure. N2, Seed Bank Standards, reviews and improves the general protocols and standards required for the work. It is led by RBGK which runs the world's largest native seed conservation infrastructure. N3, Database, is concerned with the management of data for the project. It is led by TCD that has built up considerable expertise in this area through the ENSCONET project. N4, Training & Technology will be led by MTSN and will play a particularly important role by organising training and technology support for users of the infrastructure. MTSN played a key role in the PlaSciGardens - Plant Science Education in European Botanic Gardens project under FP6. N5, Fern Spore Bank Standards, builds a new element into the conservation work by expanding coverage to Pteridophytes (in this document referring to ferns and their allies; other taxonomic works use the term 'Pteridophytes' more strictly). This work package will be led by BG-CBDC-PAS which is a leader in fern spore storage. N7 covers the management of the Access component of the project and is led by NKUA which has considerable experience of participation in EU projects.

Finally, a number of members belong to other seed networks. Consequently, it will be easy to build linkages to these other networks, to ensure that the ENSCRI deliverables are quickly distributed and to guarantee that ENSCRI's work is based on the best practice and information. For instance, RBGK co-ordinates the world's only international native seed conservation network with links to some 100 institutes in 50 countries (including ENSCONET). Other partners are directly involved with national seed bank networks (for instance REDBAG in Spain, RIBES in Italy), the European Botanic Gardens Consortium, SEMCLIMED etc. There is also significant membership of non-seed networks and collaborations in Europe and elsewhere such as the Plant Microreserve Initiative, the

NATURA 2000 implementation schemes (e.g. LIFE projects), taxonomic and ethnobotanical programmes (Euro+Med, MEDUSA network), European and international conservation organisations (Planta Europa, IUCN) etc. These networks, more general contacts and previous users of the individual infrastructures will help provide good lines of communication with the broader scientific community and potential users in support of the Lisbon Strategy.

1.2.2 The overall coherence of the set of infrastructures offering access

The infrastructures chosen to deliver the Access and Service components of the project cover the main bio-geographical regions of Europe. Coherence will be maintained with R1 Baseline collections by the same infrastructures leading this component in their respective bio-geographical regions. The latter with their respective infrastructures in brackets are Alpine (PAV-UNI-CFA), Atlantic (MNHN), Boreal & Arctic (HUBG), Continental & Pannonian (FUB-BGBM), Western Mediterranean & Macaronesian (UPM) and Eastern Mediterranean & Black Sea (MAICh).

A key aim of the project is to develop the infrastructure by each partner transferring their seed collections to the respective six regional hubs under R1 both for essential duplication and for access by users. All ENSCRI members will be part of R1. Indeed, the requirement for such a large network is to give sufficient coverage across the continent. The collections held by the hubs will then be made accessible to external users. This whole process will take place in a structured way that was previously not possible.

Of the infrastructures involved, UPM is the longest established wild species seed bank in Europe, if not the world, with over 40 years of experience not only having pioneering experience of seed conservation techniques and research but also having extensive experience in service provision (of seed samples) and training. The seed banks at MAICh and PAV-UNI-CFA are much newer but have been carefully set up to act as state-of-the-art local seed banks. PAV-UNI-CFA through linkage to RBGK has established itself as a key seed research facility. They lead work package R3. The banks at FUB-BGBM and MNHN have considerable experience of access provision to seed samples. These two facilities will be subject to updating during the coming year. The bank at HUBG is in the process being enhanced based on best advice from ENSCONET.

The service provision (of data) is being led by MAICh which has considerable data handling experience. Publications and other documents will be published on-line (open access) wherever possible thereby increasing accessibility.

1.2.3 The joint research activities will contribute to quantitative and qualitative improvements of the services provided by the infrastructures

The biggest problem limiting the access provision by European native seed conservation is the lack of an adequate number of samples to cover the genetic variation of threatened, endemic and known or potentially useful wild plant populations. With respect to the latter, there has been no co-ordinated effort to collect and conserve species that might be useful to underpin Europe's research base. Undoubtedly, this leaves Europe poorly equipped to carry out plant-based research. Europe is also vulnerable to species loss particularly against a background of climatic change. This project, through work package R1, gives Europe the opportunity to become the first continent (other than Antarctica with a flora of two seed-bearing species!) to have a large proportion of its flora both available and protected in seed banks.

Listed simply, the basic techniques of seed conservation seem relatively straightforward; namely, careful genetic sampling in the wild followed by cleaning, drying, and eventually freezing (seed bank storage) and germination. Complexity comes from the variability of plant species with respect to these different processes. For instance, there is still much to learn about how to fully germinate seed lots, and thereby release all their potential, given the variables resulting from genetic variation and environmental background during seed development and following harvest. Initial studies on a

germination predictor that takes into account taxonomic and environmental parameters, have shown promising results compared with the less structured approach currently used by most facilities. Consequently, work package R2 will not only increases the accessibility of collections by predicting ways to germinate them but will also increase the efficiency and effectiveness of viability monitoring within the overall infrastructure. As a service, R2 could enhance the operation of Europe's wild flower seed producers (re-vegetation and horticultural industry) by increasing their taxonomic coverage. Ultimately, better germination protocols for Europe's wild flowers will enable improvements in the quality and standard of supply. Similarly, efforts to restore or reinforce populations of rare and endangered plants in the wild and to cultivate them in botanical gardens may also benefit significantly by enhanced knowledge on their storability and germination.

Similarly, there is much to be learnt about the potential longevity of species. Data emerging from controlled ageing studies suggest that seed of species from certain families and certain habitats, although capable of desiccation and therefore banking, may live for only a few decades under conventional storage regimes. Once identified through the activities of R2 such species need to be subjected to alternative storage methods (see also work package N2).

1.3 Science and technical (S/T) methodology and associated work plan

1.3 i) Overall strategy of the work plan

The infrastructure will primarily be enhanced by the collection of baseline samples under work-package R1. This collecting will be organised based on the EEA's bio-geographical regions. The collecting programme will take its cue from the gaps in coverage signalled by the ENSCONET collecting plans and from the requirements of potential users, whose needs will be used to guide the targeting. Standards for R1 will be guided by work-package N2 (and where spore collection from ferns is concerned, by N5). In turn, the research on short-lived species in R3 will help influence the protocols in N2. The outputs of R1 will be seeds, collecting data and germination data. The seeds and collecting data will be directed to the Access components A1 to A6 (access to collections and infrastructure) and A7 (service – data provision) respectively, the data via N3. The germination data will directly feed into the germination predictor work, R2.

Six bio-regional hubs will co-ordinate the collecting and act as the delivery points for the Access work-packages, A1 to A6 and A7. All 28 partners will be involved in R1 thereby giving good coverage across the continent. Without this broad coverage, the project would be severely weakened both from the conservation and access standpoints. These partners draw together considerable expertise in seed collecting and the European flora. Collecting will be focussed on the EU plus EFTA. This will cover nine of the continent's ten bio-geographical regions. Nearly all partners will be involved in germination testing of the collections within R1; a specialist group will augment this work with further work on difficult collections as part of work-package R2. Germination testing is important not only in validating the success of collecting but also in allowing the collections to be exploited. The management of the access work-packages A1 to A6 will take place within N7.

The ENSCRI infrastructure will be strengthened by several components that have an impact across the project. These are the research work-package R2, the training work-package N4 and the communications work-package N6. The development of the germination predictor R2 should dramatically improve the efficiency of the curation process within the individual facilities and the regional hubs. It will also increase the probability of the collections being usable in the short-term. The training work-package N4 will have a benefit both inside the network in improving the effectiveness of the work and outside the network by giving potential users the necessary ability to make the most of their access visits or supplied seed / data. N6 will act not only to disseminate the project's work but also to draw in potential users to the Access opportunities.

The overall project will be managed and co-ordinated through N1.

1.3 ii) Timing of the different work packages and their components (Gantt chart)

Work packages Networking N1-N7																		
		Year	Year 1				Year 2				Year 3				Year 4			
		Month	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	46-48
WP	No	Task (identification)																
N1	1	Management meetings																
	2	Coordination																
N2	1	Facility sharing programme																
	2	Protocols & standards		M N2.1												M N2.2		D N2.1 D N2.2
	3	Coordinate activities																
N3	1	Requirements data import tool		M N3.1														
	2	Refinement of ENSCONET Schema			M N3.2													
	3	Field data software tool		M N3.3			D N3.1											
	4	Supervision of data input																D N3.2
	5	Database links					M N3.4			M N3.5								
	6	Coordinate activities																
N4	1	Evaluation of expertise, needs assessment																
	2	Training & technology resources		M N4.1		M N4.2												
	3	Online help		M N4.3														
	4	Workshops						M N4.4				M N4.5				M N4.6		
	5	Coordinate activities																
N5	1	Current risk status				M N5.1												
	2	Sporulation time				M N5.2												
	3	Selection of model taxa					M N5.3											
	4	Evaluation of protocols. Workshop							M N5.4	M N5.5								
	5	Implementation of standards																D N5.1
	6	Research proposal on sporophyte storage																D N5.2
	7	Coordinate activities																
N6	1	Project communication policy		M N6.1														
	2	Project homepage			D N6.1													
	3	Electronic forum			M N6.2													
	4	Content of web-pages																
	5	Produce & distribute publicity				D N6.2				D N6.3				D N6.4				D N6.5
	6	Represention at meetings																
	7	Coordinate activities																
N7	1	Contact with potential users																
	2	Access rules				M N7.1												
	3	Selection of external reviewer pool				M N7.2												
	4	Internal guidelines			M N7.3													
	5	Distribution of internal guidelines				M N7.4												
	6	Publication of access calls																
	7	Standard format for the evaluation report																
	8	Supervision of evaluation process								D N7.1				D N7.2				D N7.3
	9	Management of applications					M N7.5		M N7.6		M N7.7		M N7.8		M N7.9			
	10	Quality evaluation of users' work								M N7.10				M N7.11				M N7.12
	11	Internal reports on access												M N7.13				M N7.14
	12	Coordinate activities																

Table, cont.

Work packages Transnational Access A1-A7 and Joint Research Activities R1-R3																			
		Year	Year 1				Year 2				Year 3				Year 4				
		Month	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	46-48	
WP	No	Task (identification)																	
A1 to A6		Provision of access																	
A7	1	Identification of access services				M A7.1													
	2	Provision of remote access service						M A7.2											
	3	Maintain remote access service																	
	4	Mechanism for user feedback, improvement of services							M A7.3										
	5	Coordinate activities																	
R1	1	Update of priority lists		M R1.1															
	2	Identification of target species in >1 bio-region				M R1.2													
	3	Taxonomic working sub-group		M R1.3															
	4	Database species specific information				D R1.1													
	5	Common collecting plans					D R1.2												
	6	Optimisation of sampling strategy								M R1.4									
	7	Collecting data and plant material			D R1.3				D R1.4				D R1.5				D R1.6		
	8	Joint collecting field trip																	
	9	Processing, storage, and duplication									M R1.5								
	10	Germination tests											M R1.6						
	11	Unique numbering system for collections		M R1.7															
	12	Test of remote mapping software and data storage				M R1.8													
	13	Refinement of standards for collecting data		M R1.9				D R1.7											
	14	Data transfer to the N3 database									M R1.10							D R1.8	
	15	Data to accompany seed samples available																	
	16	Coordinate activities																	
R2	1	Data analysis from R1, further germination tests																	
	2	Refinement of predictor model				M R2.1								M R2.2				D R2.1	
	3	Coordinate activities																	
R3	1	European species with suspected short-lived seeds							M R3.1										
	2	Application of existing models for seed longevity										D R3.1							
	3	Categorisation of species with short-lived seeds						M R3.2				M R3.3							
	4	Funding applications for future research programmes																D R3.2	
	5	Alternative storing methods																D R3.3	
	6	Coordinate activities																	

1.3 iii) Detailed work description broken down into work packages

Table: Work package list

Work package No	Work package title	Type of activity	Lead participant No	Lead participant short name	Person-months	Start month	End month	Indicative Total costs	Indicative requested EC contribution
N1	Management	MGT	1	RBGK	67.00	1	48	893182	893182
N2	Seed Bank Standards	COORD	1	RBGK	17.50	1	48	192167	192167
N3	Database	COORD	10	TCD	37.75	1	48	257587	257587
N4	Training & Technology	COORD	25	MTSN	35.00	1	48	322008	322008
N5	Fern Spore Bank Standards	COORD	27	BG-CBDC-PAS	36.50	1	48	172220	172220
N6	External Communication	COORD	1	RBGK	127.75	1	48	903728	903728
N7	Organisation of Access to the Infrastructure	COORD	2	NKUA	61.10	1	48	369705	369705
A1	Provision of Access - BGBM	SUPP	3	FUB-BGBM	0.00	14	48	284293	284293
A2	Provision of Access - MAICh	SUPP	8	MAICh	0.00	14	48	88733	88733
A3	Provision of Access - HUBG	SUPP	13	HUBG	0.00	14	48	89875	89875
A4	Provision of Access - UPM	SUPP	15	UPM	0.00	14	48	68386	68386
A5	Provision of Access - MNHN	SUPP	20	MNHN	0.00	14	48	126734	126734
A6	Provision of Access - LSB	SUPP	15	UNI-PAV-CFA	0.00	14	48	72627	72627
A7	Provision of Service	SUPP	8	MAICh	20.25	1	48	103363	103363
R1	Baseline Collections	RTD	3	FUB-BGBM	667.00	1	48	5080949	3810711
R2	Germination Predictor	RTD	1	RBGK	70.50	1	48	508529	381396
R3	Research on Short-lived Species	RTD	21	UNI-PAV-CFA	33.00	1	48	247038	185278
	TOTAL				**1173.35**			**9781124**	**8321993**

Table: Deliverables list

Del. no.	Deliverable name	WP no.	Nature	Dissemination level	Delivery date
N2.1	Protocols & standards	N2	O	PU	48
N2.2	Online publication	N2	O	PU	48
N3.1	Field data tool	N3	P	RE	15
N3.2	Data storage	N3	O	CO	48
N5.1	Spore collections	N5	O	RE	48
N5.2	Research proposal	N5	O	RE	48
N6.1	Website	N6	O	PU	9
N6.2	Newsletter Year 1	N6	O	PU	12
N6.3	Newsletter Year 2	N6	O	PU	24
N6.4	Newsletter Year 3	N6	O	PU	36
N6.5	Newsletter Year 4	N6	O	PU	48
N7.1	Assessment report 1	N7	R	CO	24
N7.2	Assessment report 2	N7	R	CO	36
N7.3	Assessment report 3	N7	R	CO	48
R1.1	Species-specific information	R1	O	CO	12
R1.2	Collecting plans	R1	O	CO	15
R1.3	Accessions 1	R1	O	RE	9*
R1.4	Accessions 2	R1	O	RE	21*
R1.5	Accessions 3	R1	O	RE	33*
R1.6	Accessions 4	R1	O	RE	45*
R1.7	Field data capture software	R1	O	RE	18
R1.8	Data transfer	R1	O	RE	48
R2.1	Predictor model	R2	O	PU	48
R3.1	Seed longevity	R3	R	RE	30
R3.2	Funding application	R3	O	RE	48
R3.3	Alternative storing	R3	O	RE	48

* Depending on the start of the project, these Deliverables might move

Table: Summary of transnational access provision

Participant number	*Organisation short name*	*Short name of infrastructure*	*Installation*		*Operator country code*	*Unit of access*	*Unit cost (€)*	*Min. quantity of access to be provided*	*Estimated number of users*	*Estimated number of projects*
			number	*Short name*						
3	FUB-BGBM	Dahlem Seed Bank	1	BGBM-SAMPLE	DE	Seed sample	59.01	**4000**	**150**	**150**
3	FUB-BGBM	Dahlem Seed Bank	2	BGBM-VISIT	DE	1 visitor day	269.53	**100**	17	17
8	MAICh	Seed Bank MAICh	1	MAICh-SAMPLE	EL	Seed sample	50.00	**200**	**200**	**100**
8	MAICh	Seed Bank MAICh	2	MAICh-VISIT	EL	1 visitor day	266.55	**50**	**50**	**50**
13	HUBG	Seed bank HUBG	1	HUBG-SAMPLE	FI	Seed sample	75.00	**100**	**50**	**100**
13	HUBG	Seed bank HUBG	2	HUBG-VISIT	FI	1 visitor day	302.29	**60**	**40**	**40**
15	UPM	BGV-UPM	1	UPM-SAMPLE	ES	Seed sample	50.00	**100**	**50**	**50**
15	UPM	BGV-UPM	2	UPM-VISIT	ES	1 visitor day	234.57	**100**	**4**	**4**
20	MNHN	Banque de Graines - MNHN	1	MNHN-SAMPLE	FR	Seed sample	50.00	**140**	**45**	**30**
20	MNHN	Banque de Graines - MNHN	2	MNHN-VISIT	FR	1 visitor day	284.67	**120**	**66**	**70**
21	PAV-UNI-CFA	LSB	1	LSB-SAMPLE	IT	Seed sample	50.00	**90**	**50**	**50**
21	PAV-UNI-CFA	LSB	2	LSB-VISIT	IT	1 visitor day	251.89	**60**	**40**	**40**

Table: List of milestones

Milestone number	Milestone name	Work package(s) involved	Expected date	Means of verification
N2.1	Workshop 1	N2	6	Workshop held
N2.2	Workshop 2	N2	42	Workshop held
N3.1	Survey	N3	6	Survey completed
N3.2	Schema	N3	9	Partner database schema refined
N3.3	Field data tool	N3	6	Hardware requirements defined
N3.4	Database link 1	N3	15	Database links agreed
N3.5	Database link 2	N3	24	Database links developed
N4.1	Training resources	N4	6	Questionnaire designed & distributed
N4.2	Training programme	N4	12	Training programme & resources developed
N4.3	Online help	N4	6	Online help available
N4.4	Workshop 3	N4	18	Workshop held
N4.5	Workshop 4	N4	30	Workshop held
N4.6	Workshop 5	N4	42	Workshop held
N5.1	Risk status	N5	12	Risk status assessed
N5.2	Sporulation time	N5	12	List with sporulation time available
N5.3	Model taxa	N5	15	List of model taxa compiled
N5.4	Workshop 6	N5	21	Workshop held
N5.5	Spore standards	N5	24	Standards for spore conservation available
N6.1	Communication policy	N6	6	Communication policy & timetable agreed
N6.2	E-forum	N6	9	E-forum website updated & running
N7.1	Access rules	N7	12	Access rules developed & published
N7.2	User selection panel	N7	12	User selection panel established
N7.3	Internal access guidelines 1	N7	9	Internal access guidelines available
N7.4	Internal access guidelines 2	N7	12	Internal access guidelines communicated & standardised
N7.5	User selection 1	N7	15	User selected
N7.6	User selection 2	N7	21	User selected
N7.7	User selection 3	N7	27	User selected
N7.8	User selection 4	N7	33	User selected
N7.9	User selection 5	N7	39	User selected
N7.10	Quality report 1	N7	24	Quality report produced
N7.11	Quality report 2	N7	36	Quality report produced
N7.12	Quality report 2	N7	49	Quality report produced
N7.13	2 Year report	N7	36	2 Year internal report on access produced
N7.14	Final report	N7	48	Final internal report on access produced
A7.1	Access services	A7	12	Access services identified and communicated to database team

A7.2	Remote access service	A7	18	Remote user access (service) available
A7.3	User feedback	A7	21	User feedback mechanism established
R1.1	Priority lists	R1	6	Updated priority lists compiled
R1.2	Target species	R1	12	Target species list with ranges > 1 bio-region produced
R1.3	Taxonomic sub-group	R1	6	Taxonomic sub-group established
R1.4	Sampling strategy	R1	24	First update of optimised sampling strategy produced
R1.5	Duplication	R1	27	50% of accessions duplicated
R1.6	Germination	R1	33	Germination tests set up for 50% of all accessions
R1.7	Numbering system	R1	6	Unique numbering system available
R1.8	Mapping software	R1	12	Field mapping software successfully tested
R1.9	Collecting standards	R1	6	Refined collecting standards available
R1.10	Data transfer	R1	27	50% of collecting data transferred to database
R2.1	Predictor model 1	R2	12	First revision of germination predictor model completed
R2.2	Predictor model 2	R2	36	Second revision of germination predictor model completed
R3.1	Short-lived seeds	R3	21	List of species with suspected short-lived seeds produced
R3.2	Categorisation	R3	18	Categories of short-lived seeds defined
R3.3	Seeds assigned to categories	R3	30	Species assigned to these categories

Description of each work package

Work package number	N1	**Start date or starting event:**		Month 1		
Work package title	Management					
Activity Type	MGT					
Participant number	1	2	3	8	15	21	25
Participant short name	RBGK	NKUA	FUB-BGBM	MAICh	UPM	UNI-PAV-CFA	MTSN
Person-months per participant:	37	5	5	5	5	5	5

Objectives

- Manage the three project activities Networking, Transnational Access and Joint Research.
- Integrate the 17 work packages, in order to realise a Europe-wide seed conservation infrastructure which improves human wellbeing by providing access to conserved germplasm of native European plant species.
- Deliver the project on time and within budget.

Description of work

Task 1: Management meetings

The participants are members of the Project Steering Group and meet quarterly for a one-day Project Steering Group (=Management) meeting. One of the four meetings per year is attached to the Annual General Meeting. Additionally, there will be e-meetings on specific problems that arise between meetings.

The following partners will host the Management meetings:

Year 1: RBGK, UNI-PAV-CFA, FUL, NKUA

Year 2: MAICh, BZBG, UPM, FUB-BGBM

Year 3: MTSN, NKUA, CAG, RBGK

Year 4: MAICh, UiO, PAV-UNI-CFA, FUB-BGBM

Task 2: Coordination

The Project Steering Group is responsible for the overall progress of the project. It takes the overall responsibility for steering the direction of the project, co-ordinates the activities of the work packages and monitors their progress. It is responsible for supporting the work packages in delivering their outputs and for delivering the ENSCRI project purpose.

The Project Steering Group liaises with the International Advisory Board, prepares the Annual General Meeting, pays attention to monitoring critical path activities, and it is also responsible for steering the direction and future development of the project beyond the end of the current project funding. From Year 3, future joint funding applications will become a specific subject of discussion.

The members of the Project Steering Group in particular discuss, stimulate and structure integration between the participants of the work packages, report on the progress in the work packages, and harmonise their current and future activities.

See also Chapter 2.1 Management structure and procedures for more details about the specific roles of the Project Steering Group members.

Deliverables (brief description and month of delivery)

No specific deliverables are foreseen in this work package.

Work package number	N2	**Start date or starting event:**		Month 1			
Work package title	Seed Bank Standards						
Activity Type	COORD						
Participant number	1	7	10	14	17	21	25
Participant short name	RBGK	CAG	TCD	FUL	CYARI	UNI-PAV-CFA	MTSN
Person-months per participant:	3.5	1.5	1.5	1.5	2.0	2.0	2.0

Participant number	26	27
Participant short name	UVEG	BG-CBDC-PAS
Person-months per participant:	1.5	2.0

Objectives

- Develop a facility sharing programme between consortium members.
- Ensure high quality of work throughout the network and encourage it more widely through agreed protocols and standards that are refined during the project and published on-line.

Description of work

Task 1: Develop facility sharing programme between consortium members

The consortium agreement will cover the generic issues such as duplicating seed with the bio-regional hubs. However, participants may have specific facility sharing requirements that will need to be defined and agreed early on in the project. This is because there is a great diversity of expertise and facilities among the project partners.

Task 2: Evaluate & refine current protocols & standards through two workshops. Implement their use and publish them on-line

By the start of ENSCRI, the ENSCONET project will have developed new protocols and standards for seed collecting and curation of native European species. It has been necessary to develop these because there are no internationally-recognised protocols and standards for wild species seed conservation. Most institutes have protocols and standards as do some countries but little work has been done to get a consensus at a regional or global level for this type of material. The most accessible published standards for seed conservation were those produced for crop germplasm by FAO and IPGRI (now Bioversity International) in 1994. However, there are subtle but important differences between handling seeds of crop and wild species mainly resulting from the heterogeneity of the latter. Furthermore, there is much less species-specific literature available upon which to base decisions for wild species. Since the FAO / IPGRI standards were produced, some significant research has been published particularly with respect to the manipulation of seed moisture that now needs to be synthesised into improved protocols.

Therefore, it is intended that a small workshop should be convened in year 1 to review and refine the protocols and standards resulting from the ENSCONET project and to consider how best ENSCRI can ensure their implementation within the network and encourage their use externally. The resultant protocols and standards will be published on-line at the website (see N6) and will underpin the entire project. It is felt that on-line publishing is preferable to the production of hard copy in that changes can be made on a very regular basis as the results of new research emerges.

It is intended that the policy emerging from this first workshop will be implemented throughout the ENSCRI project but particularly in R1 (collecting protocol) and in N7 (curation protocols). The aim is that at least 90% of the ENSCRI-made collections will be collected and conserved to these agreed standards. The percentage chosen allows a margin for unavoidable failures. This target seems achievable because nearly all of the participants already use the ENSCONET collecting protocol. Judging from the broad areas of consensus expressed at a workshop held in Pavia in October 2007, the problem in implementing the corresponding curation protocols and standards when they are produced later this year will relate mainly to availability of resources. The review carried out by ENSCONET shows that over 50% of the banks do not or only partly meet the 'preferred' old 1994 standards. Therefore, the first workshop will explore the ways of facilitating the release of such resources.

The primary aim of the seed collecting protocol is to maximise the capture of genetic diversity and longevity of the collected seed. The primary aim of the various seed curation protocols is to maximise the genetic diversity released after storage. Protocols will cover aspects of seed cleaning, moisture monitoring, storage, germination / viability monitoring, and regeneration / multiplication. The initial examination of these protocols in Pavia last year has already stimulated some new research to elucidate certain controversial areas such as ultra-drying and it is likely that further refinement might impinge on R1, R2 and R3. In turn, these three work packages should lead to refinement of the protocols during the project.

It is envisaged that the curation protocols will not be prescriptive rather they will try to draw conclusions on conflicting or complex issues in a way that is useful for the beginner and will direct users to the best existing methodology. Where these do not exist, the full methodology will be described.

The standards draw heavily on the protocols and summarise the requirements of each activity at two levels: the absolute minimum standards and the greater desirable level.

This task will culminate in a workshop during year 4 when the experiences gained during the project will be discussed and the final versions of protocols and standards will be put on-line (see N6). They will also draw on the latest scientific evidence. This will include that drawn from scientific partners of non-consortium members. For example, RBGK, through the Millennium Seed Bank Project, links to many non-European institutes with an interest in seed conservation protocols and standards; the Spanish members of ENSCRI link to the Spanish network, REDBAG; and the Italian members of ENSCRI link to the Italian network, RIBES.

It is envisaged that the interim and final protocols and standards will play an important contribution towards not only ENSCRI but wider projects and strategies such as Countdown 2010 (and its successor) and the European Plant Conservation Strategy.

There will be general participation in this activity involving some of the most experienced members of the network in this area. RBGK will synthesise the findings.

Task 3: <u>Coordinate activities within the work package and with the Steering Group</u>

This task will be led by RBGK which has extensive experience of seed conservation.

Deliverables (brief description and month of delivery)

N2.1 (Month 48)

Refined seed conservation protocols and standards. The protocols would summarise the best available methods for seed collecting and methods / conditions for seed curation (including cleaning, drying, germination, packaging and storage). They would refer to other references for detailed methodology. The standards would be those that the consortium recommend be achieved to give acceptable and best results.

N2.2 (Month 48)

Online publication of the refined seed conservation protocols and standards. Online publication guarantees easy access and a wide audience.

Work package number	N3	**Start date or starting event:**			Month 1		
Work package title	Database						
Activity Type	COORD						
Participant number	10	1	3	8	21	22	
Participant short name	TCD	RBGK	FUB-BGBM	MAICh	PAV-UNI-CFA	PISA	
Person-months per participant:	17.0	1.25	1.75	15.25	1.25	1.25	

Objectives

The objectives of the work package N3 are to:

- safely store, handle and deliver easier access to data on the project's seed collections to project participants, external scientists and other researchers across Europe
- facilitate the improved use of electronic data relevant to seed conservation, including the linkage to other databases.

Description of work

Task 1: Survey partners re. the requirements for a data import tool

The project will produce huge amounts of data (in particular in the Joint Research Activities) which need to be imported into the ENSCRI database and permanently managed and kept updated, so that the access to and use of them is guaranteed throughout the lifespan of the project and beyond. Each participant is required to import its project data into the database (see work package R1). The aim of this task is to carry out a survey among the participants, in order to clarify their needs when importing new data (such as accession records or germination conditions), or when modifying or correcting already existing datasets. MAICh and TCD will jointly develop this survey form which will be sent to the participants for completion. Based on the specific requests from the participants, MAICh and TCD will design and test a workflow. This workflow will then be implemented into the data import application of the ENSCRI database system. It will be ready for use before the end of the first collecting season *(Milestone M1)*.

Task 2: Refinement of ENSCONET schema

Upgrade the structure - The ENSCRI database will to some extent be based on the already existing ENSCONET database and its PostgreSQL database schema. PostgreSQL is an object-relational database management system and arguably one of the most advanced database systems available worldwide. The database will need an extensive refinement and extension to meet the grown requirements from the ENSCRI project participants (Joint Research Activities, e.g. inclusion of germination data, seed quantity and image catalogue) and the external user community (Transnational Access activities, e.g. easy-to-handle, external accessibility to the data). Additionally, geospatial data types, e.g. points, lines, polygons, will be added to include existing geographical data and data from Geographical Information Systems (GIS) captured via the field data software tool (see Task 3 below). New relational tables and data fields will have to be inserted in the database. TCD will be responsible to implement this new, extended and refined database structure in the PostgreSQL database. Routines (i.e. small, specifically tailored software programmes) will be developed in order to display on line the queries related to the new fields stored in the amended database structure *(Milestone M2)*.

Task 3: Develop and test field data software tool

In order to meet the user requirements of and to ensure functionality for the partners during the design and development of a field data software tool for an enhanced field data capture, a questionnaire will be circulated among the network partners. The partners will identify their particular needs and requirements and will return their feedback form. A workflow will then be designed in order to meet these partners' requests. This workflow will then be used to draft a software requirements document for the field data application.

Within Task 3, the following steps will be followed:
a) Research the suitability of currently available hand-held Personal Digital Assistant (PDA) hardware and software platforms, as well as (embedded) GIS capabilities and define application hardware requirements *(Milestone M3)*.
b) Design the specific application architecture, hardware and software, based on the above mentioned requirement documents and incorporating the existing ENSCONET collection protocol into application.
c) Develop field data capture application and integrate GIS functionality, purchase PDA hardware, install, and debug the first revision of software for use by the work package participants *(Deliverable D1)*. Deliverable 1 implies the delivery of this tool after it has been tested by the work package participants. When it is delivered, other project partners will have the opportunity to decide whether they would like to use such a tool during their field expeditions. A demonstration of the tool will be scheduled during the Annual General Meeting in Year 2.
d) The field test application will initially be done by the work package participants, later also by the other consortium members during their collecting trips
e) Revise the application, based on feedback from the consortium members.

Task 4: Centrally supervise data input and check formal correctness of data

After the successful refinement of the existing database schema (e.g. insertion of field "plant population" and potentially other data required by the user community, see Task 2 above), the field and germination data collected by the project partners as part of the work packages R1 and R2 will be continuously transferred to the central database. Task 4 will centrally supervise this data input and check the formal correctness of the transferred data sets.

Systemic and data incompatibility and other probable data import problems, in particular those related to taxonomic synonymy, authority names and herbarium vouchers, will be identified and solutions found. Supporting tools which are required to enhance the data input, user interface, data exchange between partners and which thereby facilitate the production, exchange, and use of accrued data, will be developed. The long-term maintenance of the database and the availability of the data will be secured, regular updates and backups of the master database will be foreseen. Data quality markers will be used, e.g. to identify and refer to herbarium vouchers. The storage capacity of the server will be increased in order to cope with the increased storage volume needs. This way, it will be possible to upload for example photographic materials which are very storage-consuming (e.g. seeds close-ups, fruits, whole plant, plants growing in their natural habitats). In collaboration with work package A2, the development of additional routines will be investigated concerning the automatic update of some specific fields such as the "current quantity of seeds" which will need to be constantly updated after any new seed order; furthermore, the field "seed availability" will also need to be automatically updated and flagged as "unavailable" if the "current quantity of seed" drops under an agreed threshold *(Deliverable D2)*. TCD will be responsible for this task, supported by MAICh.

Task 5: Agree and provide links to other databases

Several, in some cases competing, science databases exist that all provide relevant information on seeds, plant species and associated data (in particular Atlas Flora Europaea, GBIF, Euro+Med, European Environment Agency, European Forest Data Centre, Pan-European Ecological Network etc.). Therefore, to avoid redundancy and duplication of work, there is no need to add information

to the ENSCRI database that is already provided by these databases. Instead, a dynamic, correlated link to these databases will enable the user community to access the external data with one mouse-click. Task 5 will provide these links to other databases. It will also overcome potential data consistency problems.

For all new external sites to be linked to the ENSCRI database (*Milestone M4* and *Deliverable D3*), it will be necessary to get in touch with the data managers of these sites in order to get their permission to use their data, to get the codes of their data sets, e.g. a particular gene bank accession or any information concerning the distribution or the conservation status of a particular taxon, and to write software to retrieve this information, to parse and display it correctly inside ENSCRI web pages.

All work package participants will be involved in Task 5.

Task 6: Coordinate activities within the work package and with the Steering Group

This task will be led by TCD whose database team is currently leading the ENSCONET N4 Database activity.

Deliverables (brief description and month of delivery)

N3.1 (Month 15)

Field data capture tool with integrated GIS functionality available to work package participants

N3.2 (Month 48)

All data stored to new standards

Work package number	N4	**Start date or starting event:**		Month 1			
Work package title	Training & Technology						
Activity Type	COORD						
Participant number	25	1	2	4	7	8	14
Participant short name	MTSN	RBGK	NKUA	IB SAS	CAG	MAICh	FUL
Person-months per participant:	5.5	3.5	1.5	3.0	3.5	3.0	1.5
Participant number	15	17	20	21	27		
Participant short name	UPM	CYARI	MNHN	UNI-PAV-CFA	BG-CBDC-PAS		
Person-months per participant:	3.5	1.5	1.5	3.5	3.5		

Objectives

- Empower the research infrastructure facilities to meet the end user needs, to face future challenges, to solve problems, to find effective solutions driven by a knowledge-based approach in the field of training & technology.
- Increase the level of knowledge and understanding of critical issues for seed conservation across the project and improve its capacity to deliver it to the user community, sharing facilities.
- Devise and distribute to the Access seed banks a flexible training & technology tool capable of dynamically assess training needs; adapt to them and effectively deliver what the end user requires; building the user capacity; and promoting facility sharing.
- Offer to external access and service users a diverse range of tools for training & technology (on-site and online training on specific issues and research infrastructure facility sharing) to effectively use and share the research infrastructure facilities via its access points.

Description of work

The work package N4 is responsible for:

a) assessing the ability of the project participants to deliver training & technology and improve it in order to meet the end user needs.

b) delivering training & technology to the access and service users, and build their capacity to effectively use the research infrastructure facilities with the required instruments, both remote access and distance learning (online guidelines, helpdesk, factsheets), and direct delivery (thematic workshops, summer schools, lecture series) in the form preferred by the users (accreditation modus for trainers).

Partner institutes' education departments will be involved for the organisation of key events. Three main workshops will be held at IB SAS, BG-CBDC-PAS and RBGK.

Participants specific roles:

MTSN is leading N4; IB SAS, BG-CBDC-PAS and RBGK are hosting training workshops supported by CAG and UNI-PAV-CFA. MAICh, will contribute to facilitate web related activities. Minor roles on specific issues are carried out by NKUA, FUL, UPM, CYARI and MNHN.

Task 1: <u>Evaluate expertise available, assess needs of potential users</u>

All partners will participate in this task.

The starting point of this task is a critical assessment of the training expertise which is already available and the corresponding gaps in skills and knowledge among the project participants. The

assessment will partly be based upon previous existing data from the ENSCONET Co-ordination Action.

The general and specific training needs of internal and external users will be identified in cooperation with N7 (see below). To this purpose, a questionnaire will be designed, target users identified and contact list of addressees compiled to whom the questionnaire will be distributed. The return data will be collated and analysed. This procedure will guarantee efficient and targeted use of the limited training resources: a set of criteria for the selection of topics will be developed. Topics which are considered worth including in the training programme should:

- fill the gaps identified in the above mentioned assessment
- meet the needs of the (internal and external) users
- have a positive impact on the general project objectives, e.g. implementation of seed conservation standards for improved seed longevity
- have had a dramatic development in recent years
- be traditionally neglected in current seed conservation practice
- be relevant on a bio-geographical and pan-European scale
- be relevant for the other activities of this project (work packages N2, N5, R1, R2, R3)

The work package leader will be responsible for liaising with the leaders of the other work packages (in particular N2, N5) so that standards and best practice are fed into the training programme. A final list of validated training topics will be produced, periodically reviewed and kept up-to-date.

Task 2: Prepare and validate T&T resources, devise T&T delivery scheme

Participating partners: RBGK, MAICh, UPM, UNI-PAV-CFA and MTSN.

This task collates, validates and makes available factsheets and Standard Operating Protocols (SOPs) on the training topics selected in task 1, liaising with N2 and N5. Data on key equipment is also collated in order to develop and maintain a database (connecting with N3) including:

- detailed specifications, performance and recommended use for seed bank applications,
- updated information on suppliers and quotations in different EU countries
- a decision tree guiding the choice of the equipment best suited to the end user needs,
- a cross-network trialling scheme to evaluate the performance of technology and equipment used in the network

This work package also provides to the research activities the T&T needed to implement their programmes and gains data to feed back into an improved T&T resource. Eventually the work package will finalise a validated content of the T&T resources and structure a delivery scheme with an implementation plan and a timescale.

Task 3: Set up website, on line help to disseminate and implement T&T

Participating partners: RBGK, NKUA, CAG, MAICh, FUL, UPM, CYARI, MNHN, UNI-PAV-CFA, MTSN and BG-CBDC-PAS.

The training resources prepared in the previous task are here delivered through a website in a selection of national languages. The delivery tools includes:

- pdfs of factsheets and SOPs available individually and collected in distance learning packs
- interactive and searchable factsheets, SOPs, decision trees and database on line
- demonstration videos and guides
- an on line help-desk with Q&A and e-mail advice service.

Task 4: Workshops, programme of exchange, evaluation

Participating partners: RBGK, NKUA, IB SAS, CAG, MAICh, FUL, UPM, CYARI, MNHN, UNI-PAV-CFA, MTSN and BG-CBDC-PAS.

The training resources prepared in task 2 are here delivered with a direct approach, by means of:

- 3 main events (workshops / summer schools) on two basic criteria: cover selected topics of critical importance, cover key geographical areas to facilitate attendance and to address special topics relevant for that particular bio-geographical region.
- a scheme of well-targeted bilateral exchange visits contributing to improve the research infrastructure, to grant support for training events, and to optimise facility sharing and access.

In parallel during this direct delivery the end user feedback is collected and assessed in order to revise and adapt the delivery scheme and tools to ensure an effective and Constant Professional Development (CPD).

Task 5: Coordinate activities within the work package and with the Steering Group

Participating partner: MTSN

This work package is led and co-ordinated by MTSN. MTSN staff are well positioned for this task as they have been involved in international and EU-funded education and training projects for many years (e.g. - PlaSciGardens - Plant Science Education in European Botanic Gardens FP6 - SSA 2005-020577).

Deliverables

Only milestones are foreseen in this work package.

Work package number	N5	**Start date or starting event:**		Month 1		
Work package title	Fern Spore Bank Standards					
Activity Type	COORD					
Participant number	27	10	14	15	16	20	21
Participant short name	BG-CBDC-PAS	TCD	FUL	UPM	NBGB	MNHN	UNI-PAV-CFA
Person-months per participant:	8.5	4.3	4.8	4.8	5.8	4.3	4.3

Objectives

- Prioritise the spore collection for *ex situ* conservation and associated research of European native Pteridophytes*
- Refine, develop and adopt best-practice collecting and curation protocols and standards for long-term Pteridophyte spore banking. Where possible, examine alternative banking options
- Test these protocols using selected taxa
- Develop at least one research proposal that advances the spore storage of European Pteridophytes

* N.B. In this work package and project 'Pteridophyte' is used in its loosest meaning namely ferns and fern allies.

Description of work

The major impetus of ENSCRI will be on the seed collection and storage of plants with desiccation-tolerant seeds. However, analogous methods can be used to conserve the spores of ferns and their close relatives (Pteridophytes). Many fern species are under threat within Europe e.g., 14 fern species in the Polish flora and 32 fern species (from about 150 species) in Spain. Some are under particular threat from climate change. For instance, *Athyrium distentifolium* is dependent upon late-lying snowcover in the Scottish Highlands and is likely to be affected by warmer conditions. The work package tries to expand the scope of the ENSCRI project by developing best practice for the *ex situ* conservation of ferns that, where possible, might be used in the R1 activities and which forms the platform for further work on this important taxonomic group.

Spore storage is the most efficient method for the conservation of Pteridophytes. Spores are easy to obtain in large quantities and require little storage space. They have been preserved in wet or dry conditions and at ambient or low (5°C) temperatures. However, some of them do not tolerate desiccation and after few weeks of storage they loose their viability (Quintanilla *et al*. 2002). Up to now the standard practice is to dry fern spores at 30°C prior to liquid nitrogen (LN_2) exposure and then to plunge them immediately into LN_2 (Agrawal *et al*. 1993, Ballesteros *et al*. 2004). In cases where the moisture content is reduced to 7%, the germination of spores after cryo-preservation reaches a higher level than that of fresh spores (Rogge *et al*. 2000).

Cryo-preservation could therefore be the ideal storage technique for the long-term storage of spores. However, in many cases this requires the involvement of *in vitro* methods. Fresh spores are usually collected from mature fronds. After their release from the sporangia, separated spores are surface sterilized, washed three times and drained in a sieve. For germination, spores are sterilized are encapsulated in alginate beads composed of 3% (w/v) alginic acid in half concentration of liquid MS salts medium. For the purpose of encapsulation, beads with spores are treated with sucrose for up to three days. Finally, after 4hrs of air drying they are directly immersed in LN_2. After cryo-storage re-warmed beads are transferred on solidified half concentration of MS salt agar medium supplemented with sucrose. The application of such methods helps to understand the various responses of spores according to experimental conditions used. For example, dried, encapsulated spores without the sucrose treatment do not survive LN_2 exposure. Spores after 4hrs of air drying germinate slowly and poorly. Extending the time of treatment to 3

days reduce the survival of spores. The viability of cryo-preserved spores is the best when the beads are treated with very high concentrations of sucrose during one day prior to LN_2 exposure. Such conditions could stimulate synchronized spore germination and the development of young prothalia (young gametophytes) giving unlimited culture of fertile gametophytes. Sporophytes obtained from cryopreserved and non-frozen spores readily acclimate to greenhouse conditions (Mikuła, Rybczyński, 2006).

Work on spores will be the cornerstone of this work package. However, other stages of the lifecycle could potentially yield material for storage and, if sufficient time is available might be considered within the work package. For instance, prothalia can alternatively be used as propagules for the cryo-preservation of vascular cryptogams. However, there are only few papers published (Pence 2000, Rodpradit *et al*. 2003). At least in the case of some tropical ferns, the storage of protalia seems to work, as is demonstrated by an almost unlimited production of genetically uniform individuals (Mikuła, Rybczyński 2006). The method comprises the involvement of encapsulation and dehydration of young prothalia and the use of fragments of hard-shaped culture *in vitro* derived mature gametophytes. Both explants are embedded in sodium alginate beads. A seven day long treatment with gradually increased sucrose concentrations is followed by surface drying under sterile conditions and different time regimes. Such prepared capsules are transferred to cryo-tubes and immersed in LN_2 for long term storage.

Such experiments prove that the survival of cryo-preserved gametophytes depends on their age, the duration of air-drying and the sucrose concentration during pre-culture. Three types of responses of cryo-preserved young prothalia can be observed: lack of survival, complete survival and partial survival, the later meaning continued cell division and proliferation by one or few cells spread over the gametophyte. In the post-freezing culture, the regeneration of whole gametophytes can be initiated by only one living cell. In the case of an intact young prothalium, the maturity can be reached during 5 weeks of culture, when 5 hours dehydration follows 7 days of pretreatment with increasing sucrose concentrations. All those successful cryo-preservation experiments depend greatly on the sucrose used during pre-culture (Mikuła, Rybczyński 2006).
Alternative systems of gametophyte tissue cryo-preservation are based on the use of plant growth hormones. The application of ABA in pre-culture stimulates > 70% survival of gametophytes of five different fern species but encapsulation of this material enhanced survival ability up to 100% (Pence 2000).

References:
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Pence V., C. 2000. Cryopreservation of *in vitro* grown fern gametophytes. American Fern Journal, 90: 16-13
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Rodpradit S., Thavipoke P., Thammasiri K. 2003. Cryopreservation of young *Platycerium ridleyi* H. Chist. sporophytes by encapsulation/vitrification technique. In: Proceedings 29th Congress on Science and Technology of Thailand. Khon Kean 20-22 0ctober 2003: pp. 71-73.
Rogge G.D., Viana A.M., Randi A.M. 2000. Cryopreservation of spores of *Dicksonia sellowiana*: an endangered tree fern indigenous to South and Central America, CryoLetters, 21: 223-230.

Task 1: <u>Assess current risk status of Pteridophytes using existing red lists</u>

The first task will be to assess the current status of Europe's Pteridophytes using the existing national red lists. This will help to complement the work under R1 by highlighting potential priority species / groups and bio-regions for collection and research. The checklist of European

Pteridophytes that will result from work in the European Plant Conservation Strategy will be used as the basis for this work. Reference will also be made to known living collections of European Pteridophytes that have been established with a conservation remit.

The work entails the downloading or extraction of red lists, the compilation and prioritisation. The latter will be influenced by the prioritisation system adopted in ENSCONET for seed-bearing plants. There are estimated to be slightly more than 300 native taxa of Pteridophyte in Europe so it anticipated that this will be a much more limited task than that for ENSCONET / ENSCRI R1.

Task 2: Compile information on sporulation time from the literature

To collect spores, it will be necessary to elucidate the sporulation times for different species across Europe. This is essentially a databasing operation. The members of this work package represent four of Europe's bio-regions and therefore should be able to contribute a significant amount of the data directly.

Task 3: Select model taxa for conservation protocols

Using data from tasks 1 and 2, the members of the work package will choose a small number (about 15) of model taxa that will be included under task 5. This selection will happen by means of an e-meeting. The taxa chosen will represent different taxonomic groups as well as extremes of the eco-geographic distribution.

Task 4: Evaluate current protocols. Hold workshop to refine protocols & develop standards

The current protocols that are available (see for instance above) will be evaluated and a workshop will be held to refine these protocols and develop minimum and preferred standards for spore collection, handling, storage and germination. Reference will be made to other forms of Pteridophyte *ex situ* conservation.

Task 5: Implement these agreed protocols & standards

The agreed protocols will be applied to new collections (small numbers from R1) during the remainder of the project including tests on the model taxa selected under task 3. The aim will be to highlight problems with the protocols and standards such that they could be refined in year 4. Collaboration between existing spore banking facilities will be encouraged and members will provide advice on the upgrade of existing and the construction of new spore banks in Europe.

Task 6: Identify needs for further research on sporophyte storage and conservation / write funding applications

A key reason for this work package is not only to refine what is known about Pteridophyte spore storage into some recommended protocols and standards but also to identify further research that can be carried out to underpin the long-term security of Europe's ferns and their allies. It is proposed that at least one research proposal will be generated through this work package.

Task 7: Coordinate activities within the work package and with the Steering Group

The work package is led by BG-CBDC-PAS that has considerable research experience on the long-term spore storage of endangered Polish fern species in liquid nitrogen and on the cryo-preservation of juvenile gametophytes.

Deliverables (brief description and month of delivery)

N5.1 (Month 48)

90% of pteridophyte collections collected and held to new standards

N5.2 (Month 48) At least one research proposal submitted

Work package number	N6	**Start date or starting event:**		Month 1		
Work package title	External Communications					
Activity Type	COORD					
Participant number	1	2	3	4	5	6	7
Participant short name	RBGK	NKUA	FUB-BGBM	IB SAS	ELTE	BZBG	CAG
Person-months per participant:	12.5	3.8	7.3	4.0	3.5	2.5	3.0

Participant number	8	9	10	11	12	13	14
Participant short name	MAICh	CORDOBA	TCD	CJBG	Jardin Canario	HUBG	FUL
Person-months per participant:	13.3	8.0	2.3	2.0	3.0	6.3	3.0

Participant number	15	16	17	18	19	20	21
Participant short name	UPM	NBGB	CYARI	FUC	UiO	MNHN	UNI-PAV-UNI
Person-months per participant:	5.0	3.8	2.5	2.5	3.0	4.0	2.0

Participant number	22	23	24	25	26	27	28
Participant short name	PISA	IB-BAS	JB Soller	MTSN	UVEG	BG-CBDC-PAS	HBV
Person-months per participant:	3.5	3.0	2.0	7.3	7.0	4.3	3.8

Objectives

- To communicate the work and findings of the ENSCRI project to the external world including potential users, the broader scientific community, policy makers and the public.

Description of work

Task 1: <u>Develop project communication policy & timetable</u>

The policy will need to embrace a wide range of issues and potential recipients. N6 is responsible for general dissemination including the marketing of the project, press releases via press contacts and spreading good practice to external seed banks. The main targets for the activity outside the network are the science community, policy makers and the general public. It must also advertise the project to potential users of the Access activities and encourage linkages between the Research activities and others working in these areas. It will need to publicise the outcome of Access activities. A very key element will be to improve the interface between seed conservation practitioners and the policy makers concerned with plant conservation and climate change alleviation. Feedback from the dissemination activities will be used to continuously improve access and user-friendliness of communication tools and project publications. Within the network, it will be necessary to explore communications based on the latest technology such as Skype.

Special emphasis will be paid to connecting with potential users and to the most effective way to target the broader scientific community and policy-makers. Undoubtedly, initial contact to users to highlight our potential use will initially be made through the extensive network of contacts that exists within the consortium. Although previous users of individual banks will be a first point of contact, it is essential that the net is thrown as widely as possible to draw in new users. In order to achieve this, contact will be made to generic interest groups be they ecologists or biotechnologists. For instance, contact with users of crop wild relatives might be made via the SSC CWR group. It is likely that contact to the broader scientific community and policy makers will be via a carefully targeted newsletter similar to the ENSCONET annual bulletin 'ENSCONEWS'.

The first point of contact with many organisations is their website. Therefore, strong emphasis will be placed on the role of the website making sure that it holds interest at several different levels. These would be for the knowledgeable expert, the general scientific community, the general public and students at university and secondary school level. Work will need to take place to highlight the website. This can be done through media stories and targeted publicity.

Consideration will be given to the needs of translation from English particularly into French and Spanish but also, where appropriate, into other languages. A modest budget has been set aside for this work.

Once the policy has been developed, a target frequency for release of media stories, newsletters etc and a timetable for their release will be determined.

The success of the policy will be determined by the change in hit rates on the website and the degree of media interest in the network. The anticipated level of interest is relatively high based on the successes of ENSCONET and of the consortium members.

Task 2: Develop & maintain website homepage with internal and external areas

This task will be to take the existing ENSCONET website and develop it in line with the needs of ENSCRI and to incorporate advances in graphical representation. This task will be led by MAICh. The website domains 'enscri.eu' and 'enscri.org' have been purchased in anticipation.

Task 3: Develop & maintain e-forum

This task will be to build on the successes of the ENSCONET e-forum for internal meetings and will be led by MAICh. These meetings have been very successful when the chair of the meeting stimulates the debate ahead of the meeting and discussion is separately channelled by topic. Use of the e-forum has been less successful in ENSCONET for general communication (e-mails have been more successful) and for engaging with the public. Indeed, unwanted junk mail has been a particular problem with the latter. Therefore, use of security filters will be necessary. Ways of engaging with the public and general scientific community using the e-forum need to be re-examined as it has not been that successful in ENSCONET.

Task 4: Produce content for web-pages in appropriate languages

This task will be led by RBGK but will involve input from 17 other partners. Particular consideration will be given to updating the pages and keeping news items current. Special consideration will be given to text clarity. This will be done by oversight of the text by specialists in public communication.

Task 5: Produce & distribute publicity about project

All partners will by involved in this task which will be led by RBGK.

Task 6: Represent project at appropriate national / international meetings

The profile of ENSCONET was successfully raised by the involvement of consortium members at a wide range of meetings both inside and outside Europe. Therefore, provision has been made for the attendance of 80 meetings by members to present ENSCRI data and information and to promote the project. Consideration will be given to attending meetings of particular user groups.

Task 7: Coordinate activities within the work package and with the Steering Group

This work package will be led by RBGK which access to an experienced and flourishing public relations department.

Deliverables (brief description and month of delivery)

N6.1 (Month 9)
Updated project website developed and online

N6.2 (Month 12)
Annual bulletin “ENSCONEWS” produced and distributed

N6.3 (Month 24)
Annual bulletin “ENSCONEWS” produced and distributed

N6.4 (Month 36)
Annual bulletin “ENSCONEWS” produced and distributed

N6.5 (Month 48)
Annual bulletin “ENSCONEWS” produced and distributed

Work package number	N7	**Start date or starting event:**		Month 1			
Work package title	Organisation of Access to the Infrastructure						
Activity Type	COORD						
Participant number	2	1	3	8	13	15	20
Participant short name	NKUA	RBGK	FUB-BGBM	MAICh	HUBG	UPM	MNHN
Person-months per participant:	15.0	2.8	6.5	6.5	6.5	10.8	6.5

Participant number	21
Participant short name	PAV-UNI-CFA
Person-months per participant:	6.5

Objectives

The objectives of work package N7 are to manage and co-ordinate the access to and service offered by the research infrastructures (6 Access Seed Banks) for external users. This includes the development of access rules, establish and maintain contact with potential users, select reviewers for the User Selection Panel, write, publish and administrate regular access calls, manage (receive, handle, evaluate and direct) incoming applications and oversee the evaluation process of access and service provided from both the users' and infrastructures' points of view.

Description of work

This work package is designed to operate as the central information and administrative system supporting the entire Access component of the project. It will offer, for the first time at a pan-European level, all pertinent information regarding the state-of-the-art, infrastructure facilities (6 Access Seed Banks) that can be physically accessed and services that are provided. It will furthermore function as the link of these host institutions to the large community of potential users (belonging to a multitude of scientific and technical disciplines); this diverse community, identified and compiled for the first time at a European scale, will be contacted and offered novel, fundamental information regarding plant material and services available, including funding options provided by the project for visits and services. Furthermore, all access and service offered will be organised, directed, administrated and evaluated on the basis of rules developed, and expert panels established.

The work package will function in close linkage to, and with continuous feedback with the project Steering Group and the 6 Access Seed Banks.

Task 1: Develop plan for contacting potential users & maintain contact
Task 1 is divided into two phases:
Phase A (Month 1-3). A strategy document will be produced and updated on a yearly basis. First, input will be required mainly from all work package participants. Later from month 13 onwards, feedback from the other project participants, external users and external evaluators will have to be incorporated.

Specific target groups of potential external users will be defined. Only within the wider biological and life science sectors this could include e.g. developers and managers of new gene banks, seed collectors, curators (= staff routinely involved in handling, cleaning, evaluating and germinating seeds), seed storage facilities personnel, biological database developers, instrumentation specialists, researchers within a large array of disciplines (e.g. conservation scientists, bio-technologists, geneticists, molecular biologists, biochemists, physiologists, pharmacologists, health professionals, ecologists, agronomists, weed scientists, plant breeders, technologists, engineers).

The various types of institutions and affiliations of potential users will be defined (e.g. universities, public and private research institutes, botanical gardens, governmental bodies, land management agencies, conservation authorities).

Phase B (Month 3-48)
Based on Phase A, a list of potential external users will be created and kept up to date throughout the project. Initial contact with these users will be established by electronic mail (in close cooperation with N6), they will be invited to follow the URS link once the Access Invitations (see Task 6, below) are published. An overview of the services offered as part of the Transnational Access will be given, initially through e-mail and, later on, mainly through the website (in linkage with work package N6).

Task 1 will be led by NKUA, with input from all work package participants.

Task 2: Develop rules for access and service
The development of rules for access and service will take into consideration the existing institutional, national and international rules and agreements on restrictions of use and movement of plant genetic material. Particular reference is given to national and EU Plant Health regulations, the EC Wildlife trade legislation (Council Regulation No. 338/1997 and implementing regulation No. 865/2006), and existing institutional policies on Access to Genetic Resources and Benefit-Sharing (ABS).

Additional objectives are to harmonise policies, to minimize administrative load, and to support the development of a transparent and traceable documentation system of all access opportunities, calls, applications and effected visits, remote service offered and exchange of genetic material. In particular, regarding the latter, material transfer agreement documents will be elaborated in collaboration with each Access Seed Bank but incorporating commonly agreed procedures on e.g., sample identification (unique numbering system, see N3), documentation and guidelines. First, the various types of access and service provided by the six Access facilities will be described. Then, in close adjustment with Task 4 of this work package (Development of internal guidelines), rules of direct access and service will be elaborated. These will be in accordance with the specific provisions for transnational access activities, as defined in the FP7 Grant Agreement, Annex III. Based on the “strategy document” (see Task 1, above), various types and durations of direct access will be defined and allocated among the Access Seed Banks. Similarly, a multitude of services will be specified. The quantification of access and service will be provided on a per Seed Bank basis.

Limitations to be applied have to be explicitly stated and respected. This may include:
(a) limitations imposed by national or institutional restrictions; (b) limitations for plant material for which Plant Health restrictions are in place; (c) limitations for plant species listed in the Annexes of the EC Wild Trade Regulation No. 338/1997; (d) set the upper limit for internal (= project family) users; (e) define rules for resolving cases where too many positively-evaluated requests for a particular seed bank exist (“access policy for oversubscriptions”); (f) impose the compliance of protocols for collection, curation (including germination) and storage according to the adopted ones and the general practice of the Research Infrastructure; (g) prepare model material transfer Agreements (based on ones that exist within the project’s membership) that will be signed in each case of seed or seedling transfer to or from an Access Seed Bank.

The rules will also define benefit sharing and specify that publications of research results must be freely available (e.g. through open-access publication or internet journals).

The evaluation procedure, carried out by the external evaluators (User Selection Panel, see Task 3 below) and supervised / coordinated by the work package leader and the Project Steering Group, will be defined and publicised. The access rules and the entire selection procedure will be posted on the project website, together with a help (FAQ) page.

Task 2 will be coordinated by NKUA, with significant input from RBGK and the six Access Seed

Banks. Month 1-12, Deliverable: Access Rules, Milestone: Access Rules published in the website, emailed to the list of potential users and circulated to the entire consortium. In case that this is required, the access rules will be revised in Year 3 (not shown in the Implementation Plan).

Task 3: Select external reviewer pool and invite potential reviewers ("user selection panel")
A number of internationally renowned experts will be contacted and invited to join the reviewer pool. From this pool and in collaboration with the Project Steering Group, 12 experts will be appointed who will jointly form the "User selection panel" (six of them may belong to project participants), two of them being in charge of access requests on behalf of the six access facilities. The panel composition may change at any time, upon the decision of the Project Steering Group. NKUA is leading this task, with input from all work package participants. Month 1-12, Milestone: External reviewer pool compiled and 12 user selection panel members nominated.

Task 4: Develop internal guidelines for 6 access seed banks
Internal guidelines will be elaborated during the first year of the Initiative, in order to provide with as much standardised access as possible, taking into account the singularities of each Access Seed Bank. The type of "on site" access and seed sample will be defined for each of the infrastructures. The guidelines will include the procedure of requesting access, call for proposals timetable, publicity policy, and also elaborate guidelines for staff on how to treat visitors. The type of documentation and record of the amount of access provided will be developed under this task. The coordination mechanisms with N7 will also be defined. UPM is leading this task, supported by the other Access Seed Banks. Month 4-9.

Task 5: Distribute internal guidelines to network
UPM will distribute a draft of the internal guidelines to the rest of the members of the consortium. When possible, feedback from members will be included in the Internal Guidelines to produce the final version. Month: 10-12; Milestone: internal guidelines communicated and standardized where required. UPM will be responsible for this task, supported by the other Access Seed Banks.

Task 6: Calls for access published online
In accordance with the requirements, the calls for access ("Access Invitations") will reach a wide audience, through publication on the project website and communication through individual electronic mail to the target group distribution list. Calls will be launched every six months from Year 2 on (starting in Month 14 and ending in Month 38, a total of 5 calls). Each call will have three deadlines, with candidates submitting their proposals through the online application system. The evaluation process will normally take no longer than six weeks. In the case that the evaluation process is delayed, NKUA as the work package leader will inform the Project Secretariat which will decide on how to proceed.

Task 7: Develop standard format for the evaluation report
A standard evaluation report will be prepared; this report will encompass all possible access and service types (defined in Task 2, above) as well as qualitative and quantitative indices assessing the overall degree of success for each particular access or service event from the user's point of view. Task 7 will be coordinated by NKUA, with significant input from RBGK and the six Access Seed Banks.

Task 8: Oversee evaluation process
Each access or service user will be obliged (in accordance to the rules developed in Task 2) to properly fill in and return to NKUA (within one month after the completion of each access or service event) the User Evaluation Report. NKUA will be overseeing the whole process by assisting the users to fill the form and by setting and keeping the deadlines. At the end of each year (Years 2 to 4), all reports will be individually scrutinised and an Annual User Assessment Report will be produced (also including specific suggestions towards improving access and service). These reports will be submitted to the Project Steering Group for further action while at the end of the Project, an all inclusive Final User Assessment Report will be jointly prepared by NKUA and the Project Steering Group. NKUA will be responsible for this Task in close collaboration with the 6 Access seed banks and the Project Steering Group. Month 14-48, Deliverables: 2 Annual User

Assessment Reports (Month 24 and 36), Final User Assessment Report (Month 48).

Task 9: Manage applications incl. deadlines, user selection panel, accessed seed banks and follow up
Task 9 tackles all practical aspects of managing applications requesting access and service. Each application received will be forwarded to the corresponding user selection panel members and upon the judgment of the latter and the rules of access (see Task 2), a decision will be reached. All applicants (and the respective access facility) will be notified soon thereafter and a contact with each user will be maintained both during and after the access/service event. A fully detailed archive for each application will be kept; thematic lists and statistics will be produced and submitted to the Project Steering Group yearly or as requested. The security of personal data will be guaranteed at all stages of this process. NKUA will be leading this Task in close collaboration with the 6 Access Seed Banks and the Project Steering Group.

Task 10: Evaluate quality of users' work with access rules (including publication of research results)
In accordance with the rules for access and service, each access or service event will have to be evaluated from the network point of view. Thus each Access Seed Bank will have to assess the work of each user on the basis of objective criteria. Emphasis will be placed on making the results of these works publicly available free of charge (especially in high profile scientific journals or other influential, publicity outlets). At the end of each year (Years 2 to 4), all assessments will be individually scrutinised and an Annual Quality of User's Work Report will be produced, also including specific suggestions towards improving access and service. These reports will be submitted to the Project Steering Group for further action while at the end of the Project, an all inclusive Final Quality of User's Work Report will be jointly prepared by NKUA and the Project Steering Group.

This task will be coordinated by NKUA with significant input from the six Access facilities. Month 14-48, Milestones: 3 Annual Quality of User's Work Reports (Month 24, 36 and 48)

Task 11: Produce internal reports: users' research stays, potential problems, publications and follow-up projects
UPM will coordinate all Access Seed Banks to collect and report the users' access to the infrastructures, problems that could have arisen during the visit and use of the facility. These reports will help to control the quality of the access provided, to detect any weakness and continuously improve the access provided. Also under this task, a follow up of the user research work after using the infrastructure and of the possible publications will be carried out. These reports will be produced after the calls and users' visits take place, every six months from Year 2 on (starting in Month 16 and ending in Month 40). Milestones: Report after the second year, and Final Report. UPM will be responsible for this task, supported by the other Access Seed Banks.

Task 12: Coordinate activities within the work package and with the Steering Group
Throughout the implementation of the work package N7 (Month 1-48), NKUA, the leading partner, will coordinate all pertinent activities in close collaboration with the six Access Seed Banks and the Project Steering Group.

Deliverables (brief description and month of delivery)

N7.1 (Month 24)
First annual user assessment report produced

N7.2 (Month 36)
Second annual user assessment report produced

N7.3 (Month 48)
Final user assessment report produced

General remark on work packages A1 to A6:

The Access provided for users under this project proposal is provided by six Access Seed Banks, each having two installations: 1) Distribution of seed samples (remote access to the seeds collected under this proposal)[1] and 2) "on-hands" access to the seed bank facilities, each of them being unique on a European scale (see sections "Description of the infrastructure"), as specified in detail for each of the 6 Access Seed banks in the description of the work packages A1 to A6 (including collecting, cleaning, evaluating, germinating, packaging and storing seeds).

Work packages A1 to A6 are closely related to work package N7, which will manage and co-ordinate access and service and in which the six Access Seed Banks also participate. Elements that are common to all six infrastructures are described under N7, this includes: to develop access rules (conditions and terms of Access, including funding) and internal guidelines, and distribute them among the project participants; to establish and maintain contact with potential users; to select reviewers for the User Selection Panel; to write, publish and administrate regular access calls; to manage (receive, handle, evaluate and direct) incoming applications and oversee the independent peer-review evaluation process of access and service provided from both the users' and infrastructures' points of view; and to produce regularly internal reports on the users' research stays.

Work package number	A1	**Start date or starting event:**		Month 14			
Work package title	Provision of Access – BGBM						
Activity Type	SUPP						
Participant number	3						
Participant short name	FUB-BGBM						
Person-months per participant:	0						

Description of the infrastructure
Name of the infrastructure: Dahlem Seed Bank, Botanischer Garten und Botanisches Museum Berlin-Dahlem (BGBM)
Location (town, country): Berlin, Germany
Web site address: www.fu-berlin.de/, http://www.bgbm.org
Legal name of organisation operating the infrastructure: Freie Universitaet Berlin, Koerperschaft des oeffentlichen Rechts
Location of organisation (town, country): Berlin, Germany
Annual operating costs (excl. investment costs) of the infrastructure (€): 451,532.25
Description of the infrastructure: The Dahlem Seed Bank is part of the Botanic Garden and Botanical Museum Berlin-Dahlem (BGBM). BGBM is a world-renowned taxonomic institution which goes back over 300 years in history as the major depository for botanical materials (both living and preserved) and botanical literature in Germany. The Botanic Garden houses one of the largest and scientifically well documented living collections on about 43ha. The main outdoor phyto-geographic section of the world temperate zones with an extensive collection of European taxa is complemented by tropical and subtropical taxa cultivated in greenhouses covering more than 16,000 m^2. Over the last 20 years, the BGBM has successfully developed new departments such as biodiversity informatics, laboratories and DNA collections. All collections including literature are global in range. The extensive herbarium collections (a total of 3.5 millions specimens, 100,000 holotypes and a

[1] The unit of access is defined as one seed sample, representing one accession from one population of a particular plant species, the number of seeds sufficiently representing the genetic diversity within that sampled population

fruit and seed reference collection) in the Botanical Museum are completed by laboratory facilities, libraries, galleries, and modern IT facilities. Staff and networks are involved in a broad spectrum of research spanning the breadth of biosystematics, biodiversity and conservation. The collections are extensively curated and documented and an increasing number of specimens (currently about 60,000) being digitised.

The Dahlem Seed Bank was the first seed bank for wild plants in Germany. It started exchanging seeds in the 19th century. New facilities for the long-term conservation of seeds mainly for highly endangered species of some European regions were built in 1994. These well documented baseline collections have increased from app. 400 accessions in 2005 to more than 2,000 accessions in 2007. An additional 4,500 samples in the access seed bank are re-collected every two years. Duplicates are offered for scientific purposes via the *Index Seminum* which is the most comprehensive worldwide. BGBM has signed the International Plant Exchange Network (IPEN) policy on Access and Benefit Sharing (ABS) and acts in accordance with the Convention on Biological Diversity (CBD) and the Convention on the International Trade in Endangered Species (CITES).

The BGBM staff have the benefit of extensive systematic and taxonomical knowledge, and long-term experience and skills in seed curation. Since 2007, samples of seed bank accessions and other collections have been used for DNA extraction and DNA banking. Extraction, storage and aliquots for research are available on request. Since 1994, germination tests have been performed at regular intervals. Rare and endangered species especially from northeast Germany and from the eastern Mediterranean Region (including the Balkan Peninsula) are being cultivated for research and for reinforcement of wild populations. Accession data of banked seeds, other living collections, DNA bank, taxonomic data and cultivation history data are stored in the extensive garden databases.

Seed banking projects and research in cooperation with the federal states of Berlin and Brandenburg and a regional network on native species conservation focus on the genetic diversity of rare and endangered species and comparing genetic variation of *in situ* populations to *ex situ* seed and living collections. Projects currently being prepared will look at the germination of long-term stored seeds, allocation of seeds, seedling survival, and reproductive success.

The Dahlem Seed Bank is located in the suburban south-west part of Berlin. Berlin has an inexpensive and efficient public transport system and is easily accessible from elsewhere in Europe.

<u>Services currently offered by the infrastructure:</u>

Distribution of seed samples

The Dahlem Seed Bank offers seeds for scientific research and cultivation at the international level e.g., for other Botanical Gardens and research organisations which respect the CBD and other relevant international regulations. The traditional *Index Seminum* catalogue of seeds is published every two years and in 2006 was sent to about 580 partners worldwide. It is also available at the homepage of the infrastructure. Approximately 50% of the seeds originate from Germany and 40% from Europe (e.g. southern Europe including Turkey). Seeds are collected in the wild (approx. 50%) or from cultivated plants which must originate from the wild. Field data of all seeds are documented. The *Index Seminum* 2006 offered 4,454 accessions of which 6,974 sub-samples were sent to 260 customers. Seed number per sub-sample varies but usually is small. Seeds are offered at no costs.

Access to the facility

Due to the historical importance of the *Index Seminum* as a service for plant exchange, only a small number of visitors are received in the Dahlem Seed Bank each year. Seeds and other plant material from the Botanic Garden collections are requested locally for research, conservation, and education (30,000 to 40,000 samples/year). Long-term *ex situ* cultivation and conservation of endangered plant species is part of a service within a regional network of Botanical Gardens, NGOs, and authorities. The BGBM DNA bank deposits and offers high quality DNA samples of the accessions for genetic analyses. High resolution digitised herbarium specimen are provided on demand. Electron microscopes and photographic equipment for seed documentation and plant identification are available. Access to other BGBM research facilities with library, herbarium, living

collections in the garden, and the fruit and seed reference collection give opportunities for systematic, morphological and anatomical studies. Taxonomic expertise serves various botanical projects and botanical expertise is used for general dissemination and specific training of students and a variety of purposes e.g. for horticulture. Upon approval, researchers have access and to all collections, facilities and expertise of the institution as described.

Description of work

Modality of access under this proposal:

Regarding the "Distribution of Seed Samples", all samples collected within the scope of the project by FUB-BGBM and the duplicate seed lots received from the Continental and Pannonian bio-geographical regions will be offered at no cost. A fraction of all samples entering the Dahlem Seed Bank will be devoted for the long-term baseline collections. The remaining seeds will enter the access seed bank for immediate service on demand. For more details on access modalities see N7.

Regarding the "Access to Facility", the Dahlem Seed Bank will offer access for users from 1 day up to three months and estimates an average stay to be six days. Access opportunities will focus on the seed bank infrastructure namely seeds in access seed bank. Access to additional collections such as the fruit and seed reference collection (app. 30,000 specimens) and the vast living collections (more than 20,000 taxa, e.g. as source of plant material and seeds) could be provided in support of the project use. Likewise, upon request and according to the project internal access and approval regulations, access could be given to a whole range of facilities and equipment of the BGBM for research in plant taxonomy, conservation of plants, and horticulture as described above. This includes DNA extraction from seeds and other fresh plant material and herbarium for identification and high resolution digitised images of specimens. Staff expertise is available especially in taxonomy, horticulture, international seed exchange, seed (bank) curation, germination, and *ex situ* cultivation of endangered species but also in molecular methods for genetic species delimitation, conservation genetics, and biodiversity informatics. Users will have full and independent access to all facilities and collections within the normal regulations (e.g. permission necessary for all collections prior to destructive use and access to restricted areas for security reasons) and without any additional fees. Visiting group size will be limited to five persons maximum. Users can be integrated into the scheduling of daily research without any specific impediment except holidays and Christmas time when labs will be closed for two weeks. Germination experiments can be performed with a maximum of 40 days. Cleaning and drying of seeds can be performed within reasonable limits regarding sample size and number.

Support offered under this proposal:

No support other than described in work packages N3 and N7 will be necessary for "Distribution of Seed Samples".

Besides support and guidance by technicians and researchers, "Access to Facility" will offer the following specific support:

Incubators will be offered for germination tests and a particular greenhouse is provided for research on seedling establishment and development. Access to laboratory facilities and to reference collections will be given for seed research and identification of plant material. The BGBM holds the largest botanical library in the German-speaking area and thus offers excellent access to the vast relevant taxonomic literature which forms the basis for taxonomic data capture and editing. The BGBM is leading the German DNA Bank network and its recently modernised molecular lab facilities and the repository facility DNA Bank will give support. Apart from its traditional role in the acquisition, preservation, and investigation of scientific collections of specimens, the BGBM recognised comparatively early the new role of Natural History Museums in development and exploration of data collections and therefore proceeded to build a powerful IT infrastructure and a separate department of Biodiversity Informatics with actually more than 20 staff members. Together with our recently established research groups on conservation genetics these groups will stimulate

discussions of seed conservation issues in the broader context of basic and applied research by a well balanced and highly motivated staff of experienced and young researchers and a large number of skilled and experienced technicians. Contacts and co-operation with regional networks for *ex situ* cultivation of endangered species will facilitate collecting activities. The Freie Universität Berlin offers all the opportunities of an excellent and internationally visible academic institution. The BGBM has a long tradition and experience with scientific guests who are welcome since the foundation of our institution. We offer lab and IT workplaces in the institute and accommodation in a restricted number of guestrooms located within the fences of the Botanic Garden. Supporting accommodation, subsistence, transportation and giving general or specific introduction to facilities and collections are regular and basic procedures for all guests visiting BGBM.

Outreach of new users

For a detailed description of the measures to be taken to attract potential new users, see work package N7.

Both the number of visitors and the quality of their research stay are expected to rise significantly. While the number is expected to rise from 20 to 37, the quality of visits is expected to increase dramatically as the five visitors we receive each year until now are merely visiting and not "working", and most of them come currently from other German institutions.

Review procedure under this proposal:

For a detailed description of the review procedure, see work package N7 (Tasks 3, 6 and 9).

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
Distribution of seed samples	Seed sample (1 accession)	59.01	4000	150	0	150
Access to Dahlem Seed Bank	1 Visitor day	269.53	100	17	100	17

Work package number	A2	**Start date or starting event:**			Month 14		
Work package title	Provision of Access – MAICh						
Activity Type	SUPP						
Participant number	8						
Participant short name	MAICh						
Person-months per participant:	0						

Description of the infrastructure MAICh
Name of the infrastructure: Seed Bank of the Mediterranean Agronomic Institute of Chania
Location (town, country): Chania, Crete, Greece
Web site address: www.maich.gr
Legal name of organisation operating the infrastructure: CIHEAM – Mediterranean Agronomic Institute of Chania
Location of organisation (town, country): Chania, Crete, Greece
Annual operating costs (excl. investment costs) of the infrastructure (€): 62,477.00
Description of the infrastructure: The Seed Bank of the Mediterranean Agronomic Institute of Chania (MAICh) is the best organised seed bank for native plant species in Greece and in the Eastern Mediterranean region, following international standards. It was established in 2000 and according to the initial design, it allows the safe long-term preservation of approximately 10,000 accessions. It is a member of the Mediterranean network of seed banks "GENMEDOC" and of the pan-European network "ENSCONET". The infrastructure provides all the essential steps for the preservation of seed germplasm, such as collection (well experienced personnel on the collection of the regional flora and on taxonomy and plant identification), seed drying (modern drying facilities including a drying room), and storage (fully equipped cold room). In addition, there is a fully equipped laboratory for germination experiments (six germination chambers with controlled temperature and light conditions, plus a dark room with safety light for studies on e.g. seed dormancy). The Seed Bank works in a close association with the Botanical Garden of Cretan endemic and threatened plant species and the Herbarium at MAICh, with specimens from the most important plant species of Crete (8,000 specimens) and with all the required facilities for taxonomic plant identification (references and books covering the flora of all the Eastern Mediterranean countries). Services currently offered by the infrastructure: Currently, the infrastructure at the Seed Bank of the Mediterranean Agronomic Institute of Chania (MAICh) offers a wide spectrum of services and possibilities for visitors. They can be summarised under a) Access to the facility and b) Distribution of seed samples: *a) Access to the facility* • *Ex situ* conservation of endemic and threatened plants of Crete. Up to date, approximately 70% of the endemic and threatened taxa of Cretan flora are conserved. • Studies on and development of optimum germination protocols for plant species. • Participation in various research projects, e.g. on the conservation of the native flora of Crete. • Training of graduated and post-graduated students. • Training and transfer of know-how to scientists interested in the establishment of new seed banks of native plant species in Greece and other neighbouring countries. • Duplication of accessions with/from other seed conservation centres of the Mediterranean • Germination experiments for the validation of germination protocols developed by other seed

conservation centres of the Mediterranean

b) Distribution of seed samples

- Dissemination activities involving the general public (e.g. guided visits for students and teachers, seminars, production of information material).
- Provision of genetic plant material to botanical gardens and research institutions on a national level.

Description of work

The Seed Bank of the Mediterranean Agronomic Institute of Chania will be the regional hub for the East Mediterranean and the Black Sea bio-geographical regions.

Modality of access under this proposal:

Visits of the facility

The Seed Bank of the Mediterranean Agronomic Institute of Chania will provide access to the seed samples collection, the germination protocols, and the photographic collection with image documention from herbarium specimens, and plant individuals in different ontogenetic stages (flower, fruit, seeds). In addition, it will provide access to plant identification resources (herbarium and literature concerning the flora of the East Mediterranean area), to the Botanical garden of MAICh with the endemic and threatened plants of Crete, and of course to all the facilities of the laboratory, including seed cleaning facilities, germination lab infrastructure (for germination studies), drying and packaging facilities. Staff expertise will be available in all cases. The Seed bank will provide the above access for study/work upon request and according to the project internal access and approval regulations, for an estimated 150 days during the project. The duration of each research stay will depend on its specific requirements: for example, germination studies would last for 15 days up to three months, depending on the number of seed lots to be tested and the difficulty to germinate them (in the case some preliminary data or bibliographic references are available) plus other works planned by the user (e.g. collecting, taxonomic work, literature screening, seed morphology studies etc).

Distribution of seed samples

The Seed Bank of the Mediterranean Agronomic Institute of Chania will distribute seed samples from native plant species, collected and duplicated in the East Mediterranean and Black Sea bio-geographical regions under this proposal. A fraction of all samples entering the Seed Bank will be devoted for the long-term baseline collections. It is estimated that in total about 200 samples will be distributed, each representing the entire genetic variety of the sampled population.

Support offered under this proposal:

No support other than described in work packages N3 and N7 will be necessary for “Distribution of Seed Samples”.

MAICh, as an international institute that offers post-graduated studies for over 20 years now, has a long experience in hosting scientific visitors, not only those who come for post-graduate studies, but also others who participate in scientific conferences, meetings, short courses, etc. With regard to the installation “Access to Seed Bank MAICh”, the following specific support will be offered besides support and guidance by technicians and researchers:

MAICh is located at the outskirts of the beautiful city of Chania, Crete. The user can either stay in one of the city hotels or on the campus of the institute where full accommodation is available. Besides working in the Seed Bank lab, the visitor has the opportunity to enhance their studies using the Herbarium and the Botanic Garden, and to meet the scientific staff of the institute.

Additionally, the access could be enhanced by visits to other academic facilities such as laboratories of Horticultural Genetics and Biotechnology, Food Quality Management, Natural Products and Biotechnology, Sustainable Agriculture, Environmental management.

To improve the quality of their visit, users can also have access to the library, the computer centre and various athletic and recreational facilities. The official language of the institute is English; consequently, the visitor should not have any communication problems in their daily routine.

Field trips for additional collections (based on the needs of specific projects) can be arranged all over the island of Crete. Besides that, the institute is located in Western Crete where someone can easily have access (daily excursions) to various legally protected areas with many endemic and stenoendemic plant species and a great variety of very important habitats of South east Mediterranean area.

Outreach of new users

For a detailed description of the measures to be taken to attract potential new users, see work package N7.

The Seed Bank of MAICh is recently established and therefore it is not yet well-known to the international scientific community. Until now it has mainly known and used by the scientific community on a national level; it is known and used to a lesser extent by scientists from other Mediterranean or European countries through the various projects that MAICh's Seed Bank participates. It is also known by the institute's students that attend the post-graduate programme. Through the co-ordinated pan-European effort based on the ENSCRI project, we estimate that the percentage of external users will increase dramatically from 5% to 50-60% (many of them from abroad), since the flora of East-Mediterranean and Black Sea regions is not well studied yet. Significantly more (international) researchers will be interested to have access to plant genetic material of the area.

Review procedure under this proposal:

For a detailed description of the review procedure, see work package N7 (Tasks 3, 6 and 9).

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
Distribution of seed samples	Seed sample (1 accession)	50	200	200	0	100
Access to Seed Bank MAICh	1 Visitor day	266.55	50	50	150	50

Work package number	A3	**Start date or starting event:**			Month 14		
Work package title	Provision of Access – HUBG						
Activity Type	SUPP						
Participant number	13						
Participant short name	HUBG						
Person-months per participant:	0						

Description of the infrastructure HUBG
Name of the infrastructure: Seed bank of the Helsinki University Botanic Garden (HUBG)
Location (town, country): Helsinki, Finland
Web site address: www.fmnh.fi/english/botanicgarden
Legal name of organisation operating the infrastructure: Helsingin yliopisto (University of Helsinki)
Location of organisation (town, country): Helsinki, Finland
Annual operating costs (excl. investment costs) of the infrastructure (€): 573,000.00 in total, of which 64,093.00 is pertinent to seed bank activities
Description of the infrastructure: Helsinki University Botanic Garden (HUBG), founded in 1678, is a well established scientific garden whose collections and curation standards are of highest international quality. The collection policy focuses on well-documented wild-collected plants of boreal regions throughout the world. The main purposes of HUBG are: a) to support and conduct university level research; b) to support and give university level teaching and supervision of graduates; c) to act as an expert authority in botanical issues related to various sectors of the society; d) to popularise botanical knowledge; and e) to conserve native plant species and populations. HUBG has participated in international seed exchange between botanic gardens for more than 100 years. Its seed catalogues are renown among exchange partners for containing meticulously documented wild-collected seed accessions of native species. HUBG is member of the ENSCONET network where it is in charge of the Arctic and Boreal bio-geographical regions and where it participates in the activities of the Alpine bio-geographical region. HUBG is currently developing its seed laboratory into a seed bank for long-term seed storage with guidance from ENSCONET. This bank will provide all the essential aspects of the preservation of seed germplasm: collecting, drying, storage and germination experiments; the development will be completed by the end of 2009. Helsinki University Botanic Garden is a unit within the Finnish Museum of Natural History (FMNH) whose Botanical Museum (international acronym H) holds approx. 3.1 million herbarium specimens of plants and fungi. HUBG is able to provide all necessary facilities for seed research through the laboratory and library facilities and taxonomic expertise of FMNH and the University of Helsinki to which FMNH belongs. Together HUBG and the Botanical Museum form a centre of expertise of the European boreal flora whose staff lead the Atlas Florae Europaea project and participate in several flora projects, such as Flora Nordica (among others). Services currently offered by the infrastructure: The Helsinki University Botanic Garden with its seed bank offers a wide spectrum of services and possibilities for research and study for visitors. These include both, access to the facility and the distribution of seed samples: • Provision of plant material (*i.e.* vegetative material and seeds) to researchers. • Plant identification services. • International seed exchange. • Long-term *ex situ* conservation of plant species and populations.

- Taxonomic expertise for various botanical projects.
- Botanical expertise for the national horticultural industry.
- DNA laboratory facilities (in cooperation with the Finnish Museum of Natural History).
- Training of graduated and post-graduated students.
- Activities of dissemination to the public (guided visits for students and teachers, seminars, production of information material)

Description of work

Modality of access under this proposal:

HUBG as the bioregional hub for the Boreal and Arctic bio-geographical regions will be uniquely positioned on a European scale.

Distribution of Seed Samples
Regarding the "Distribution of Seed Samples", all samples collected within the scope of the project by HUBG and the duplicate seed lots received from the Boreal and Arctic bio-geographical regions will be offered at no cost. A fraction of all samples entering the Seed Bank will be devoted to the long-term baseline collections. The remaining seeds will enter the access seed bank for immediate service on demand. For more details on access modalities see N7.

Access to Seed Bank HUBG
The following access will be offered: provision of seed samples on site where the researchers can, for example, carry out external morphology analysis; seed identification services including the use of reference collections of dried (approximately 1.5 million vascular plant specimens) and living plants (c. 7,500 accessions) and a well equipped library; germination experiments will be possible on-site and within the mother institution (University of Helsinki), if necessary. The duration of the morphology studies will vary depending of the number of seed samples, with an estimated mean duration of two weeks. For the germination studies the estimated duration will be 40 days. The germination studies would have to be appropriately scheduled to fit with a) the amount of work carried out by other researchers and b) with the capacity of the germination chambers.

Support offered under this proposal:

No support other than described in work packages N3 and N7 will be necessary for "Distribution of Seed Samples".

Besides support and guidance by technicians and researchers, the facilities will offer the following specific support:

One of the lines of research of the Seed Bank of the Helsinki University Botanic Garden HUBG is *ex situ* conservation from which the user could also benefit. Logistic support for visitors includes the possibility to stay on-site in guest rooms and transportation between collections and other facilities where necessary.

Outreach of new users

For a detailed description of the measures to be taken to attract potential new users, see work package N7 (Tasks 1 and 6). The number of European users from outside Finland is expected to increase dramatically to an estimated 40 as a result of this proposal.

Review procedure under this proposal:

For a detailed description of the review procedure, see work package N7 (Tasks 3, 6 and 9).

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
Distribution of seed samples	Seed sample (1 accession)	75	100	50	0	100
Access to Seed Bank HUBG	1 Visitor day	302.29	60	40	120	40

Work package number	A4	**Start date or starting event:**			Month 14		
Work package title	Provision of Access – UPM						
Activity Type	SUPP						
Participant number	15						
Participant short name	UPM						
Person-months per participant:	0						

Description of the infrastructure UPM
Name of the infrastructure: Banco de Germoplasma Vegetal – Universidad Politécnica de Madrid
Location (town, country): Madrid, Spain
Web site address: http://www.etsia.upm.es/DEPARTAMENTOS/biologia/index.htm
Legal name of organisation operating the infrastructure: Universidad Politécnica de Madrid
Location of organisation (town, country): Madrid, Spain
Annual operating costs (excl. investment costs) of the infrastructure (€): 56,480.00
Description of the infrastructure: The Banco de Germoplasma Vegetal – UPM is run by the Department of Plant Biology (Universidad Politécnica de Madrid). It was created in 1966. Therefore it is one of the oldest seed banks in the world dedicated to wild species. It currently comprises seed accessions stored under conventional seed banking conditions, a Leguminosae field collection, and accessions of *in vitro* stored endangered plants. The main part is the seed bank that currently holds approximately 10,000 accessions, mainly of Brassicaceae from all over the world and of plants endemic to the Iberian Peninsula. Seed samples are preserved in closed individual glass ampoules together with silica gel in order to achieve low water content conditions. This procedure is supplemented by cold storage (-10°C). Recent germination tests with the oldest seed samples (1966) have proved that this technique is fully satisfactory for 37 species of Brassicaceae (Pérez-García et al., Seed Sci. & Technol., 35 (2007), 143-153). In 1982, the Banco de Germoplasma Vegetal – UPM was designated as base bank for Brassicaceae by IBPGR (International Board for Plant Genetic Resources, now Bioversity International). The Plant Germplasm Bank has two cold rooms (approx. 20 m^2 each) running at -10°C and 5°C, the second one with controlled relative humidity; laboratory area for seed cleaning, drying, processing (80 m^2); and an office area. There are seed germination facilities comprising a laboratory (fully equipped with microscopes, stereomicroscopes, analytic balances and other lab equipment), and eight incubators. There are *in vitro* culture facilities for *in vitro* germination (77 m^2 laboratory and 12 m^2 growth chamber). By providing seeds worldwide to many researchers, The Banco de Germoplasma Vegetal – UPM has supported a wide range of scientific works (see below), from anatomy and morphology studies to hybridization and transgenesis. The Banco de Germoplasma Vegetal – UPM is part of the Department of Plant Biology. Research in the Department of Plant Biology is mostly related to Plant Genetic Resources (morphological and molecular characterization, conservation techniques, in vitro culture, cryopreservation, seed germination/dormancy, to name only a few areas). Visitors from all over the world benefit from the researchers' experience and knowledge gathered in the Department on those lines. The Banco de Germoplasma Vegetal – UPM is a member of the European Native Seed Conservation Network (ENSCONET) and of the Spanish seed bank network (REDBAG).

Services currently offered by the infrastructure:

Distribution of seed samples

The Banco de Germoplasma Vegetal – UPM has been amply providing seeds to researchers over the past forty years. It has been able to facilitate more than 200 scientific papers published by researchers outside the Department of Plant Biology – UPM (Gómez-Campo, Plant Genetic Resources Newsletter, 151 (2007), 40-49). Other uses, such as exhibits of rare or common species in botanical gardens have probably been very extensive, but have been impossible to track.

The Banco de Germoplasma Vegetal – UPM also provides seeds from its active collection (Index seminum).

It holds duplicates from other seed banks, and provides seed storage facilities to Spanish institutions that require it.

Access to the facility

Apart from the many users to which seed samples have been sent, the Banco de Germoplasma Vegetal – UPM (and the related infrastructure in the Department) receives every two years around one external user on site to carry out germination studies. This figure excludes those users who receive training through different seminars and courses.

Description of work

Modality of access under this proposal:

The Banco de Germoplasma Vegetal – Universidad Politécnica de Madrid will act as the bio-geographical hub for the West Mediterranean and Macaronesian regions. It will provide access to two installations: 1) Distribution of seed samples (collected under the auspices of this proposal, a fraction of all samples entering the Banco de Germoplasma Vegetal will be devoted to the long-term baseline collections) and 2) Access to the facility. In the latter one, the external researchers can carry out external morphology analysis or germination studies. The duration of the morphology studies will vary depending of the number of seed samples, with an estimated mean duration of one week. For the germination studies, the estimated duration is estimated to be 40 days per visitor (as average). The germination studies will have to be appropriately scheduled to fit with the amount of work carried out by other researchers in the infrastructure and university holidays (Christmas two weeks, Easter one week, and summer July and August).

Support offered under this proposal:

No support other than described in work packages N3 and N7 will be necessary for the installation “Distribution of seed samples”. With regard to the installation “Access to BGV-UPM”, the facilities will offer the following specific support besides support and guidance by technicians and researchers:

Research staff of the Department of Plant Biology have ample experience in such type of work, and the scientific environment and main line of research of the department is plant genetic resources from which the users will benefit. The user will be scientifically guided by research staff (Dr Félix Pérez) with ample experience on seed germination/dormancy studies especially on Mediterranean and Macaronesian species, which makes the Plant Germplasm Seedbank-UPM a unique facility to carry out this type of research. This support will enable external visitors to perform cutting-edge research. The research visitor will also have technical staff at hand for any specific request. The user will be helped to find accommodation within easy reach of the facility.

Outreach of new users

For a detailed description of the measures to be taken to attract potential new users, see work package N7 (Tasks 1 and 6). The number of European users from outside Spain is expected to almost triple.

Review procedure under this proposal:
For a detailed description of the review procedure, see work package N7 (Tasks 3, 6 and 9).

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
Distribution of seed samples	Seed sample (1 accession)	50	100	50	0	50
Access to BGV-UPM	1 Visitor day	235.53	100	4	160	4

Work package number	A5	**Start date or starting event:**			Month 14		
Work package title	Provision of Access – MNHN						
Activity Type	SUPP						
Participant number	20						
Participant short name	MNHN						
Person-months per participant:	0						

Description of the infrastructure MNHN
Name of the infrastructure: Banque de Graines – MNHN / DJBZ
Location (town, country): Paris, France
Web site address: www.mnhn.fr/
Legal name of organisation operating the infrastructure: Museum National d'Histoire Naturelle
Location of organisation (town, country): Paris, France
Annual operating costs (excl. investment costs) of the infrastructure (€): 88,667.00
Description of the infrastructure: The MNHN is a world-renowned taxonomic institution in all fields of natural and human sciences devoted to teaching, research, expertise and dissemination of scientific knowledge. It was established in 1793 but its botanic garden dates back to 1626. It is a major depository for botanical materials with extensive preserved collections: the Herbarium is one of the largest in the world with 10 million specimens, and its living plant collection comprises 16.000 taxa, outdoor and under glass, in the Jardin des Plantes and the nearby Arboretum of Chevreloup. The Banque de Graines – MNHN / DJBZ (in the following: MNHN seed bank) was created in 1822. There are two collections: a living seed collection (5,000 accessions) and a reference collection with 25,000 accessions from around the world. The living seed collection represents wild-collected samples from populations of the French and European flora, which have been used for seed exchange and distribution for over 10 years and for long-term storage. The rare and endangered species of the French flora are subject to national rules and managed by the network of Conservatoires botaniques nationaux. MNHN helps facilitate access to them. The current seed banking facilities comprise: room 1 (drying, sorting and cleaning the seeds collected or received), room 2 (seed conservation at 5° / 40% RH, 10 m^3 volume) and room 3 (with deep freezers at -18°C). These facilities will be improved and ready for use at the beginning of 2009. The new facilities will include: • a visitors' room with office desks, computers, a hand library, and microscopes • a room for drying, sorting and cleaning the seeds collected or received • temperature and humidity controlled seed drying cupboards (standard 15°C / 15% RH) • an air-controlled experimental room • deep freezers (-18°C) for storing the seed material (duplicates) from countries of the European Atlantic bio-geographic region. Germination tests are carried out in compost substrate and under ambient conditions. A well equipped *in vitro* laboratory is located near the MNHN seed bank. The MNHN seed bank has access to cultivation plots and glasshouses with controlled light and temperature conditions so that seed samples can be grown out, e.g. for studies on the physiology of seedlings. There is good horticultural and taxonomic expertise available. MNHN seed bank staff comprises six people working under the supervision of a scientist. They participate in multiplication programs for the botanical collections, collecting trips of new plant material in the wild and the subsequent cleaning and conservation processes. The MNHN seed

bank produces an annual *Index Seminum* which is sent to 800 correspondents.

Services currently offered by the infrastructure:

1) distribution of seed samples

The MNHN Seed Bank annually produces an *Index Seminum* which is distributed to 800 recipients from all over the world. Through this means, it provides access to the seeds collected. For the last 15 years, the seeds offered in the *Index Seminum* have only come from known wild origin (different regions in France). An average of 8,000 seed accessions are distributed each year to about 400 different correspondents. The seed samples are carefully identified by the team before distribution and are kept in a cold room. Occasionally further identifications are done with the help from other MNHN botanists, or by using the Herbarium or the seed and fruit reference collections. Seeds are also regularly sent to external research institutions for scientific purposes most of them requested through the Botanic Gardens Conservation International Plant Search Database. Other samples of seeds and fruits are regularly requested on loan for specific exhibitions.

2) *visits of the facility*

The MNHN seed bank offers access to its facilities and expertise and thereby supports a wide range of different research projects and other scientific requests. The reference seed collections and fruit collections of the MNHN seed bank is unique on a national and regional level and together with the accompanying expertise of the staff is extensively used by a wide range of users. Within the biological sciences, these include among others, seed morphology, taxonomy (identification of plant material for archaeologists, botanists, forensic laboratories etc.), phytotoxicology, seed biology (research collaborations). Thematic training courses are organised by the MNHN for the general public, and visits of the seed bank are organised every year. Master or PhD students visit and use the seed bank facility in the course of their research projects. Its living seed collections and the unique horticultural know-how provided by the MNHN seed bank staff supports a wide range of different research projects. A large majority of visitors come from France.

The MNHN seed bank is conveniently situated in central Paris in the direct vicinity of the other facilities of the MNHN which are at the disposal of the scientists of the Institution and which will be available to the access users in support of their work, such as the scientific and documentary databases (Flora, Sonnerat, Jacim, INPN…), Scanning Electron Microscope, a photographic department and others. Five out of the seven research departments of the MNHN can be approached to provide further scientific expertise (“Ecology and Biodiversity Management”, “Systematics and Evolution”, “Regulation, Development and molecular Diversity”, “Aquatic Environments and Populations”, “Man, Nature and Societies”).

Description of work

Modality of access under this proposal:

The MNHN Seed Bank will become the bioregional hub for the Atlantic bio-geographical region and will provide access to its own seed accessions, those duplicated from other Atlantic project participants, and other facilities for the researcher selected according to the general rules established in work package N7.

1) distribution of seed samples

The duplicate seed samples received from other seed banks in the Atlantic Bio-region and those collected under the ENSCRI project in the Atlantic bioregion in France will be available for distribution on request by users according to the guidelines set up at the start of the project. A fraction of all samples entering the MNHN seed bank will be devoted to the long-term baseline collections.

2) *visits of the facility*

The MNHN seed bank offers full access to its facilities and expertise and thereby supports a wide range of different research projects and other scientific requests (see above). The other facilities of the MNHN will be available to the access users in support of their work (such as the scientific and documentary databases, Scanning Electron Microscope, a photographic Department and others).

Support offered under this proposal:

Besides support and guidance by technicians and researchers, the facilities will offer the following specific support:

No support other than described in work packages N3 and N7 will be necessary for “Distribution of Seed Samples”.

Access to the facility

Once the users’ proposals have been positively evaluated, the researchers will receive full support in organising their stay in the institution, help in finding suitable accommodation, and help with directions between international or national airports, train stations and the MNHN. The city of Paris has an extensive network of public transport. On arrival, there will be someone to welcome the user and help him to organise their stay. Inexpensive meals are provided in the building next to the MNHN Seed Bank. Staff expertise will be available at hand especially in taxonomy, horticulture, *ex situ* cultivation and international seed exchange, as well as in vitro culture.

Research activities, germination tests and studies on seed dormancy and seed viability will be carried out in collaboration with the Seed Biology Laboratory INRA AgroParisTech, Paris situated in the immediate proximity of the MNHN seed bank.

Outreach of new users

The number of users in the MNHN seed bank is expected to increase dramatically from 3 to 16 per year as a result of this proposal. It is expected that most external users come from abroad. The access provided thereby directly supports the objectives of the European Research Area to create opportunities for researchers and to increase their mobility.

Review procedure under this proposal:

For a detailed description of the review procedure, see work package N7 (Tasks 3, 6 and 9).

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
Distribution of seed samples	Seed sample (1 accession)	50	140	45	0	45
Access to Banque de Graines – MNHN	1 Visitor day	284.67	120	66	200	70

Work package number	A6	**Start date or starting event:**		Month 14			
Work package title	Provision of Access – LSB						
Activity Type	SUPP						
Participant number	21						
Participant short name	UNI-PAV-CFA						
Person-months per participant:	0						

Description of the infrastructure PAV-UNI-CFA
Name of the infrastructure: Lombardy Seed Bank (LSB)
Location (town, country): Pavia, Italy
Web site address: www.unipv.it/labecove; www.unipv.it/det/
Legal name of organisation operating the infrastructure: Università degli Studi di Pavia
Location of organisation (town, country): Pavia, Italy
Annual operating costs (excl. investment costs) of the infrastructure (€): 49,033.75
Description of the infrastructure: The seed bank of PAV-UNI-CFA (Lombardy Seed Bank, LSB) is a facility set up in 2005 by the Regional Government of Lombardy (Italy) and part of the Centre for Native Plant Conservation (CFA); The seed bank of PAV-UNI-CFA is located at the University of Pavia (Dipartimento di Ecologia del Territorio). It carries out *ex situ* conservation activities for native plant species occurring in Italian Lombardy Region and surroundings areas, especially the southern Alps which are a biodiversity hot spot. Approximately 600 species out of the 3,200 native plants locally occurring are to be considered threatened, 30 being already extinct. In this alarming context, the seeds stored in the LSB will act as a safety reserve available for future activities aimed at strengthening or re-introducing fast disappearing species that might become locally extinct. Presently, about 1,000 seed accessions are conserved in our seed bank, 400 of which belong to rare and threatened species and about 200 germination tests have been performed. LSB is supported by the Regional Government of Lombardy with yearly funds and occasionally by grants from foundations, research institutions and private companies. The seed bank of PAV-UNI-CFA is well equipped with modern, up-to-date facilities arranged in three functional units: 1) the dry room and cold store house the key equipment necessary to dry and properly conserve the seeds. It has been designed to slowly lower the moisture content of the seeds, without damaging them. This whole process is attained with a slow equilibration with dry air that is constantly renewed and maintained at 15°C and 15% relative humidity. Five deep freezers are also placed in the dry room, they are conventional column freezers, operating at -18°C, where seeds are finally located and preserved for long time. 2) The seed cleaning lab is designed to remove the unnecessary plant material by extracting the seeds without incurring any damage to the collection. It is equipped with several sieves at different mash sizes, two different seed aspirator (Agriculex and Zig-Zag), one cowl and other lab equipments. 3) The germination lab is equipped with eight cooled incubators with temperature and light control (LMS series 1), two heaters (for longevity studies), two analytical balances, three microscope and other laboratories equipments. GIS software and several hand-held GPS instruments are used to collect and store field collection data. Specimens of reference for the collection of seeds are normally identified in the Department and stored in the Herbarium of the Botanic Garden. All information regarding seeds samples managed are stored in a dedicated internal electronic data-base. The areas of research normally supported by the seed bank of PAV-UNI-CFA are seed ecology, seed physiology, population ecology, genetics, taxonomy and plant conservation. These topics are often related in the context of climate warming.

The seed bank of PAV-UNI-CFA is part of the "Laboratory of Plant Ecology and Conservation Biology" under the supervision of Prof. G. Rossi. The main activities performed by the Laboratory are research activities on:

1) Seed dormancy, germination and longevity, mainly referred to alpine and woodland herbaceous species, the genera *Anemone* and *Silene* being the most investigated taxa (e.g. Mondoni et al., 2007. Seed Ecology Conference, Perth, Australia). The germination requirements of the species are often analysed in the context of climate change.

2) Climate changes effects on alpine and lowland plants (Parolo G., Rossi G., 2008. Basic and Applied Ecology)

3) *In situ* conservation and management of species and habitats.

4) Taxonomy of Poaceae.

The reproductive behaviour of plant species is managed in the Botanical Garden of the Department. In partnership with public authorities, the laboratory is also involved in project activities regarding the reinforcement and reintroduction of populations of threatened plant species in protected areas, and regarding the restoration of former quarries and waste areas.

The seed bank of PAV-UNI-CFA plans to open a new section, dealing with cryo-conservation with liquid nitrogen (LN_2), in order to preserve non-orthodox seeds, pteridophytes spores and short-lived seeds. This new section will be probably completely operative in 2010.

Services currently offered by the infrastructure:

Seeds samples

The seed bank of PAV-UNI-CFA offers updated facilities and qualified staff. All levels (professors, researchers, PhD students, and technicians) guide and advice external users in their studies/activities.

The seed bank of PAV-UNI-CFA currently offers seeds for research and advises to other Italian universities (e.g. Trieste, Bologna, Pavia), other Italian research institutions (e.g. ISAFA S. Michele all'Adige, Museo Tridentino di Scienze Naturali Trento), and even to a few institutions abroad (e.g. research institutes in Austria and Switzerland). These and other institutes usually apply to the LSB for very particular species, like those of endemic, threatened and rare Alpine species, since the seed bank of PAV-UNI-CFA is arguably one of Europe's best laboratories to deal with these plant species. Furthermore, the LSB is the only infrastructure which offers access to seeds of herbaceous native plant species of the Italian Lombardy region, the North Apennines and North Adriatic Sea coast.

In addition, the seed bank currently offer seeds/spores for restoration projects (e.g. in the north Italian province of Cremona, along the river Po), use in the urban parks (e.g. wildflower meadow project of the Municipality of Pavia), or for reinforcement of local plant populations (e.g. in natural reserves, species are among others *Leucojum aestivum*, *Iris sibirica*, *Phyllitis scolopendrium*, *Marsilea quadrifolia*). Germination protocols of the species conserved in the seed bank, and other experimental protocols, are normally provided to the CFA (Lombardy Government) and the private Minoprio Foundation for large-scale plant production in the Lombardy region.

The seed bank collects also seeds of Italian species for other seed banks involved in international *ex situ* biodiversity conservation projects (Millennium Seed Bank Project, Royal Botanic Gardens Kew, UK). Finally, seeds are collected in the field for protected areas outside the Lombardy, and duplicated with other seed banks (Millennium Seed Bank Project) for long term conservation. Seeds from four Italian parks are presently managed.

Presently, the number of international users using the facility is about five per year. Some of the most interesting scientific achievements already obtained by users include: genetic investigations on different endemic species from the southern Alps (*Linaria tonzigii*, *Viola comollia*, *Sanguisorba dodecandra*), genetic and taxonomic studies on *Gentiana lutea*, *Cistus salvifolius*, and the genera *Artemisia*, *Sesleria* and *Festuca*).

Visit of the facility

The seed bank offers training courses for other seed banks or institutes in the laboratory and in the field (seed collecting, cleaning, germination tests, conservation protocols) in Italy (e.g. universities of Molise, Pisa, Genoa, Padua, Ancona, Viterbo), from other Member States (Belgium, United Kingdom, Hungary) and also non-EU Member States (e.g. Faculty of Forestry, University of Banja Luka, Bosnia-Herzegovina; Switzerland).

Description of work

Modality of access under this proposal:

Distribution of seed samples

As the Alpine bio-geographical hub, the LSB is without doubt one of the most important seed banks in Europe. It will not only offer access to seeds from the Italian Alps, lowland Po plain, North Apennines and North Adriatic Sea coast (areas which are its own focal areas) but from the entire arch of the European Alps (also rare and threatened) and other Alpine mountain areas in Europe. Seed samples will be provided to the scientific community and other uses on specific request after positive evaluation of their proposal. Each seed sample will be completed by a data sheet, containing information (number of seeds, name of the plant species, locality and date of collection in the field etc.)

Access to the facility

The Lombardy Seed Bank (LSB) within the Dipartimento di Ecologia del Territorio will invite external users working in our Department to share the rooms and laboratories with the staff of the institute. This will guarantee a short way in cases where specific advice or help is required. LSB will provide access and research opportunities to the different facilities here operating: seed cleaning room, germination test laboratory, dry and storage room. Facilities of the Department are at the disposal of the external researchers during their visit. The guests will have access to our seed collections and all the information about them stored in the LSB database (e.g. germination tests and storage behaviour).

Support offered under this proposal:

No support other than described in work packages N3 and N7 will be necessary for “Distribution of seed samples”.

With regard to “Access to the facility” and besides support and guidance by technicians and researchers, the LSB will offer the following specific support:

Joint research activities on Alpine plants, such as the effects of global warming on germination, are welcome. With regards to logistics, accommodation and subsistence are usually provided in a short walking distance from the facility. Furthermore, Pavia is conveniently situated just 40 minutes from the Milan airports. The quality of the scientific environment in which the users will be working is excellent, documented by numerous papers published in peer-reviewed scientific journals of seed and plant ecology, conservation biology and taxonomy. The seed bank of PAV-UNI-CFA offers support to users interested in species from the Alpine bio-geographical region (common, rare and threatened plant species) for activities such as for example scientific research, *ex situ* seed conservation, habitat restoration and re-introduction projects. Field trips in the Alps and in the continental part of Italy can be arranged for seed/spore collection activities on endemic species.

Outreach of new users

For a detailed description of the measures to be taken to attract potential new users, see work package N7 (Tasks 1 and 6). The number of European users from outside Italy is expected to

increase dramatically from about 5 per year to about 40 in total as a result of this proposal.

Review procedure under this proposal:
For a detailed description of the review procedure, see work package N7 (Tasks 3, 6 and 9).

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
Distribution of seed samples	Seed sample (1 accession)	50	90	50	0	50
Access to LSB	1 Visitor day	251.89	60	40	60	40

Work package number	A7		**Start date or starting event:**			Month 1	
Work package title	**Provision of service**						
Activity Type	SUPP						
Participant number	8	1	3	10	13	15	20
Participant short name	MAICh	RBGK	FUB-BGBM	TCD	HUBG	UPM	MNHN
Person-months per participant:	11.5	0.5	0.5	5.75	0.5	0.5	0.5
Participant number	21						
Participant short name	UNI-PAV-CFA						
Person-months per participant:	0.5						

Description of the infrastructure
Name of the infrastructure: ENSCRI database
Location (town, country): Chania (Crete), Greece
Web site address: currently http://www.ensconet.eu/Database.htm; the address will change to http://www.enscri.eu which has already been registered.
Legal name of organisation operating the infrastructure: CIHEAM - Mediterranean Agronomic Institute of Chania
Location of organisation (town, country): Chania (Crete), Greece
Annual operating costs (excl. investment costs) of the infrastructure (€): n/a
Description of the infrastructure: The ENSCRI database has been developed under the FP6 Co-ordination Action ENSCONET. It has been co-developed by and is hosted at the CIHEAM - Mediterranean Agronomic Institute of Chania (MAICh), Greece. The database has currently 37,755 accessions of 8,831 plant taxa that span 39 contributing countries (status 20th February 2008). The database contains invaluable collection information such as habitat, conservation status, bioregion, moisture content, and germination data. This data set offers invaluable support for the essential steps of *ex situ* conservation of native flora of Europe. The database schema itself (see also work package N3) contains 135 data fields whose information can be viewed and queried. The database is under constant development and will incorporate data and outputs from activities of the current proposal. Within this work package, data stored will be integrated as an access service available for internal and external users. Services currently offered by the infrastructure: The database currently offers simple as well as very complex queries facilitating high-profile, plant-related research in Europe. Full access will be provided internally by mid 2008 and externally by mid 2009. The current user base is the ENSCONET network family consisting of 24 contractors and five associated network participants. Scientists of these institutions consult the database while performing for example seed collection, germination studies or fundamental and applied research. A significant proportion of the European native flora is conserved *ex situ* in ENSCONET gene banks (about 50% of the taxa listed in Flora Europaea). Of particular interest is that the current accessions have been screened against Annex II (486 plant taxa) of the Council Directive No. 92/43/EEC of 21st May 1992 (Habitats Directive) resulting in185 (38%) of them are currently being stored in ENSCONET partner gene banks. Additionally, the database contains internal ENSCONET priority collecting scores for 9 of the 10 bio-geographical regions in Europe. These data are invaluable in planning future collection activities and *ex situ* conservation programmes of

threatened taxa.
Second, researchers are able to view germination conditions of specific taxa as the database contains about 17,000 germination tests. Germination conditions are therefore optimised for any new germination tests that a user undertakes.

Third, the database contains information about species involved in recovery programmes (seed accessions, country, geo-code etc). Again, this data is invaluable in planning *in situ* conservation programmes of threatened taxa.

Finally, the database offers direct links to other relevant external databases and information such as:

- taxonomic information (Flora Europaea, IPNI, EUNIS)
- conservation status (IUCN)
- scientific literature (SID, EUNIS)
- digital photos (e.g. Google Image and other web-based picture databases)

Description of work

Modality of access under this proposal: The database will be available online via an easy-to-use Web interface and free of charge, accessible directly or through the project portal. The service contains the following capabilities:

- Search by taxonomy, habitat type, country, bio-geographical region, conservation status
- Access to information about the availability of a seed accession and accession specific information
- Access to information about original or current seed quantity
- Direct link to other relevant external databases and information
- Application for access to seed samples, as part of work package N7 (see above).

(Additional features to be decided, see Task 1, below)

Task 1: Identify services and access to be provided
Task 1 will identify access services (such as specific data access as outlined above) to be provided. A questionnaire will be circulated among the project participants and among already identified potential external users (including service restrictions). TCD and MAICh will, in cooperation with the other work package participants, analyse the responses of the questionnaires, to define data and services that need to be offered, implemented and improved upon on top of already available services under the existing ENSCONET schema (Month 1-12, Milestone 1: Services identified and communicated to database team).

Task 2: Develop and provide internet remote access service for users
The aim of Task 2 is to develop in close collaboration with work package N3 appropriate (raw) data access queries that are required for each service defined in Task 1 (see above). These software routines will be used to develop a service implementation infrastructure based on a Service Oriented Architecture (SOA), a design and methodology for linking computational resources like applications and data on demand to achieve the desired results for service consumers (which can be end users or other services). This would include incorporating query, retrieval, and presentation services to use and to display the query data online. Additionally, in collaboration with R1 Task 12 (Test remote GIS mapping software) and N3 Task 4 (Centrally supervise data input), GIS based services will be provided (such as distribution maps which would be either be delivered internally by ENSCRI or by utilizing external services such as ArcIMS/ArcGIS Online).

As external users will have access to the data, appropriate data and network security systems as well as disaster recover plans need to be implemented. These security systems will insure accessible and robust network services as well as long term data security and accessibility.
TCD and MAICh are jointly responsible for this task (Month 13-48, Milestone 2: User access available Month 22, Deliverable: links developed Month 31).

Task 3: Maintain internet remote access service for users
Task 3 will be based on Task 2. The safe internet remote access service for users will be maintained from Month 22 on for the entire duration of the project.
TCD and MAICh are jointly responsible for this task (Month 22-48).

Task 4: Implement Quality Of Service (QOS) improvement mechanism
Internal and external users of the ENSCRI database and its service will have the possibility to submit their user feed back, either directly through a communication portal on the website or through electronic mail. Such feed back is welcome and will be used to permanently improve the services provided. As far as the access rules and the quality of the data provided itself is concerned, service users would be requested comment on it via an online form. This feed back will be compiled and analysed as part of work package N7.

While MAICh is leading this task, all work package participants will be involved. Month 22-48, Milestone M3: Feed back mechanism established Month 22.

Task 5: Coordinate activities within the work package and with the Steering Group
MAICh will be leading this work package, as it will host the ENSCRI database and maintain the website.

Support offered under this proposal

The database access should be self-explanatory and is free of charge. Additional support is provided in the form of a help page containing contact e-mail addresses (see N4).

Outreach of new users:

As this service is available on the internet in an unrestricted fashion, theoretically everyone interested will have access. It is estimated that each accession record will be viewed at least three times. We therefore estimate a total number of hits as 45,000. Estimates of use are difficult but some 2,000 users from about 40 countries seems likely. Exact statistics will be provided in the yearly report to the European Commission.

Review procedure under this proposal: n/a

Implementation plan

Short name of installation	Unit of access	Unit cost	Min. quantity of access to be provided	Estimated number of users	Estimated number of days spent at the infrastructure	Estimated number of projects
ENSCRI database	Remote access to the database via Web interface	Service is free of charge	15,000	2000	0	2000

Deliverables (brief description and month of delivery)

No specific deliverables are foreseen in this work package

Work package number	R1	**Start date or starting event:**		Month 1		
Work package title	Baseline Collections					
Activity Type	RTD					
Participant number	3	1	2	4	5	6	7
Participant short name	FUB-BGBM	RBGK	NKUA	IB SAS	ELTE	BZBG	CAG
Person-months per participant:	75.8	19.8	27.8	11.3	13.8	9.8	15.3

Participant number	8	9	10	11	12	13	14
Participant short name	MAICh	CORDOBA	TCD	CJBG	Jardin Canario	HUBG	FUL
Person-months per participant:	36.3	12.5	15.8	14.8	23.3	17.8	8.8

Participant number	15	16	17	18	19	20	21
Participant short name	UPM	NBGB	CYARI	FUC	UiO	MNHN	UNI-PAV-UNI
Person-months per participant:	44.8	10.3	16.8	9.8	15.3	62.8	64.8

Participant number	22	23	24	25	26	27	28
Participant short name	PISA	IB-BAS	JB Soller	MTSN	UVEG	BG-CBDC-PAS	HBV
Person-months per participant:	54.5	11.3	10.8	19.3	26.8	10.8	7.3

Objectives

The objectives of this work package are to efficiently collect, store, germinate and then duplicate seed collections with the Access Seed Banks (for Trans-National Access) together with accompanying relevant field and curation data and thereby improve the quality and range of the research infrastructure facilities and documentation of living seed collections for research, conservation, and education. New seed samples of a significant proportion of the European flora will be collected during four seasons to further develop the network-wide collection, with special regard to priority species and the needs and requirements from the user community.

Description of work

The collection will be based on the priority lists developed in ENSCONET, on (future) conservation needs, and on the needs and requirements from the user community.

An important iterative action of this work package will be to identify at a bio-regional scale Focal Areas for Collecting Target Species (FACTS). Collecting may focus on certain habitats as a result of analysis of scenarios of climatic or land use change. Collected seed material will be stored in the collecting seed bank and duplicated with the bio-regional co-ordinating access seed bank; data will be transferred to the ENSCRI database. To achieve these goals, all consortium members are participating in this work package. It will be co-ordinated by FUB-BGBM. The six access seed banks will co-ordinate the planning and collecting activities in their bio-geographic region, thereby giving continuity between collecting and access. Four of these banks cover more than one bio-

geographic region.

The work package is composed of three sub-packages: A) Development of collecting strategy; B) Collecting and storage of seeds of European native seeds & C) Documentation of seed collections.

A) Development of collecting strategy

Collecting seeds efficiently and successfully at the European scale requires a common collecting plan (CCP) strategically based on specific regional priorities. Secondly, detailed regional planning of collecting activities depend on information about species phenology, eco-geography and traits such as breeding system. Duplication with the six regional hubs is important for collection security and is central to the Trans-national Access.

Task 1: Analysis and update of priority lists
Seed collecting activities will cover the entire European flora. Prioritisation will be based on the priority lists developed in ENSCONET, updated to take account of recent collections and new threats (e.g., new predictions of climate change threat) and potential user requirements. Dialogue will be established with the potential user community (see N6 and N7). Prioritisation methods established in ENSCONET will be used. All consortium members will be involved in this task.

Task 2: Identify target species for collecting with a distribution range covering more than one bio-geographical region
Because collecting will be organised on a bio-regional basis, overlap of target species (which occur in more than one region) will be identified in order to harmonise sampling efforts across the continent. Priority species that are widespread will be targeted to take into account eco-geographic variation and particularly vulnerable populations on the margins of their distribution that may have important genetic variation. One representative of each bio-geographical region will be involved in this task.

Task 3: Taxonomic working sub-group for nomenclature and synonymy
The priority lists developed in ENSCONET revealed significant problems concerning the taxonomic integrity and comparability of the incorporated data. The usability of data sources from different countries is hindered by a missing standard list including synonymy and a satisfactory unified checklist is not yet available (though ones applicable to Europe are being developed through GSPC and Species 2000). A taxonomic working sub-group will be established to guide the work package through controversial nomenclature and synonymy and harmonise the data sent to N3.

Task 4: Database species-specific information for use in the common collecting plan (CCP)
The field capture of genetic diversity depends on the availability of ecological and trait information. Information about phenology, distribution and abundance of target species will influence the planning of collecting trips. Species ecology information on a continental and, if available, local scale will be required. Information about breeding system (RBGK has been developing a database that might be used), seed dispersal and expected phylo-geographic history can be correlated with patterns of genetic variation in species. For instance, there is greater likelihood that there will be inter-population variation in inbreeding species. Following analysis, ecological and trait information will help further refine the collecting plans (task 5) and should help to deliver better genetic capture which will be important to the Access component. Information will be from published sources (Europe has one of the best described floras in the world), kept updated, and through feedback from collecting trips.

All work package participants will contribute to this task. The database will be developed by work package N3.

Task 5: Refine the common collecting plans for each bio-geographical region
Based on tasks 1-4, the bio-geographical collecting plans developed in the ENSCONET will be refined on an on-going basis. The exercise will need to take into account the collecting capabilities (accessions per year) of members. All consortium members will be involved in this task.

Task 6: Optimise sampling strategy on basis of information available and add information through support for short-term research
The ENSCONET collecting protocol that will be refined under work package N2 and the common collecting plan developed in task 5 should result in good capture of genetic diversity from species across their range. However, it is important that ENSCRI tries to move forward our understanding of the very best sampling strategies. It is relatively straightforward to devise strategies where the distribution of genetic diversity is known. However, for the majority of European plant species, little is known. Consequently, in formation in task 4 augmented by short-term research should help refinement of the sampling strategy. Some consortium members have the infrastructure to investigate the genetic diversity in selected, high priority species and populations. They will carry out short term research in order to fill knowledge gaps crucial for the success of the project. Moreover, attempts will be made to analyse the genetic diversity of seed populations stored in seed banks in comparison to the initial genetic structure of the sampled populations. Data will be fed into the species-specific information database (see task 4). The latest deliberations on sampling strategy will be fed into the collecting protocol in work package N2.

B) Collecting and storage of seeds of European native seeds

Central to work package R1 are the collecting trips to which all consortium members will contribute through regional collecting. Collecting will take place over all four years. Institutes affiliated to the project may support the consortium members in their collecting activities. The work will use protocols from N2 and plans from task 5. The predicted total number of new population samples of seed is at least 15,000.

Task 7: Collecting (plant material and data): Collecting trips on a regional level, following the collecting strategy jointly agreed
As described above, Focal Areas for Collecting Target Species (FACTS) will be identified in the CCPs. Collecting will concentrate on habitats rich in target species but also on threatened biomes with a rich or endemic flora. There will be four collecting seasons from about April to October each year, depending on phenology. According to national and regional regulations, authorisation will be gained locally (e.g., in the case of threatened species and habitats). Included within this will be permission for use of the seeds as described in Chapter 3.2. The quantity of seed sampled will vary depending on a number of factors but the target where protocol rules from N2 permit is at least 5,000 seeds per accession (to increase the usefulness of the collection). Each sample will be accompanied by extensive collection data (specified through N2) and pressed herbarium voucher specimens for the documentation of taxa. The collection data will be important baseline information on the status of species which will be fed to relevant national and international (e.g., EEA, GBIF) agencies.

Task 8: Join one collecting field trip
Each consortium member will have the opportunity to join another member's collecting field trip preferably in a different bio-geographic region to their own. Such joint collecting trips will complement the national activities and increase the opportunity of experience. The expected exchange of field experience will enhance standards of collecting and collaboration.

Task 9: Process, store, and duplicate collected seed material
As a general rule, the seed material will be processed and stored in the seed bank facilities of the collecting institute. Cleaning, drying and storing of the collected seeds will follow the protocols established in work package N2. A sub-sample of each processed seed accession will be sent as the duplicate and access collection to the access seed bank responsible for the bio-geographic region.

Task 10: Germination tests carried out and data transferred to main database
Accessions in all banks will have a sub-sample removed for germination testing both for monitoring viability and elucidating conditions such that the seed can be used. The approach to be used is outlined in work package R2 (below). All but a few partners will carry out this work. Difficult collections will be passed to work package R2. All data will be recorded on the ENSCRI database

(see N3).

C) Documentation of seed collections

Seed samples only have value if they are properly identified and are fully documented with objective and reliable data including GPS pinpointed locations. This data can be augmented with valuable photographic images of the location, species, micro-habitat etc.

Task 11: Develop unique numbering system for collections. Explore use of bar-coding and RFID technology
It will necessary to track a large number of seed and voucher collections in this project and to ensure that they are accompanied by their correct data (including collecting permits etc). This requires agreement on an accession numbering system that is unique and self-checking. Reference might be made to the International Plant Exchange Network (IPEN) numbering schema. Bar-coding and Radio Frequency Identification (RFID) technology (nowadays widely used in daily life to automatically identify objects) will be explored aiming at error reduction and ease of data flow. This task will agree a numbering system and explore bar-coding / RFID. All work package participants will contribute to this task.

Task 12: Test remote GIS mapping software and mobile data storage
Field data capturing is important for the usability and value of the seed samples. In close cooperation with N3, new developments in GIS systems and mobile data storage will be tested for automatic mapping of sample locations and field data surveys. Tests will be executed during the collecting field trips, and their results if successful will be incorporated in the protocols (N2). All work package participants will contribute to this task.

Task 13: Refine standards for collecting data
The collecting data fields / standards (see N2) will be refined as the project progresses based on field experiences, task 12 and the requirements of the Transnational Access that emerge. All work package participants will contribute to this task.

Task 14: Transfer of data to the N3 database
All data of new accessions (collecting and curation) will be transferred to the ENSCRI database (see work package N3) in order to make them available for internal and external use. The way this transfer of data can be implemented depends on the developments of software and technology (work package N3) and on the organisation of all involved processes of collecting (work package R1). All work package participants will contribute to this task.

Task 15: Data to accompany seeds sent to users available
It is envisaged that there may be incidental data that is not incorporated in the ENSCRI database (e.g., data that is gathered via Task 4) but that may be useful to certain types of users. Effort will need to go into making sure that as much data as is useful accompanies seeds sent out for research. The six Access Seed Banks will be involved in this task.

Task 16: Coordinate activities within the work package and with the Steering Group
FUB-BGBM will lead this work package and represent it in the Project Steering Group

Deliverables (brief description and month of delivery)

R1.1 (Month 12)
Database species-specific information for use in the common collecting plan (CCP) available

R1.2 (Month 15)
Common collecting plans for each bio-geographical region refined

R1.3 (Month 9)
20% of total number of accessions collected

R1.4 (Month 21)

50% of total number of accessions collected

R1.5 (Month 33)
80% of total number of accessions collected

R1.6 (Month 45)
100% of total number of accessions collected

R1.7 (Month 18)
Field data capture software available

R1.8 (Month 48)
All collecting data transferred into ENSCRI database

Work package number	R2	**Start date or starting event:**		Month 1			
Work package title	Germination Predictor						
Activity Type	RTD						
Participant number	1	2	3	7	8	14	15
Participant short name	RBGK	NKUA	FUB-BGBM	CAG	MAICh	FUL	UPM
Person-months per participant:	19.0	12.5	6.0	4.0	7.0	2.0	6.0

Participant number	20	21	25
Participant short name	MNHN	UNI-PAV-CFA	MTSN
Person-months per participant:	6.0	6.0	2.0

Objectives

Develop a seed germination predictor that (1) increases percentage germination of European native seed lots thereby increasing the usability of collections, (2) increases the efficiency of germination monitoring and (3) might have wider application.

Description of work

RBGK are in the process of developing a seed germination predictor for UK native species. The UK has a well-described flora and there is significant data about germination of its native species. The UK flora is therefore a perfect test-bed for the development of a germination predictor. This work is being funded by grants from the Esmee Fairburn Foundation and Sfumato and support has been expressed by statutory bodies (Natural England, Centre for Ecology & Hydrology), an NGO (Plantlife), academic bodies concerned with ecology (University of Sheffield) and land reclamation (Cranfield University) and private business concerned with seed production for re-vegetation programmes (Emorsgate Seeds, British Wild Flower Plants). Clearly, the work has wide commercial, conservation (for re-introduction and re-vegetation) and academic interest, in addition to that for which it was originally intended; namely to release seed dormancy in seed bank collections to facilitate viability monitoring and to maximise the release of genetic variation for the user.

The methodology is based on data-mining the largest available data sets for patterns and hence rules that can then be refined by insights provided by experts and the scientific literature. Highly heritable characteristics of germination such as physical dormancy are easy to predict. More difficult are the germination / dormancy characteristics which are strongly influenced by environment both pre- and post-harvest. The model draws heavily on environmental data to try to pin-point key environmental parameters that influence the germination / dormancy characteristics. A crude model based on RBGK's global collections managed to increase the percentage pass rate of first tests from 52% to 61%. RBGK has one of the world's largest seed laboratories and access to over 37,000 seed collections of 21,000 species in the Millennium Seed Bank. Included within these numbers are *ca*. 4,000 collections, representing 1,388 species, around 96% of the 1,440 or so species regarded as native in the UK.

The aim of R2 is to expand the use of the predictor to seeds from the flora of the rest of Europe, which covers a wider range of species from a much more diverse eco-geographic background. ENSCRI offers the opportunity to gather a very large amount of germination data by experienced staff (and several acknowledged experts) to a standard format in a very short time and to cover habitats from the Arctic through to the Mediterranean. This would give clear insights that would hasten the development of a global seed germination predictor. When banking European seed

collections, it is not uncommon to encounter species about whose germination requirements little or nothing is known. Currently, difficult germination is one of greatest problems faced by managers of wild species seed banks. Quite apart from inhibiting use (see A1), this problem leads to undue loss of staff time and the wasting of precious seeds in carrying out tests to get an estimate of germination.

Task 1: Analyse data from R1 and augment with further germination tests

Participants within R1 that have appropriate facilities will carry out germination tests on the seed lots collected under R1. In year 1, these tests will be based on the best available information provided by a combination of the UK species germination predictor (see above) and local testing regimes. It is anticipated that there will be a failure rate in the order of 25-50% and that further targeted tests will need to be carried out in the more specialist laboratories on these difficult collections. The germination results will be fed into the predictor model and further modelling will take place (see task 2). Therefore, in subsequent years, the testing will increasingly rely on the modified predictor. A residue of difficult collections will remain each year which will need special investigation under this task.

Task 2: Refine existing UK germination predictor model to make it useful at a European level

With respect to development of the European seed predictor, one of the first steps would be the incorporation of the germination data collected over many years and to different standards and assembled as part of the ENSCONET project. This data set comprises (February 2008) test data on nearly 17,000 collections.

On the basis of analyses of failures of the predictor, improved models will be produced. These will draw on the literature and refinements in modelling environmental conditions both pre- and post-harvest. The work will particularly concentrate on taxonomic groups looking for strongly heritable characteristics and on ecological groupings. Where possible, ecological information will be drawn from external databases (such as the LEDA trait-base developed under FP5 for the flora of NW Europe).

By the end of year 4, it is envisaged that the germination predictor might give successful first test conditions (i.e., germination >75%) for as much as 75% of European seed collections.

Via a simple user interface, the system will allow users to input species name, date and place (geo-reference) of collection together, with information on several informative seed or adult plant traits, as available.

A bespoke piece of software produced for the UK will be refined by RBGK, who will translate existing information into a fully accessible format. Behind the scenes, the system will use geographical information system (GIS) technology to link the place and time of seed collection to relevant local climate conditions, and the name will link to a number of informative species' traits that will have been compiled. The output will be either a single germination treatment most likely to be successful, or several, ranked by likelihood of success, or by ease of application.

The European germination predictor will be made available from the RBGK website via a link from the ENSCRI website. The first version will be available at the end of year 1 with a second version available in year 3. The final version will be issued at the end of year 4. During the project, the predictor will be advertised to potential users via N6 and feedback encouraged. In addition to feedback internal and external to the Consortium, the hit-rate on the predictor will be used as a measure of success.

The R1 germination data set will also be made available as a resource on the ENSCRI website.

Task 3. Coordinate activities within the work package and with the Steering Group

The work will be led by RBGK.

Deliverables (brief description and month of delivery)

R2.1 (Month 48)

A germination predictor model published on-line that predicts with a high degree 75% of certainty germination requirements for native European plant populations given geographical and taxonomic parameters. This predictor will be useful for those involved in seed conservation, horticulture, agriculture, habitat creation / restoration and ecological modelling (including climate change prediction and studying invasive species).

Work package number	R3	**Start date or starting event:**		Month 1			
Work package title	Research on Short-lived Species						
Activity Type	RTD						
Participant number	21	1	2	5	15	25	27
Participant short name	PAV-UNI-CFA	RBGK	NKUA	ELTE	UPM	MTSN	BG-CBDC-PAS
Person-months per participant:	9.0	7.0	4.0	3.0	4.0	3.0	3.0

Objectives

1. Validate and improve existing models (e.g., Kew's CL model) to identify European species that are likely have short-lived seeds.
2. Categorise type of storage problems that should be the subject of more detailed research programmes.
3. Write funding applications for future research programmes.
4. Identify and compile alternative storage methods for *taxa* unsuitable for seed banking
5. Coordinate activities within the work package and with the Steering Group

Description of work

Task 1. Compile list of European species with suspected short-lived seeds

Working out a list of species with suspected short-lived seeds is important to understand which and how many *taxa* in Europe fall into this category. The list will be influenced by the existing information available. For example it has to include as priority: seeds that are proved to be short-lived in the soil seed bank, seeds with undifferentiated or under-developed embryos, species from particular habitats such as Alpine meadows, riparian vegetation forests, wetland areas and/or systematic groups (e.g. Campanulaceae) (see Task 3 below). A first draft of this list will be established on a taxonomical basis. In order to investigate whether a systematic group of plant species is actually short-lived under conventional seed bank procedures, as many species as possible need to be sampled under work package R1 for use in task 2.

Every partner of R3 will be involved in this task.

Task 2. Application of existing models for seed longevity

From the 1960s onwards, the most common way to predict the longevity of seeds in storage has been the development and use of a viability equation. This equation requires viability constants to be known that explain the effect of both moisture and temperature on viability for a given species. Within limits, reduction in moisture content and storage temperature increase longevity of 'orthodox' seeds (desiccation-tolerant) seeds. However, the generation of the viability constants for the equation requires considerable experimentation and seeds. The required quantities of seeds may not always be available for many wild species. To overcome this, a comparative longevity (CL) protocol was developed by RBGK, using just 600 seeds for each collection tested. In comparative longevity testing, benchmark species are used as a reference points. These species include *Ranunculus sceleratus* (a typical short-lived species) and *Brassica napus* (a relatively long-lived species). A brief description of the CL procedures can be summarised: the seed collection to be tested is taken from cold storage, acclimatised at room temperature and hydrated to equilibrium with 47%RH at 20°C before being aged at 60% RH at 45°C. During ageing, samples are withdrawn at pre-determined intervals and tested for viability in a germination test. A survival curve is then plotted. By using sigma (time for viability to fall by one probit) and P50 (time for viability to fall to 50%) values of the marker species, the longevity of other species can be ranked accordingly, as an

indicator of relative longevity.

A controlled ageing test will be applied to seeds of species identified in Task 1. In order to minimise the number of seeds used in such tests, a modified controlled ageing protocol will be developed. A species ranking order for comparative longevity will be compiled and estimates of potential longevity in seed bank storage will be made by reference to the benchmark species. Results will be used to select the appropriate retest interval for conservation collections and for any species identified as extremely short lived will inform decisions regarding possible alternative conservation methods such as cryopreservation. This will inform the protocols developed under work package N2.

PAV-UNI-CFA and RBGK will be involved with the initial redefinition of the existing seed longevity model for use with European wild species in this project. Once established, all R3 participants will contribute to test it on the species listed in task 1.

Task 3. Drawing up of the list of species with short-lived seeds and categorise the type of problems

Results from task 2 will allow the ranking of species into longevity classes. It is expected that the application of the longevity model will identify numerous (maybe ~1000) European species of conservation importance that show low relative seed longevity. After the list of those species in Europe has been compiled, status (of problem) categories will be assigned and the species seen as the greatest problems will be identified as potential fields for research.

For example, following the fact that seeds of the woodland herbaceous *Anemone nemorosa* showed short longevity in seed banks, Ali *et al*. (2007) found that undeveloped seeds of *A. nemorosa* became desiccation tolerant after a post-harvest treatment during which embryos grew and differentiated. It was clear that in this case the problem concerning *A. nemorosa* was about the level of embryo differentiation. Although about 70% of seed became desiccation tolerant after the post-harvest treatment, results from seed longevity test showed that seeds of *A. nemorosa* were extremely short-lived.

The categories of problems are not expected to only concern undifferentiated embryos. Other species with undeveloped embryos are fully desiccation-tolerant and perhaps long-lived. On the other hand, there are species with developed embryos which appear to be short-lived. This means that many factors and their interaction may contribute in determining longevity. Furthermore, RBGK (Probert *et al* 2008 in prep) has shown that species with small embryos from cool, moist environments are more likely to be short lived compared with species with large embryos from warm dry regions. Important taxonomic trends have also emerged. For example, the Campanulaceae, Ericaceae and Melanthiaceae appear to be consistently short-lived whereas the Myrtaceae, Fabaceae and Lamiaceae seem to be generally long-lived. In other families, interesting trends have emerged at the genus level. For example, although seed longevity varied considerably in the Primulaceae, all members of the *Primula* genus were found to be short-lived. Similarly, all members of the *Gentiana* genus were found to be short-lived. In both cases, the tendency for seeds to be short-lived was correlated with the fact that collections originated from particularly cool wet environments.

These recent studies highlight an urgent need for further research to underpin the successful conservation of European species. Alpine species (that may be particularly threatened by climate change) and geophytes from cool, moist woodlands in particular should be longevity tested using a controlled aging protocol as soon as possible after collection. The results of such tests will define the optimum retesting schedule and highlight species that may need to be conserved by alternative techniques such as cryo-preservation.

Task 4. Write funding applications for future research programmes

While ENSCRI will contribute to the classification of species that may be short-lived in seed banks, more detailed research will be required to complement this work. These studies will not be part of

this project but parallel projects thematically linked but funded from other sources. e.g., in FP7, *Environment (including Climate Change)* and *Food, Agriculture and Fisheries, and Biotechnology*, LIFE+ Programme, INTERREG etc. They might investigate, for example, 1) the effects of different storage conditions like rate of drying and temperature of cold storage on seed longevity; 2) whether the natural environment under which the seeds ripen might affect their *ex situ* longevity and 3) whether and why seed longevity can be related to some seed features like dimension, oil content, embryo development (see above), endospermy etc.

PAV-UNI-CFA, RBGK, NKUA and UPM will be involved in this task.

Task 5. Compile alternative storage methods for short-lived species

Having defined which species might live insufficiently long under conventional seed banking protocols, alternative storing methods for these species will be identified (e.g. cryopreservation, tissue culture). These alternative storing methods might be tested through parallel projects thematically linked but funded from other sources. (see also Task 4). All work package participants will contribute to this task.

Task 6. Coordinate activities within the work package and with the Steering Group

This task will be coordinated within the work package and with the Steering Group by PAV-UNI-CFA

Roles of Participants:

PAV-UNI-CFA (leader)

Organise agendas, chair R3 meetings and virtual e-forum meetings; if required, PAV-UNI-CFA will invite work package participants for short meetings to discuss a particular task (e.g. experimental procedures of the longevity model); co-ordinate the activities both within the R3 and between the Project Steering Group; help and ensures that the milestone met on time; design of questionnaires; coordinate the preparation of the list of suspected European short lived species; validate and improve the seed longevity model; test the seed longevity model on Alpine and Continental species and on particular taxonomical groups (e.g. Ranunculaceae); produce a common list of categories of storage problems for all the species tested by the partners; identify and compile alternative storage methods for taxa unsuitable for seed banking; write funding applications for future research programmes.

UPM

Provide data about the suspected European short-lived species; take part in validating and improving the seed longevity model; test the seed longevity model on Mediterranean species and on particular taxonomical groups (e.g. Brassicaceae); help leader of work package in funding applications for future research programmes and in managing / coordination activities; produce list of categories of storage problems for the species tested though the model; identify and compile alternative storage methods for taxa unsuitable for seed banking.

RBGK

Provide data about the suspected European short-lived species; validate and improve the seed longevity model; test the seed longevity model on Atlantic species and on particular taxonomical groups (e.g. Orchidaceae, Primulaceae); produce a list of categories of storage problems; Identify and make available short-lived species at European level; write funding applications for future research programmes; produce list of categories of storage problems; identify and compile alternative storage methods for taxa unsuitable for seed banking.

NKUA

Provide data about the suspected European short lived species; take part in validating and improving the seed longevity model; test the seed longevity model on Mediterranean species and on particular taxonomical groups (e.g. Campanulaceae); help leader of WP in funding applications for future research programmes; identify and compile alternative storage methods for taxa unsuitable for seed banking; produce list of categories of storage problems.

MTSN

Provide data about the suspected European short lived species; take part in validating and improving the seed longevity model; test the seed longevity model on Alpine species and on particular taxonomical group (e.g. Saxifragaceae); produce list of categories of storage problems; identify and compile alternative storage methods for taxa unsuitable for seed banking.

ELTE

Provide data about the suspected European short lived species; take part in validating and improving the seed longevity model; test the seed longevity model on Pannonian species and on particular taxonomical group (e.g. Poaceae, Fabaceae); produce list of categories of storage problems; identify and compile alternative storage methods for taxa unsuitable for seed banking.

BG-CBDC-PAS

Provide data about the suspected European short lived species; take part in validating and improving the seed longevity model; test the seed longevity model on Continental species and on particular taxonomical group (e.g., Orchidaceae – selected Polish native species); produce the list of categories of storage problems; identify and compile alternative storage methods for taxa unsuitable for seed banking.

Deliverables (brief description and month of delivery)

R3.1 (Month 30)
Existing seed longevity model applied, and report on results produced

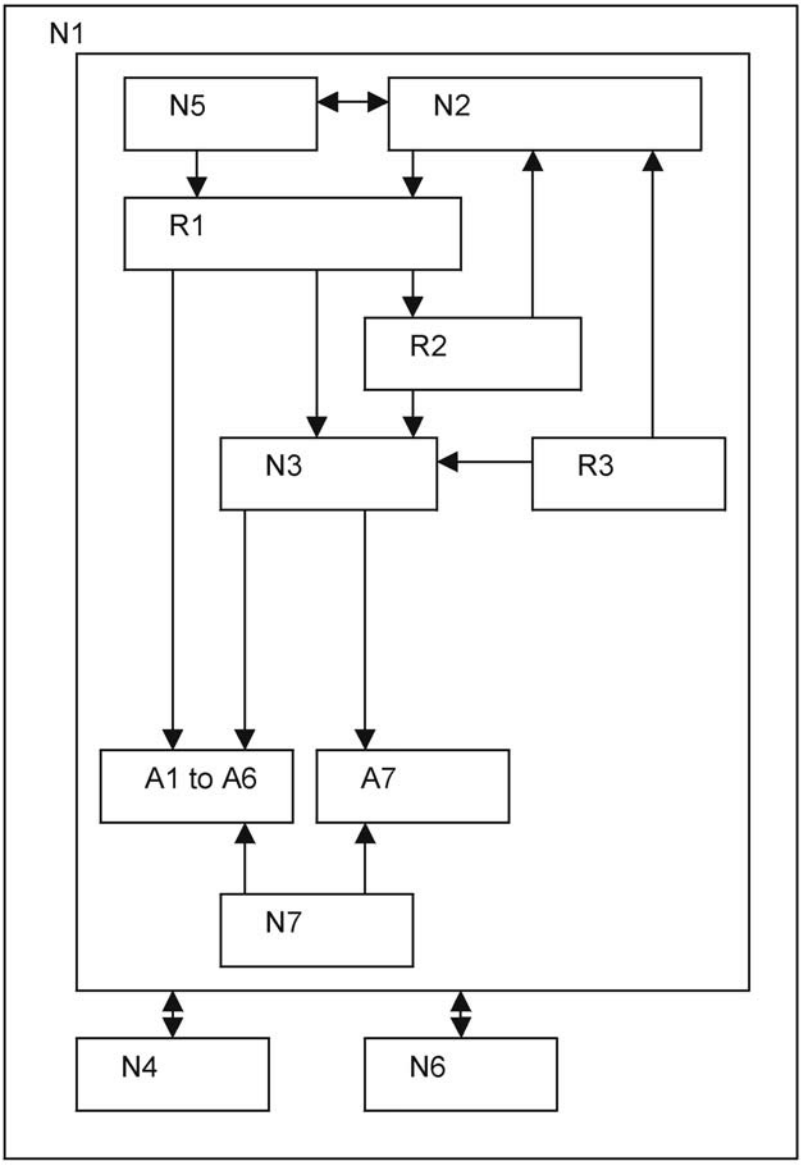
R3.2 (Month 48)
New applications for future research programs submitted. These research programs might investigate, for example, 1) the effects of different storage conditions like rate of drying and temperature of cold storage on seed longevity; 2) whether the natural environment under which the seeds ripen might affect their *ex situ* longevity and 3) whether and why seed longevity can be related to some seed features like dimension, oil content, embryo development

R3.3 (Month 48)
Compilation of alternative storing methods completed

Table: Summary of staff effort

Participant no./short name	N1	N2	N3	N4	N5	N6	N7	A1-6	A7	R1	R2	R3	Total person months
1 RBGK	**37.0**	**3.5**	1.25	3.5		**12.5**	2.8		0.5	19.8	**19.0**	7.0	**106.9**
2 NKUA	5.0			1.5		3.8	**15.0**			27.8	12.5	4.0	**69.6**
3 FUB-BGBM	5.0		1.75			7.3	6.5		0.5	**75.8**	6.0		**102.9**
4 IB SAS				3.0		4.0				11.3			**18.3**
5 ELTE						3.5				13.8		3.0	**20.3**
6 BZBG						2.5				9.8			**12.3**
7 CAG		1.5		3.5		3.0				15.3	4.0		**27.3**
8 MAICh	5.0		15.25	3.0		13.3	6.5		**11.5**	36.3	7.0		**97.9**
9 CORDOBA						8.0				12.5			**20.5**
10 TCD		1.5	**17.00**		4.3	2.3			5.8	15.8			**46.7**
11 CJBG						2.0				14.8			**16.8**
12 Jardin Canario						3.0				23.3			**26.3**
13 HUBG						6.3	6.5		0.5	17.8			**31.1**
14 FUL		1.5		1.5	4.8	3.0				8.8	2.0		**21.6**
15 UPM	5.0			3.5	4.8	5.0	10.8		0.5	44.8	6.0	4.0	**84.4**
16 NBGB					5.8	3.8				10.3			**19.9**
17 CYARI		2.0		1.5		2.5				16.8			**22.8**
18 FUC						2.5				9.8			**12.3**
19 UiO						3.0				15.3			**18.3**
20 MNHN				1.5	4.3	4.0	6.5		0.5	62.8	6.0		**85.6**
21 UNI-PAV-CFA	5.0	2.0	1.25	3.5	4.3	2.0	6.5		0.5	64.8	6.0	**9.0**	**104.9**
22 PISA			1.25			3.5				54.5			**59.3**
23 IB-BAS						3.0				11.3			**14.3**
24 JB Soller						2.0				10.8			**12.8**
25 MTSN	5.0	2.0		**5.5**		7.3				19.3	2.0	3.0	**44.1**
26 UVEG		1.5				7.0				26.8			**35.3**
27 BG-CBDC-PAS		2.0		3.5	**8.5**	4.3				10.8		3.0	**32.1**
28 HBV						3.8				7.3			**11.1**
Total	**67**	**17.5**	**37.8**	**35**	**36.8**	**128.2**	**61.1**		**20.3**	**668.3**	**70.5**	**33**	**1175.5**

1.3 iv) Graphical presentation of the components showing their interdependencies (Pert diagram)



1.3 v) Significant risks, and associated contingency plans

The primary risks relate to failure of partner institutes to deliver against their tasks. In ENSCONET this has been addressed with some success by use of a traffic light system that clearly highlights failures in performance and by a reward system involving early grant payment. This approach was agreed mid-way through the project. For ENSCRI, it would be incorporated within the Consortium Agreement. The latter document will cover most foreseen management issues. Among the risks relating to poor performance is staff turn-over. However, there is little that can be done to fore-arm against this.

As with any project involving a large number of institutes, a concern will always be the continued support during the duration of the project in each partner institute. Despite contractual agreements (between the partners and the Commission and within the Consortium), there is always the risk that changed institutional prioritisation resulting from government policy may result in partner institutes withdrawing during the project. While this is a concern, the number of partners involved within the project limits the risk. The biggest concern would be if one of the bio-regional hub institutes withdrew. There are potential but less satisfactory substitutes in all cases. A further concern is the failure of institutes to deliver the 25% matched funding within the research component of the project (though see comments with section 2.4).

The other main concerns relating to the budget are inflation and exchange rates for currencies outside the Euro-zone. The budget has taken 2008 costs and inflated them annually based on the average national inflation rates given by Eurostat for 2005-7. In a few cases, a slightly higher rate has been anticipated. The project could be under-resourced if individual (or even all of the) predictions under-estimate inflation. Similarly, the budget assumes exchange rates between the Euro and non-Euro currencies are at February 2008 values. If these exchange rates for these non-Euro currencies become unfavourable during the course of the project, then certain partners might become under-resourced. To combat these problems, it is proposed that a proportion of each pre-payment from the Commission is held back by the co-ordinator such that, subject to agreement within the network (probably covered by the Consortium Agreement), funds can be re-allocated according to need.

Work package R1 (Baseline Collections) of the project is concerned with the enhancement of the European seed conservation infrastructure by the harvesting of a specified number of seed collections within four years. Fundamental concerns with any such project are the unpredictable variables of climate, seed production (fecundity) and the interaction between the two. In many areas, target collections may turn out to be in inaccessible locations. Obviously, these are outside the control of the project, though inaccessible collections might be accessed by specialist help). RBGK as project leader has a great deal of experience in collecting agreed numbers of samples against the clock (24,200 species worldwide 2001-9). The programme will harness this experience and will incorporate the necessary flexibility and opportunism.

Three of the six regional hubs are scheduled for some development of their facilities ahead of the project. The institutional funding for this work is a concern but alternative facilities could be found from within the partnership to act as hubs if necessary.

Some of the work in ENSCRI builds on that of the ENSCONET project. For instance, the ENSCONET collecting and curation protocols would be the foundations for the ENSCRI work. The collecting protocol is substantially ready and the curation protocol should be ready before the earliest date that the ENSCRI project, if successful, would start. The ENSCONET collecting priority lists and plans would directly feed into the ENSCRI collecting prioritisation (though there would not be a complete overlap because ENSCRI would rank immediate use more highly). The lists are ready and it is expected that the plans would be in place by the date required. Therefore, the risks are not considered great.

Work package R2 (Germination Predictor) of the project is dependent upon the completion of a germination predictor for UK species being developed by RBGK. This work is scheduled to be complete during 2009, therefore, there might be a potential delay. RBGK consider that the UK predictor although not finalised should be in a sufficiently advanced state that it can be used after the first (2009) collecting season. A further (small) risk within R2 is that the predictor fails to deliver to the extent anticipated and that significantly more germination tests are required.

The project is partly dependent upon external data sets e.g., red data lists in R1 and the LEDA trait-base in R2. This should not be a problem but it is a factor that is largely outside the project's control.

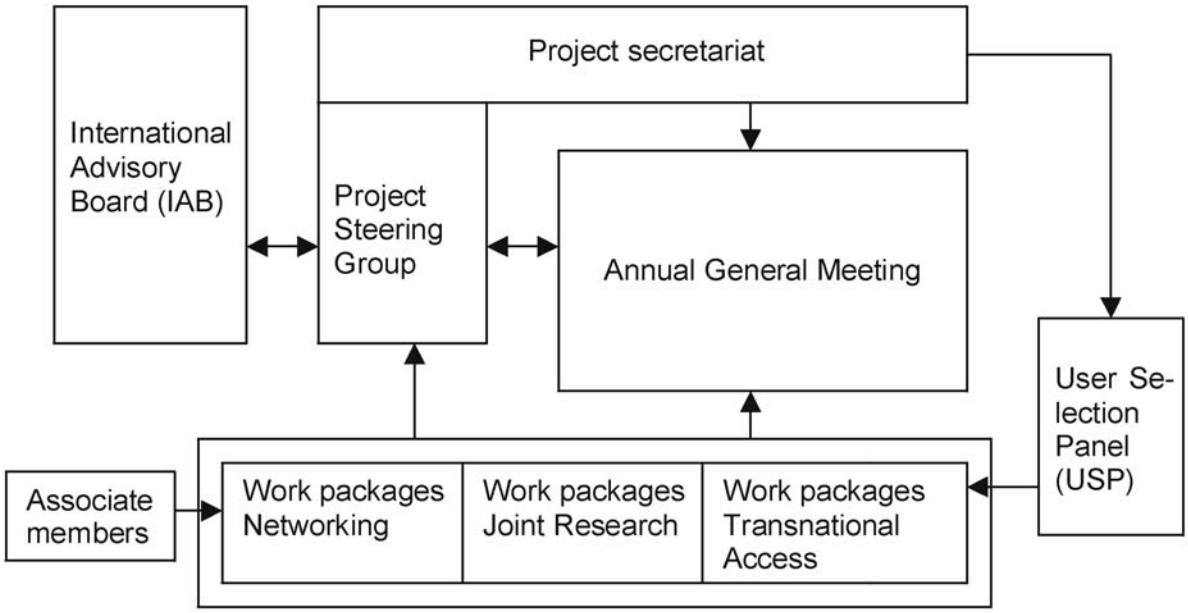
The ENSCRI project contains a significant Access component. This is based on expressed and anticipated interest. If this interest does not materialise or the applications are not of a sufficiently high calibre, then this component of the project would be weakened. Another risk in this component of the project is that the external users do not follow the access rules. Furthermore, it has been necessary to estimate the number of access visits, their duration and the number of samples requested. In a project of this nature, where the potential users are very varied, there is always going to be the risk that the relative scale of the different factors has been incorrectly estimated. A further (small) risk is that it is difficult to find external reviewers.

Other risks to R1 collecting include obtaining national and local permission. In most cases, the partner institutes have or can obtain the necessary national mandates for seed collecting. At the local level, permission will need to be obtained on an *ad hoc* basis. Again, flexibility will be the key, moving collecting sites if permission is not forthcoming. Once collected, the project requires that seeds are transferred to the hub banks for the access component. The ENSCONET project has examined the movement of germplasm between banks within Europe. Because the project comprises the collection of seed in only EU and EFTA members, the plant health issues are well understood. There is freedom of movement for seeds within the EU with limited extra restrictions for Norway and Switzerland. It is assumed that no new plant disease restrictions will hinder this movement. Export of national or continental rarities (e.g., those covered by EC Wild Trade Regulations or the Habitat Directives) may pose more of a problem though this should be clear within R1 ahead of the first collecting season such that contingency arrangements can be made.

2. Implementation

2.1 Management structure and procedures

The chart below illustrates the organisational structure of the project and summarises the linkages between the groups.



Project secretariat
The Project secretariat consists of the co-ordinating team based at RBGK. They are supported by RBGK's finance department in financial matters. The Project secretariat is the prime manager of the project. It is responsible for the day-to-day management of the project, it co-ordinates the project, makes suggestions to the Project Steering Group and executes decisions taken by the Project Steering Group regarding project management. It prepares the quarterly meetings of the Project Steering Group and liaises closely with the members of the Project Steering Group, the leaders of the work packages and the members of the User Selection Panel (USP) for the Transnational Access activity.

Project Steering Group
The Project Steering Group consists of the Chairman, the Project Co-ordinator and the leaders of the work packages N4, N7, A2 & A7, A4, A6 & R3, and R1. Its members meet quarterly.

Composition of the Project Steering Group

Project Steering Group for ENSCRI project			
No.	**Short name**	**Country**	**Role**
1	RBGK	UK	Chairman, Project co-ordinator, Leader – Work package N1, N2, N6 & R2
2	NKUA	Greece	Leader – Work package N7
3	FUB-BGBM	Germany	Leader – Work package R1
8	MAICh	Greece	Leader – Work package A2 & A7
15	UPM	Spain	Leader – Work package A4
21	UNI-PAV-CFA	Italy	Leader – Work package A6 & R3
25	MTSN	Italy	Leader – Work package N4

Responsibilities of the Project Steering Group

The Project Steering Group is responsible for the overall progress of the project. It takes the overall responsibility for steering the direction of the project, co-ordinates the activities of the work packages and monitors their progress. It is responsible for supporting the work packages in delivering their outputs and for delivering the ENSCRI project purpose.

The Project Steering Group liaises with the International Advisory Board, prepares the annual General Assembly, pays attention to monitoring critical path activities, and it is also responsible for steering the direction and future development of the project beyond the length of the current project funding. From Year 3, future joint funding applications will become a specific subject of discussion.

Meetings and decision making

The members of the Project Steering Group will be in regular email and telephone contact and meet quarterly for one day. One of the four meetings per year will be attached to the Annual General Meeting. Decisions will be taken by general consent. In case of dissent, the Chairman takes the final decision, after consultation with the International Advisory Board.

The members of the Project Steering Group in particular discuss, stimulate and structure integration between the participants of the work packages, report on the progress in the work packages, harmonise their current and future activities.

Annual General Meeting

All grant beneficiaries attend the Annual General Meeting which takes place once a year. These meetings are used for an intensive, focussed exchange of information and knowledge between the participants. The activities in the work packages and their progress are reviewed, and project issues of general interest and administrative matters (such as project budget, reporting, and audits) are discussed.

The Annual General Meeting comprises a meeting of all participants plus meetings of certain work packages as required. Key decisions will be taken at these meetings. It is the Chairman's role to encourage the development of a consensus. However, where necessary, a majority vote can be taken. All grant beneficiaries have an equal vote, one per institute, and the Chairman can cast a deciding vote when required.

Between the Annual General Meetings, information, results and draft documents will be exchanged between project partners mainly via email or at virtual meetings. Such virtual meetings will take place in the electronic e-forum on the internal project web-pages.

Work packages

Within the three areas Networking, Transnational Access and Joint Research Activities, the project activities are split into 17 work packages. Within each work package, the work package leader and its deputy take responsibility to reach objectives and produce deliverables. It is the responsibility of the work package leaders to immediately report to the Project Secretariat any development likely to delay significantly the completion of any of their objectives and deliverables. In such a case, the Project Secretariat discusses the matter with the relevant leader and the Project Steering Group, to take a decision on required remedial actions. Experience in ENSCONET has shown that, in those rare cases, issues can be resolved by careful negotiation and experienced support.

The work package leaders are responsible for the liaison within and between the three project activities, and for the day-to-day coordination of the activities in their work packages. They stimulate exchange and discussions among the participants of the work packages. For work packages in the Networking activity, this also includes an active involvement of potential associate partners. Special attention will be given to work packages with a relatively high number of participants (e.g. N6, R1).

In the Transnational Access activity, intensive contacts exist between the six regional hubs (Alpine, Arctic/Boreal, Atlantic, Continental/Pannonian, E Mediterranean/Black Sea, W Mediterranean/Macaronesian). Each regional hub will stay in permanent contact with the grant beneficiaries belonging to the region for which the hub is responsible, and with the leader of the work package R1. The quality of the access and service provided will be assessed yearly by members of the International Advisory Board (see below).

In the Joint Research Activities, the leader of the work package R1 interacts with the participants to co-ordinate the seed collecting activities between and within the bioregions, and with the leaders of certain work packages in the Networking and Transnational Access activities (in particular, N2, N3, A1 to A7). They will also chair the taxonomic working group.

Participants of the work package R1 will be jointly responsible to co-ordinate their seed collecting activities in their countries

Associate members

Associate project members are not mentioned in the grant agreement and will not receive any EC-funds directly. However, they are allowed to take part in the Networking activities. There is a budget line for them to contribute towards their travel and subsistence costs, to join the consortium at invited meetings.

International Advisory Board (IAB)

The International Advisory Board will consist of not more than five independent and internationally renowned plant conservation and seed research experts. The Board members will meet when required. They will participate at one Project Steering Group meeting per year, and two members of the Board can be invited to join further Project Steering Group meetings upon request from one of the Project Steering Group members.

The main tasks are to oversee the project and its progress critically, to help identify and solve emerging problems, to discuss and influence the future development of the project, together with the Project Steering Group. It will assess the quality of the access and service provided yearly and in particular it will oversee the equal involvement of female and young researchers. The Board will be consulted by the Chairman in case of disagreement among the Project Steering Group members and before any controversial decisions are taken.

One member of the International Advisory Board will have significant experience in international species protection legislation (e.g. CITES) and in plant health issues. They will give advice on the export/import of protected plant species and of those species for which plant health requirements are in place. The project participants are encouraged to contact their national CITES agencies / plant health authorities to get additional help.

User Selection Panel (USP)

The User Selection Panel (USP) will evaluate the proposals for access to the Research Infrastructures. They will guarantee a fair and independent evaluation of the proposals. There will be two reviewers for access proposals for each of the six Access Seed Banks in the work packages A1 to A6. The reviewers can be chosen from within the consortium but they must not have direct links to the Research Infrastructure for which they are responsible. Whereas the selection of the USP is one of the tasks in work package N7, the contact to the USP once established will be maintained through the Project Secretariat.

2.2. Individual participants

1 (Coordinator)	Royal Botanic Gardens Kew

The Royal Botanic Gardens, Kew traces its origin back to 1759. Since 1984, Kew has been a Non-Departmental Public Body (NDPB) managed by a Board of Trustees under the authority of the 1983 National Heritage Act. It receives about 50% funding from the Department of the Environment, Food & Rural Affairs (Defra) which ensures that it has the resources to meet its statutory obligations, is accountable to parliament for those resources, and produces work of a high scientific quality as required by the above Act. Kew's mission statement is "To inspire and deliver science-based plant conservation worldwide, enhancing the quality of life".

Over 1 million people a year visit Kew (London) and Wakehurst Place (Sussex). These gardens hold the largest and most diverse collection of living plants in the world, containing one in eight of all flowering plant species. Kew's Herbarium and Library hold the world's most comprehensive collection of preserved plant material, plant products, botanical books, paintings drawings and literature while the Jodrell Laboratory is one of the world's foremost centres of plant science. The Seed Conservation Department (SCD) is based at Wakehurst Place and manages the Millennium Seed Bank Project (Euro 97m). This is the world's largest network devoted to the seed banking of wild species. The Millennium Seed Bank holds over 40,000 collections of over 22,000 species. The Project works with some 100 partner organisations in 50 countries. The SCD is co-ordinator of the ENSCONET project. RBGK will co-ordinate and manage ENSCRI through the Project Secretariat and N1. It will manage work packages N2, N6 and R2.

Staff involved will be Simon Linington, Chairman of ENSCONET and Head of Curation in SCD with nearly 27 years experience in seed conservation and Dr Jonas Müller who has been Co-ordinator for ENSCONET.

2	National and Kapodistrian University of Athens

The Seed Research Laboratory of the National and Kapodistrian University of Athens (NKUA) was established 30 years ago to deal with various aspects of seed biology: germination mechanisms and adaptations, eco-physiology and ecology of germination, seed priming, seed longevity and seed banking. Besides offering education and advice on seeds, the main mission of the laboratory has been the research on seeds at both basic and applied levels as well the development of databases on Greek plant diversity and Mediterranean seed bibliography.
The NKUA Seed Bank of Native Greek Plants was set up in 1993. A total of about 450 seedlots from 250 taxa of native plants of the Greek and Cypriot flora are already collected and stored. The long term aim of the Seed Bank is the *ex situ* conservation of a substantial portion of the Greek flora (more than 6,500 taxa), with priority placed on the protected, threatened, rare and endemic plants (ca 1,500 taxa). The NKUA Seed Bank is currently a member of the EU funded, European and Mediterranean networks ENSCONET (2004-9) and SEMCLIMED (2006-8), respectively. It is comprised of a team of permanent staff (Profs Thanos and Georghiou, Drs Delipetrou and Doussi) and about 10 junior scientists and students.

NKUA will be the leader of work package N7 and a member of the Project Steering Group (N1). It will host two Steering Group Meetings in years 1 and 3. It will also participate in work packages N4, N6, R1, R2 and R3.

3	Freie Universitaet Berlin, Koerperschaft des oeffentlichen Rechts

The FUB-BGBM with its extensive scientific collections of herbarium specimens (3.5m specimens; 100,000 primary types), living plants in the Botanical Garden (more than 20,000 taxa) and a number of project memberships is a centre of taxonomic research in Europe and the principal institution of its kind in Germany. The BGBM holds the largest botanical library in the German-speaking area and thus offers excellent access to the vast relevant taxonomic literature which forms the basis for taxonomic data capture and editing. Laboratories have been modernized to include molecular facilities and the new repository facility DNA Bank; the FUB-BGBM is leading the German DNA-Bank network. FUB-BGBM recognised comparatively early the new role for

development and exploration of data collections and therefore proceeded to build a powerful IT infrastructure and a Biodiversity Informatics Department (more than 20 staff members). The extensive plant collections of the FUB-BGBM, are among the most important in the world and analytical facilities, libraries, galleries, staff and computer networks are involved a broad spectrum of studies, under the umbrella of biodiversity research, focused both on taxa and on specific European regions. BGBM is completing a comprehensive checklist of Mediterranean vascular plants.

The Dahlem Seed Bank at FUB-BGBM originated in the 19th century as an access seed bank and was improved in 1994 to take up seed lots of endangered species for long term preservation. The oldest preserved accessions go more than 90 years back in time. Seed Bank facilities are complemented by a fruit and seed reference collection (appr. 30,000 specimens) and greenhouses and garden areas specifically devoted to cultivation and propagation of endangered species and for research projects. Presently long-term seed bank accessions originate mostly from Central Europe, the Mediterranean region and Germany (appr. 2,000 seed lots). Additionally, 4,500 accessions are stored in the access seed bank for international exchange. The range of seed collecting activities is global. However, the main focus is on the genetically representative collection of German rare and threatened taxa as well as all regional species. Research on population genetics, germination, seedling survival and reproductive success will play an important role for the next years. Reinforcement activities of threatened taxa are done in close cooperation with the regional authorities. The highly dedicated and motivated seed bank staff members (15) have a long experience in seed collection, seed curation, germination tests, seed bank management and *ex situ* horticulture.

Work-package R1 will be co-ordinated by Albert-Dieter Stevens, Director, Dept. Botanic Garden and Herbarium. FUB-BGBM will participate in work-packages N1, N3, N6, N7, A1, A2, R1, R2.

4	Botanický ústav Slovenskej akadémie vied

The Institute of Botany SAS is the largest taxonomic research centre for the taxonomy of vascular and non-vascular plants in the Slovak Republic, which includes the largest part of the West Carpathians and most northern regions of Pannonia. The institute houses the Slovak Global Biodiversity Information Facility (GBIF) node and Global Taxonomy Initiative (GTI) national focal point. The institute participated as partner institution in several EU-supported projects: Euro+Med PlantBase, ENBI, BioCASE, Intrabiodiv, ENSCONET and EDIT. Albeit the institute does not possess its own seed bank but it cooperates in this respect with the Slovak National Seed Bank in Piešťany, Slovak Republic. The institute has experience with seed collecting and based on the Memorandum of Collaboration it closely cooperates with the Millennium Seed Bank belonging to the Royal Botanic Gardens, Kew, U.K. The institute has a leading role in national projects such as the multi-volume Flora of Slovakia (Flóra Slovenska), Checklist of non-vascular and vascular plants of Slovakia (with updates), Red lists of non-vascular and vascular plants of Slovakia. The institute has also recently established laboratories of flow cytometry and molecular systematics, which enable it to apply most advanced methods in studies of the evolution of vascular plants and the phenomenon of polyploidy.

Assoc Prof. Karol Marhold has published >90 scientific papers, mostly on taxonomy, phylogeny and phylogeography of vascular plants. He is the representative of the Slovak Republic in the GBIF Governing Board, member of GTI Coordination mechanism for Central and Eastern Europe. He organised the participation of IBSAS in all above-mentioned EU-supported projects.

Dipl. Ing. Jaromír Kučera will defend his PhD thesis in 2008. He was responsible for everyday management of the ENSCONET project at the Institute of Botany SAS and is expected to take part also in the follow-up project ENSCRI. He has experience with seed collecting and will supervise the work of other collaborators from the institute.

5	Eötvös Loránd University

The Eötvös Loránd University (ELTE) is the oldest (founded in 1635) and the largest university in Hungary, currently having more than 30,000 students and 2,500 scientific staff. In its Biology

Division there are 12 departments, one of them the Department of Plant Taxonomy and Ecology with the Ecophysiological Laboratory which was established 15 years ago. The Laboratory carries out various research projects related to seed germination and early stages of phenological development of a wide range of species. These projects are governmentally financed, most of them supported by the Hungarian National Research Fund. Since 1995, ELTE has been carrying out in cooperation with BZBG yearly seed collecting trips in several regions in Hungary and the surrounding countries. Collected seeds prepared in seed dryers and incubators are regularly used for research and teaching purposes in a well equipped germination lab. An additional mission of the Laboratory is the development of seed morphological and seed ecological databases. Papers on the databases as well as scientific achievements based on the application of these databases have been published in internationally recognised journals.

ELTE will participate in the work-packages N6, R1 and R3 of the project, with research staff organized by Prof. Dr. Péter Csontos, seed ecologist (local group leader), Dr. Tibor Kalapos, ecophysiologist (docent, senior researcher), and Gábor Endresz (current PhD student in the Ecophysiological Lab. of ELTE).

6	BZBG

Budapest Zoo & Botanical Garden (BZBG) was established in the middle of 19th century, and has also worked as a botanical garden since the beginning of the 20th century. Its principal mission is education, with a particular emphasis on natural environment and nature conservation. Besides this, BZBG takes part in several national and international nature conservation programs, both *in situ* or *ex situ*.

Within the BZBG, the Department of Botany and Horticulture has been collecting plant material and seeds of native species in different natural habitats of Hungary for several decades and, since the beginning of the 1960s, it has also taken part in the international seed exchange amongst botanical gardens all over the world. Besides its participation in ENSCONET, BZBG initiated the establishment of the Pannonian Seed Bank in Hungary, that procured acceptance and assistance by the Hungarian Ministry of Environment and Water.

In the current ENSCRI project proposal, BZBG participates in the Networking activities, using mainly its profound experience and wide practice in dissemination and communication, and in the Joint Research Activities, making use of its long term knowledge and experience in seed collection.

Responsible for the project tasks is Vince Zsigmond, MSc, Curator of botany and horticulture.

7	Università degli Studi di Cagliari

The Department of Botanical Sciences of the University of Cagliari houses a Botanical Garden and Museum, a Herbarium (international acronym CAG), the Centre for Conservation of Biodiversity (CCB) and the Germplasm Bank of Sardinia (BG-SAR). Research topics include biodiversity and conservation studies of the Mediterranean flora, biosystematics' studies of the Cyrno-Sardinian flora and germplasm conservation of the threatened floristic units of Sardinia. *Ex situ* conservation is guaranteed by BG-SAR whose staff are experienced in seed collection, curation, testing and in the management of the seed lots. The Department is partner of the GENMEDOC network (Interreg IIIB, "Genmedoc" and "Semclimed" projects) which links several plant conservation centres of the Mediterranean area and it is also member of the Italian seed bank network "RIBES". A bilateral research and seed conservation collaboration with Kew Gardens' Millennium Seed Bank Project has been active since 2006 with the aim to collect and safely store seeds of rare and threatened plants species of Sardinia.

CAG will participate in the work packages N2, N4, N6, R1 and R2.

8	CIHEAM - Mediterranean Agronomic Institute of Chania

The Mediterranean Agronomic Institute of Chania (MAICh, http://www.maich.gr) is one of the four Mediterranean Agronomic Institutes administered by the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM, http://www.ciheam.org) whose General Secretariat resides in Paris, France. MAICh provides postgraduate education leading to the degree of Master of Science (M.Sc.) and undertakes basic and applied research related to the sectors of economics, rural development, management, and applied biological, technological and environmental sciences, addressing problems in the Mediterranean area. Up until now, MAICh has been involved in research projects, all of which have been conducted in close collaboration with Greek and other European academic and research institutions. These projects were financed by the Commission of the European Communities and other organisations. The annual budget contribution of the Mediterranean Agronomic Institute of Chania is entirely provided by the Greek government.

With reference to plant preservation, MAICh provides the following infrastructure: a Botanical Museum (Herbarium), founded in 1991 and designed to house specimens of all the native species of the Cretan flora; and a Seed Bank in association with a Botanical garden, designed to enhance the *ex situ* conservation of endemic and threatened plants of Crete by storing and preserving a representative range of their genetic diversity. The infrastructure of the seed bank provides all the essential steps for the preservation of the seed germplasm.

The scientific staff of the laboratory are well experienced ın the collection and curation of the endemic and threatened plants of Crete. The Seed Bank of MAICh will be leader of the work package A2, since it will be the regional hub for the East Mediterranean and the Black Sea bio-geographical regions. The information systems technology group of MAICh, experienced in the analysis and programming of various biological databases, will lead the work package A7. MAICh will also be member of work package N1.

9	Universidad de Córdoba

The Universidad de Córdoba (University of Córdoba) is the institution responsible of the scientific direction of the Andalusian Germplasm Bank (BGVA) which is located in the Botanic Garden of Córdoba and was initially created thanks to the co-operation between the University of Córdoba and the Town Council Foundation “Jardín Botánico de Córdoba” (currently “Municipal Institute for the Environmental Management”). Since 1987, the Andalusian Regional Government has been cooperating in the creation, management, and development of the BGVA, which was legally regulated by the Andalusian Regional Government in 1994 (Decree 104/94) and further consolidated by the Law 8/2003 of Wild Flora and Fauna, with the primary aim of a) conserving seeds, bulbs, and propagules of endangered Andalusian species, and of b) supporting the implementation and development of recovery, conservation, and management plans for the indigenous or endangered representatives of the Andalusian flora.

The Andalusian Seed Bank plays an essential role in the conservation of Andalusian flora and wild phytogenetic resources by maintaining its genetic heritage for a practically indefinite period. The BGVA currently stores approximately 5,000 accessions corresponding to almost 1,600 taxa. This *ex situ* conservation system constitutes an extremely valuable complement to *in situ* conservation, especially in sowing and regeneration operations of natural populations.

10	The Provost, Fellows and Scholars of the College of the Holy and Undivided Trinity of Queen Elizabeth near Dublin (hereinafter called TCD)

The University of Dublin, Trinity College, is Ireland’s premier university and is ranked among the top 20 European universities. Its research income, and research output, exceeds any other in Ireland.

The Department of Botany is part of the School of Natural Sciences, and is the main department in Ireland dealing with terrestrial plant conservation. The Botanic Garden is a unit of the Department and, along with the Herbarium, provides an important tool for plant conservation research. The *Irish Threatened Plant Genebank* is housed at Trinity College Botanic Garden,

and regularly liaises with State conservation agencies (National Parks and Wildlife Service; Department of Agriculture, Fisheries and Food) and NGOs (e.g. Genetic Heritage Ireland). The Garden has particular skills in databasing botanic gardens records, and led the Data Management work package of the ENSCONET project. Trinity College Dublin has recently agreed to the formation of a research centre for Biodiversity and Sustainability, and development of the gene bank will be a core activity of the new centre.

Trinity College's input to ENSCRI will be led by Dr Steve Waldren, who has over 20 years of plant conservation research experience with over 50 peer reviewed publications. He is Curator of the Botanic Garden, and also Director of a new taught MSc programme in Biodiversity and Conservation.

Trinity College will lead the work package N3 (Database) work package, working in close collaboration with MAICh, as happened successfully in ENSCONET. Trinity College will also contribute to N2 (Seed Bank Standards), N5 (Fern Spore Bank Standards - Dr Waldren has a long standing interest in pteridophyte diversity and conservation), N6 (External Communications) and A7 (Provision of Service- mainly through provision of access to the database), and R1 (Baseline Collections - through biogeographical collecting).

11	Conservatoire et Jardin botaniques de la Ville de Genève

The Conservatoire et Jardin botaniques de la Ville de Genève is a Geneva city museum, integrated in the culture department. It hosts one of the world's largest herbarium and botanical libraries and manages an associated garden. Its goals are to explore the environment worldwide; extract botanical collections and associated data; ensure the conservation of living and fixed collections; perform research based on these collections in the realms of flora, vegetation, and evolution; teach botany; contribute to the conservation of environment and species and develop education programmes.

Materials of Special Interest:

- *Herbariums*: comprising the general collection G, the De Candolle Herbarium (G-DC), the Boissier Herbarium (G-BOIS), and the Burnat Herbarium (G-BU) – app. 6 million specimens in total
- *Library*: contains almost all information on botany (systematic, taxonomy) ever published
- *Database SIBG*: a relational database allowing management of data related to the various projects of the institute (flora projects, African Plant Checklist, etc.) as well as management of data related to the living (garden) and fixed (herbarium) collections
- *Publications*: Flora alpina, Flore de Corse, Flora del Paraguay, Boissiera etc.

Conservation goals and seed bank:
In 2000, a conservation section was created aiming at developing *in situ* and *ex situ* conservation activities focusing on endangered species. The seed bank project started in 2000, with the aim to collect the most endangered species at regional and national levels. Seeds are collected in the wild, deep frozen after desiccation and tested for germination. The seed bank started on a small-scale, a new project to extend the infrastructure in building a dry room started in 2007. About 200 rare or endangered Swiss taxa (about 700 samples) are actually present in the seed bank freezer. One part of the seed bank is kept for long term seed conservation and the other part for *in situ* re-introduction projects. Presently, the CJBG is the sole institution developing a seed bank in Switzerland. Its long-term goal is to increase its activities to contribute in the next years to the *ex situ* protection of plant genetic resources, as recommended by the Convention on Biological Diversity (Art. 9).

The following staff will be involved in the ENSCRI project:
David Aeschimann, Dr es Sciences., biologist, chief of conservation section
Catherine Lambelet, Dr es Sciences, ing. Agronome ETHZ, scientific supervisor and coordinator of the seed bank, organise seed collecting and conservation projects
Sophie Dunand-Martin, Ing. Agronome HES, technical supervisor, organise the technical activities and germination tests
Cédric Fawer, horticulturist, technical activities for the seed banking

Garden staff: the garden staff will help collect and clean the seeds, and multiply small samples

12	Jardin Botánico Viera y Clavijo del Cabildo de Gran Canaria

Since its foundation in 1952, the Botanic Garden “Viera y Clavijo” of the Cabildo de Gran Canaria has been the only institution dedicated entirely to research and conservation of the flora of the Canary Islands, the geographical region with the highest rate of plant biodiversity in Europe.

This centre has seven scientific departments: seed bank, molecular biodiversity, reproductive biology and electron microscopy, in vitro cultivation, environmental studies and education, threatened flora data base, taxonomy and systematics (Herbarium).

The Viera y Clavijo garden has regularly published the scientific journal “Botanica Macaronésica” since 1976. The public part of the Garden consisting of 27ha houses the world’s most complete collection of Canarian endemic plants as well as important collections of palms and succulent plants.

The international opinion forum known as the Gran Canaria Group regularly meets at the Garden and was the promoter and developer of the Global Strategy for Plant Conservation officially adopted by the Convention on Biological Diversity in 2002 and of the Gran Canaria Declaration on Climate Change and Plant Conservation presented in 2007. A UNESCO-UNITWIN CHAIR in Biodiversity is currently being established in the Garden through a convention between UNESCO and the Cabildo of Gran Canaria.

The seed bank at the Viera y Clavijo Garden was founded in 1984 with the objective of collection, storage and long-term conservation of the native species of the Canarian flora especially the rare or threatened endemics. It holds about 3,500 seed accessions of over 600 species.

The infrastructure of the bank consists of an air-conditioned underground chamber with currently 5 independent freezers where seeds are held over silica gel in glass tubes and stored at -10ºC, a cold room storage room at 15ºC and 15% relative humidity; a laboratory area for cleaning, drying and processing seeds, seed germination testing facilities with three incubators, analytic balances, microscopes, stereo photomicroscopes, seed aspirator and other lab equipment. The research and technical staff of the seed bank are experienced in collecting techniques, conservation and germination of seeds of threatened species etc. and have participated as leaders in European projects such as BASEMAC (MAC 4.1 C9) and CAVEGEN (04/MAC/3.5/C34) both under the EU INTERREG III B programme for Madeira-Azores-Canaries. The seed bank is a founder member of the Spanish Germplasm Bank Network (REDBAG) and of the European Native Seed Conservation Network ENSCONET.

The programme leader is Dña. Alicia Roca Salinas, head of the Living Collections and Seed Bank Section and 3 permanent members of the seed bank staff will be directly involved with the project. Jardin Canario will participate in work-packages N6 and R1.

13	Helsingin Yliopisto

Helsingin Yliopisto, the University of Helsinki, was established in 1640. There are currently eleven faculties, and the range of disciplines is the widest in Finland. There are almost 39,000 degree students and more than 7,700 staff. The number of degrees taken each year is around 4,300, of which 350 to 400 are doctorates. The University concentrates on high-level scientific research and researcher education. Scientific research is also the basis of the teaching provided. The University operations support the development of society, as well as business and industry. The results produced by the research and teaching carried out at the University have been widely acclaimed. The University of Helsinki has been invited to be a member of the League of European Research Universities, a co-operation body for the leading European research universities, and it is regularly ranked among the 100 top universities of the world.

Helsinki University Botanic Garden (HUBG), founded in 1678, is currently part of the Finnish museum of Natural History (FMNH), which is a separate institute within the University of Helsinki. HUBG is a well established scientific garden whose collections and curation standards are of highest international quality. HUBG has participated in international seed exchange between botanic gardens for more than 100 years. Its seed catalogues are renown among exchange partners for containing meticulously documented wild-collected seed accessions of native species. The Director of HUBG is national representative of Finland within the European Consortium of Botanic Gardens. HUBG is member of the European Native Seed Conservation Network (ENSCONET) where it is in charge of the Boreal bioregion and participates in the activities of the Alpine-Arctic bioregion. The Botanical Museum within FMNH (acronym H) holds ca. 3.1 million herbarium specimens of plants and fungi; these collections as well as those of HUBG are each year visited by 50 to 75 international researchers. Together, HUBG and H form a centre of expertise of the European boreal flora whose staff lead the Atlas Florae Europaea project and participate in several flora projects, such as Flora Nordica among others. In the current proposal, HUBG has been attributed tasks in Networking (work-packages N6 and N7), Transnational Access (work-packages A1 and A2), and Joint Research Activities (work packages R1 and R2), all of which are areas HUBG and its sister institutions are well equipped to carry out due to their established lines of activities.

Within HUBG, the following staff members will participate in the activities of the current proposal:
Dr. Leif Schulman, Director, and Phil.Lic. Leo Junikka, Curator. Both have ample experience in the management and curation of Botanical collections; expertise in plant taxonomy and floristics.
MSc Mari Miranto, ENSCONET officer. Trained in seed bank management within the ENSCONET network; expertise in *ex situ* conservation.
MSc Teija Alanko, PhD student. Expert in archaeobotany, experienced in seed identification.

14	Fundação da Universidade de Lisboa - Jardim Botânico da Universidade de Lisboa

The seed bank of Lisbon Botanical Garden was created in 1878 after the development of the Botanical Garden. Since then, a great effort of seed collection has occurred not only from plants of old Portuguese colonies but also from native Portuguese plants. A great interchange of seeds was established through the edition of *index seminum* that has never stopped since this time.

In 2001 a new seed bank strategy was established as a mitigating action aiming at preserving plant genetic heritage. This endeavour was driven by the need of an *ex situ* germplasm conservation activity that was required for a total land area of 25,000 ha. During two years, the seed bank team focused on the collection, storage and long-term conservation of germplasm in order to minimise the loss of genetic resources and to become a tool for further conservation actions (e.g., habitat re-establishment, plant species re-introductions or reinforcements) in the area. Under this project 1,200 specimens from over 300 species were sampled, representing *circa* 60% of the flora present in the area. After this effort, the organisation and management of the seed bank has changed, namely the development of protocols of conservation, in terms of collection strategy and curation as well as the construction of a database directed to the internationalisation and knowledge dissemination.

The Botanical Garden of the Lisbon Natural History Museum has always been active in conservation research. The systematic collections serve various fields of botanical research, *in situ* and *ex situ* conservation strategies, as well as dissemination of botany among the general public and students at all levels.

Maria Amélia Martins-Loução is full professor at the University of Lisbon and is heading the Botanical Garden where the seed bank is included. She has been responsible for conservation projects, plant-monitoring programs and is responsible for many PhD and master students. She belongs to the direction of Iberian Macaronesian Botanical Gardens Association.

Adelaide Clemente is a pos-doc at the University of Lisbon, working both in the Centre for Environmental Biology and the Botanical Garden. During her PhD she has worked with soil seed

banks and after that she has been involved in the development of action plans of plant species conservation and habitat rehabilitation. Adelaide will be directly involved in the proposed project tasks.

Helena Cotrim is a pos-doc at the University of Lisbon, working now with a research contract in Botanical Garden. She has knowledge about the Mediterranean plant ecosystems and is particularly interested in plant endemisms, evolutionary processes and conservation strategies.

Domitila Brocas is a technician at Botanical Garden Seed Bank and is responsible for the maintenance and smooth running of the seed bank.

15	Universidad Politécnica de Madrid

The Universidad Politécnica de Madrid (www.upm.es) comprises 21 faculties dedicated mostly to engineering studies. Within UPM, the Department of Plant Biology (which belongs to the agronomical engineering faculties) would be responsible for the action. The main fields of excellence of the Department of Plant Biology are those related to plant genetic resources. In particular, the department runs the Plant Germplasm Bank (Universidad Politécnica de Madrid) which was created 40 years ago and holds two main collections, one dedicated to wild crucifers and the other to plant endemics of the Iberian Peninsula (approximately 10,000 accessions). The first collection is one of the most complete collections of crucifers in the world. The second collection holds the largest collection of Spanish endemics, plus Macaronesian endemics, Ibero-african endemics and Mediterranean endemics. The research and technical staff involved in the proposal have an ample experience on seed preservation techniques, seed germination, seed dormancy, taxonomy, geographic information systems, among others subjects. Several staff of the Department will be involved in the action: Dr Elena Gonzalez (Plant Biology Professor, main expertise in cryopreservation and seed conservation research) will be member of the Project Steering Group; Dr. Félix Pérez-García (Plant Biology Professor, expert in seed germination/dormancy studies), Dr Marcelino de la Cruz Rot (Assistant Professor, expertise on botany and plant ecology), Dr. Juan Martínez-Laborde (Assistant Professor, plant taxonomist), Dr César Gómez-Campo (emeritus Professor, founder of the UPM seed bank), Dr. Carmen Martin (Assistant Professor, plant conservation specialist), Dr. César Perez (Professor, plant conservation), and Mr. David Draper (technical staff working in the seed bank, with expertise in seed bank management and GIS and plant conservation studies).

UPM will be one of the six access banks, and will participate in work package A7. UPM will participate also in the work-packages N4, N5, N7, and in the three work packages of the joint research activities (R1 to R3).

16	National Botanic Garden of Belgium

The National Botanic Garden of Belgium (NBGB) is an institute of botanical research, mainly in the fields of phylogeny and systematics of all groups of plants and fungi. The total number of staff is 175. NBGB has a long standing tradition in the study of the flora of temperate Europe and Central Africa. The herbarium holdings are estimated between 3 and 4 million specimens, the library keeps approx. 200,000 volumes (books, monographs and journals) while the living plant collections are represented by around 17,000 taxa and are used for education, research and conservation.

The NBGB Seed bank contains rare or endangered species of the different phyto-geographical regions of Belgium stored at -20° C. Seeds manipulated in the ‘general seed bank’ are harvested from the living collections. They are conserved on a short-term basis and are used mainly for NBGB’s own sowing programs and/or exchange with other botanical gardens or scientific institutions. The NBGB is participating in the International Seed Exchange Scheme for botanic gardens. A list of seeds is compiled every year and mailed to about 600 correspondents.

In addition, the Garden ensures the management of a base collection of botanical and wild forms in the tribe *Phaseoleae* and the sub-tribe *Phaseolinae*. The main objective is to conserve on a long-term basis the largest possible genetic diversity through seed samples stored at -20° C. The

collection provides the basic material at the disposal of the study of the global genetic diversity and of the improvement of food legumes, in particular for the genera *Phaseolus* and *Vigna*.

17	Agricultural Research Institute - Ministry of Agriculture, Natural Resources and Environment

The Agricultural Research Institute (ARI) near Nicosia is a department of the Ministry of Agriculture, Natural Resources and Environment. It is the only institution in Cyprus engaged in the agricultural research and depends almost exclusively on Government funding. It was established in 1962 (shortly after Cyprus gained its independence) as a cooperative project of the Government of Cyprus and UNDP, with FAO acting as the executive agency. By 1967 it was firmly established as a research institution, staffed predominantly by local scientists.
The Institute undertakes applied and adaptive research within the wider domain of plant and animal production. It is organized in eight Sections (i.e. Field Crops, Horticulture, Plant Protection, Plant Pathology and Biotechnology, Soils and Water Use, Animal Production, Statistics and Computers and Agricultural Economics). It has a Central Chemistry Laboratory providing analytical backup services and also pursuing work on pesticide residue analysis.

The institute has well equipped specialised laboratories, including a radioisotope laboratory, a molecular biology laboratory, a tissue culture laboratory, cold storage facilities, a gene bank, a herbarium and a library which receives most of the leading agricultural journals. The institute has an experimental farm where the livestock is kept, and outstations of plant production all over Cyprus.

The institute's work is published in international journals or in its own publications series (Annual Review, Technical Bulletin, Miscellaneous Reports, and Agricultural Economics Report) in English.

CYARI is the national AGRIS Centre collecting, cataloguing and indexing the Agricultural literature published in Cyprus and is also the national CARIS Centre collating information on on-going research. All this information is supplied to FAO for inclusion in the global data bases of the AGRIS and CARIS systems

Dr Androulla Georgiou and Mr Constantinos Constantinou will be involved in the ENSCRI project tasks.

18	Frederick University Cyprus

The Nature Conservation Unit (NCU) was established in 2005 under the Frederick Institute of Technology (now Frederick University Cyprus) and it specialises on biodiversity conservation, natural resources management and environmental education. More specifically, the Unit focuses on the study, monitoring, management and conservation of the flora, fauna and habitats of Cyprus and the conservation and management of ecologically important areas. Moreover, it aims at the promotion of public awareness about major environmental issues.

The members and collaborating scientists of the NCU have extensive experience on conservation biology and natural resources management. They were actively involved in several biodiversity conservation projects, including the Life Projects for the inventory, identification, evaluation and mapping of the habitat types and flora and fauna species in Greece and Cyprus. In addition, they have participated in several research projects on the conservation of the endemic, rare and threatened plants and animals of Cyprus and Greece as well as in projects promoting environmental awareness and education in Cyprus. Towards achieving its goals, the Unit has established a contemporary laboratory with modern equipment.

FUC will participate in Activity Group N6 and R1. The group leader will be Dr Costas Kadis who is also the Head of the Unit.

19	Universititetet i Oslo

UiO has a more than 100 years history in collecting seeds in the wild for exchange with other botanical gardens around the world, and also has experience in doing research on taxonomy and evolution of several taxonomic groups of seed plants. During 2008 the institution will be fully equipped for housing a seed bank for native Norwegian seed plants, with facilities for drying, cleaning, packing and storing seeds. This seed bank will be a national seed bank storing seeds from the entire country. In collaboration with other botanical gardens in the country the aim is to have banked 60 % of the threatened Norwegian species in 2010.

The staff comprises the head of the garden, three botanists, two head gardeners and 12 gardeners. The botanists have a strong taxonomic training and a long experience in doing field work and collecting seeds. They will be fully competent to participate in Activity groups N6 and R1. One of the head gardeners has experience in work with GIS mapping, databases and web-pages and will contribute to Activity group N5 and some tasks of Activity group R1. Some of the gardeners have training in collecting, cleaning and packing and will accordingly contribute to the work of Activity group R1.

UiO will house the annual meeting in year 4.

20	Museum National d'Histoire Naturelle

The Museum National d'Histoire naturelle (MNHN) current mission is *"To discover, understand, highlight and help preserve the Earth's natural and cultural diversity".* Its areas of activities are Research, Education, the management and enrichment of collections, Expertise and Public Awareness. It plays a key role in the implementation of the GSPC strategy through its botanical gardens, its seed bank, the National Botanic Conservatory, its Research Departments and its world famous Herbarium.

The MNHN seed bank was created in 1822 and since its origin has had a national remit collecting seeds in the wild, providing seeds for scientific research and educational purposes (with the exception of French rare and endangered species which since 1988 have come under the responsibilities of the of Conservatoires botaniques nationaux). The living seed collection holds wild-collected population samples of the French and European flora (5,000 accessions) and a reference collection of 25,000 seed samples including 5,000 from the French flora. It contributes to different areas of research and expertise: Seed Morphology, Taxonomy, Phytotoxicology, and Seed Biology.

The current seed bank infrastructure will be modernised to become the Atlantic hub in the ENSCRI project and will provide a convenient transnational access and service activities for the scientific community. Ten different members of staff will be involved, on a part time basis, for the scientific and technical coordination, to: establish guidelines for user's access, provide data and collection access, organise training, guide and evaluate the users work etc. Furthermore, the scientists will benefit from the various key resources available within the Institution: the living and inert collections (65 million objects), the databases, the extensive documentation collections, the expertise of the scientific staff from the 7 research departments (34 research units, 500 researchers). Moreover MNHN holds the Scientific responsibility for the inventory of the French natural heritage (animal, plant and mineral), available on-line since January 2005 with taxonomic systems of reference and mappings of protected species. It is also involved in two European projects: SYNTHESYS (*Synthesis of Systematic Resources*), a network of natural history collections and EDIT (*European Distributed Institute of Taxonomy*). MNHN also participates in three major world projects: GTI (*Global Taxonomy Initiative*), GBIF (*Global Biodiversity Information Facility*) and CBOL (*Consortium for the Barcode of Life*).

In ENSCRI, the enrichment of the seed collections through targeted collecting programmes will be organised, the accessions will be processed and stored for conservation, the duplicates received from other seed banks managed. MNHN will participate in a working group to contribute to raise taxonomic difficulties. The databases will be enriched with field and literature data to optimise sampling and conservation strategies. Research activities, germination tests and

studies on seed dormancy and seed viability will be carried out in collaboration with the Seed Biology Laboratory INRA AgroParisTech, Paris.

21	Università degli Studi di Pavia

The Università degli Studi di Pavia, founded in 1361, is one of Europe's oldest universities and the oldest one in the Lombardy region. It is a research university with a strong tradition of international student and teacher exchanges, offering a wide variety of disciplinary and interdisciplinary teaching organised in nine faculties. The university offers Degree Courses, Doctorates, Post-graduate Schools, Specialisation Courses and Master degrees. In the Department of "*Ecologia del Territorio*" (Land Ecology), fields of excellence include: taxonomy, plant distribution mapping using GIS techniques, plant ecology and conservation, bio-monitoring of climate changes (EU projects GLORIA, FP5, and ENSCONET, FP6). In this Department are based: a Botanical Garden, a Herbarium, and the Lombardy Seed Bank (LSB). The LSB is one of the facilities of the Centre for Native Plant Conservation (CFA), funded by the Regional Government. It carries out *ex situ* seed conservation activities for native plant species occurring in Lombardy Region and surroundings areas, especially in southern Alps, a hot spot of biodiversity. Presently, about 1,000 seed accessions are conserved in the LSB, 400 of which belong to rare and threatened species. The LSB is well equipped with modern facilities. Equipments include: a dry room and cold store with dryers and five deep freezers (necessary to dry and properly conserve the seeds), different sieves, two seed aspirator (Agriculex and Zig-Zag) for extracting the seeds without incurring any damage, eight cooled incubators with temperature and light control (LMS series 1) for germination studies; two seed drying ovens, analytical balances and three microscopes.

Prof. Graziano Rossi is head of the LSB, he will represent PAV-UNI-CFA in the Project Steering Group. He has a permanent position in the Department. He will be supported by other staff of LSB, including PhD students, post docs and technicians. PAV-UNI-CFA will take part in all three project activities. It will lead the work package R3.

22	Dipartimento di Biologia dell'Università di Pisa

The Botanic Garden of Pisa is part of the Department of Biology of the University of Pisa (Director: Prof. Roberto Lorenzi), a multidisciplinary institute with a research focus in Anthropology, Biochemistry, Botany, Cellular Biology, Ecology, Ethology, Animal Physiology, Plant Physiology, Genetics, Geology, and Zoology. The Department has laboratories well equipped with instruments for molecular and biochemical studies, a Botanic Garden with an associated Seed Bank, and a Herbarium. Research topics at the Pisa Botanic Garden include biodiversity and conservation of the Mediterranean flora, biosystematic studies of the Italian flora, databases on the distribution of Tuscan plants, and germplasm conservation for the threatened floristic units of Tuscany. The Botanic Garden, with the associated Seed Bank, is a partner to the EU-funded ENSCONET project and current leader of RIBES, the Italian seedbank network for native plant species. In the current project proposal, it will participate in the Networking and Joint Research Activities (work packages N3 (database), N6 (communication), and R1 (development of baseline collections)). The project tasks will be performed mainly by a team of permanent staff members including four scientists (a project leader, a plant molecular biologist, a plant taxonomist, a plant ecologist) and five technicians involved in seed collection, curation and storage; GIS and GPS technology; preparation of herbarium vouchers for seed accessions.

23	Institute of Botany, Bulgarian Academy of Sciences

The Institute of Botany was founded within the Bulgarian Academy of Sciences (BAS) in 1947. It stands out as a comprehensive scientific centre of theoretical and applied research, consultancy and education in the following fields: floristics, taxonomy and biosystematics of plants and fungi, chemotaxonomy, phytocoenology and ecology, phytogeography and resources, palaeobotany, plant cytoembryology, biodiversity protection, biotechnology, and medicinal and aromatic plants. There are five scientific departments with well equipped relevant lab facilities and a herbarium with a spermatophyte and mycological collections (SOM, SOMF). IB-BAS has been involved in a number of high-profile projects recently: Euro+Med PlantBase, BioCASE, National Biodiversity

Platform, Important Plants Areas, PHYTO-Monitor, NATO SfP974453 Bioproduction, Neogene Climate Evolution in Eurasia (NECLIME), Environments and Ecosystem Dynamics of the Eurasian Neogene (EEDEN), Multifunctional Integrated Study of Danube Corridor and Catchment (MIDCC), Natura 2000, ENSCONET, etc. The Institute publishes the peer-reviewed international journal Phytologia Balcanica.

The research group involved in this current project proposal belongs to the Department of Applied Botany and is experienced in the conservation of native vegetation and habitats in Bulgaria. Researchers are involved in the development of national policy and legislation on biodiversity protection and in establishment of NATURA 2000 areas in Bulgaria; they take part in development of the Red Data Book of Bulgaria (Volumes Plants and Habitats, 2008); a seed collection co-operation is in place with the Millennium Seed Bank Project of the Royal Botanic Gardens Kew (UK). The team initiates local conservation and re-introduction projects focused on development of *in situ* and *ex situ* conservation strategies and practices for some rare and threatened species of conservational and economical importance. IB BAS will participate in the work-packages N6 and R1.

24	Fundació Jardí Botànic de Sóller

The Sóller Botanic Garden (JB Sóller) was founded in 1985 and was opened to the public in 1992 as a centre of conservation, study and understanding of the Mediterranean flora, and specifically the Balearic flora. In April 1997, a foundation (the "Fundació Jardí Botànic de Sóller") was set up, of which the patrons are: the Government of the Balearic Islands, the Council of Mallorca, the municipality of Sóller, the Balearic University, the savings bank "SA NOSTRA", the Ibero-Macaronesian Association of Botanic Gardens and the Association of the Balearic Natural Sciences Museum.

JB Sóller is a centre dedicated to research into plants in all their complexity, and into the properties of these plants that can be of use to humans. JB Sóller's main asset is its well-documented living plant collections. These collections – as well as the Seed Bank and the Herbarium – allow for research into the development of plants and their biological requirements. JB Sóller's main objectives are the conservation of Mediterranean plant biodiversity, research in the field of conservation biology, and education, providing information and raising awareness about the value of plants and to what extent they are endangered, in order to help protect them The seed bank holds samples of seeds from Balearic Islands stock at temperatures of -15/18°C. The main aim is the conservation of seeds of Balearic endangered plant species as well as the support for the implementation and development of the Endangered Balearic Flora Recovery, Conservations and Management Plans.

JB Sóller will participate in work-packages N6 and R1. The staff members who will undertake the work are the Curator of the Garden, Dr Magdalena Vicens, and second biologist who will be contracted once the project starts.

25	Museo tridentino di scienze naturali

The Museo tridentino di scienze naturali (MTSN, Trento, Italy) maintains a regional seed storage facility, dedicated to the threatened Flora of the Eastern Alps. It is familiar with the problems of newly established seed banks, having been founded quite recently in 2002. It is committed to conserve the Alpine Flora and investigate the germination ecology and the seed longevity of alpine species.

In the Networking activities, MTSN will lead the work package N4 "Training and Technology" offering to the network the experience that its staff gained during specific training on seed bank design and management received and given in recent years. It will be part of the Project Steering Group (N1) providing feedback from the training needs of the network and user community alike. It will contribute to work package N2 (Genebank standards) capitalising on its role of curation deputy in the ENSCONET Co-ordination Action. In work package N6, MTSN will contribute to communication on training topics and will liaise with the local national and bioregional context. In the Joint Research Activities, MTSN will contribute to develop baseline collections (work

package R1) capitalising on its role of co-leader of the Alpine bio-geographical group, carrying out seed collecting campaigns in the Alps, thanks to ten years experience in plant distribution mapping in the SE Alps. In work package R2 MTSN will provide germination data on alpine species and support activities planned. In work package R3 MTSN will be keen to support activities aimed at defining the seed longevity of short lived species such as alpine species and identifying best methods to enhance seed longevity of alpine species.

The MTSN unit is led by Mr. Costantino Bonomi, who was specifically trained in seed conservation in 1999-2000, raised funds and directed the MTSN seed storage facility in 2002 and contributed to the design and implementation of the Pavia facility (partner 21 UNI-PAV-CFA) in 2005.

26	Universitat De Valencia Estudi General

The Universitat de València Estudi General, through the Germplasm Bank of the "Jardí Botànic" (Botanic Garden) develops tasks in research, conservation and popularisation of botanic topics. Two centuries of history resulted in a profound experience in the study of plant species and their conservation. Currently, the Germplasm Bank is integrated as a research centre within the Institute "Cavanilles" of Biodiversity and Evolutionary Biology. It was created in 1991 with the aim of conserving the genetic diversity of rare, endemic or threatened species of the Valencian Community, and other taxa with bio-geographical and systematic interest. More recently in 1998, a Fern Spore Bank project was developed, including a research line focused on the long-term conservation of Pteridophyte biodiversity.

Since 1991, the Germplasm Bank has established several agreements with the national Spanish government through its ICONA (Institute for Nature Conservation), and from 1992 to the present, agreements exist with the regional government (Generalitat Valenciana). Since 2004, the Germplasm Bank has been participating in international seed conservation networks, such as the Mediterranean "Genmedoc" and the pan-European "ENSCONET".

The expertise from the staff that belongs to this university department is focused on seed banking, plant anatomy and pteridodology, all applied to determine the best practices to preserve wild plant germplasm.

The curator of the Germplasm Bank, Dr. Elena Estrelles, is responsible for the work of the different projects carried out in this unit. Since her arrival in the Botanical Garden, she has been directly involved in the development of seed and fern spore collecting and conservation programmes coordinated with the regional government (Generalitat Valenciana). She is in charge of collecting, cleaning, curation, data management and exchange activities, as well as manages the different projects focused on seed and spore long term conservation (e.g. Spore Conservation REN2002-03697/GLO MCyT; GENMEDOC 2003-03-4.1-E-060 EU; ENSCONET RICA-CT-2004-506109 EU; Seed Conservation CGL2006-10536 MEC.; PERSIST CGL2006-07126/BOS MEC).

27	Botanical Garden - Center for Biological Diversity Conservation, Polish Academy of Sciences

The Botanical Garden in Warsaw was established in 1974. It is a research unit of the Polish Academy of Sciences with special research activities devoted to biological diversity conservation and therefore is called the Center for Biological Diversity Conservation. Among botanical gardens, it is the leading institution in Poland for the *ex situ* conservation of Polish rare and endangered native plant species. The Botanical Garden has excellent facilities for the long-term preservation of genetic material (seeds, spores, plant tissues, and *in vitro* cultures), including cryogenic storage using liquid nitrogen (LN_2). Thanks to the international co-operation with various gene banks, it has carried out many studies on the conservation of crop genetic resources, especially of the genus *Secale*. These studies analysed physiological, biochemical and genetic effects of seed aging during long-term storage. The rich living plant collections of the Botanical Garden (exceeding 9,000 taxa) serve widely for conservation purposes, as well as for education for students and the general public. The main research areas include molecular

taxonomy and population genetics, biotechnology and conservation botany of rare and threatened plants.

The following staff members will be involved in the tasks of this proposal:
Jerzy Puchalski, PH.D., D.Sc., professor of agronomy, director and head of the Department of Plant Diversity Conservation and Evaluation, specialist in seed biology, molecular plant genetics and taxonomy, and in conservation biology of plants.
Jan Rybczyński, Ph.D., D.Sc., professor of biology, head of Plant Biotechnology Department, specialist in somatic embryogenesis of plants and cryo-preservation of *in vitro* cultures.
Agata Obłuska, M.Sc. in horticulture, specialist in conservation of plant diversity through seed banking.
Anna Mikuła, Ph.D. in biotechnology, specialist in cryo-preservation of *in vitro* cultures including suspension cell cultures and fern spores.
Arkadiusz Nowak, Ph.D. in botany, specialist in plant taxonomy and floristic of rare and endangered vascular species of the Polish native flora.

28	University of Vienna

With c. 72,700 students and close to 8,000 employees, the University of Vienna is the largest teaching and research institution in Austria and one of the largest in Central Europe.
At the Department of Biogeography, particular experience exists in collecting and conservation (*in situ* and *ex situ*) of Central European plants (including co-ordination of the international project “Mapping the Flora of Central Europe”), and in research on different aspects of evolution, phylogeography, population genetics and taxonomy of higher plants all over the world. The department maintains a large database with distributional data of plants in Austria, as well as a taxonomic database of the vascular plants of Central Europe. The co-ordination of the project “Red Lists of Austrian Plants” is also situated here. The molecular systematics laboratory used jointly by the departments of the “Center of Biodiversity of the Faculty of Life Sciences” is well equipped to carry out relevant research.

The Botanical Garden of the University of Vienna is part of the Department of Biogeography. In its more than 250 years of existence, it has developed special experience in *ex situ* conservation of endangered or threatened plant species. The Botanical Garden also is strongly involved in Austrian programs on CBD issues (e.g., ABS) and serves as co-ordinator for the Austrian Network of Botanic Gardens and its conservation activities.

2.3 Consortium as a whole

The consortium consists of 28 partners from 18 European countries (EU member and EFTA states) stretching from the Canary Islands to Cyprus and from Sardinia to Norway. This number is above the EU Commission recommendation of 20 consortium members and might therefore be considered high. Consequently there might be concerns about the efficient functioning and manageability of the consortium. However, a large number of members are necessary in order to get the widespread eco-geographic coverage of the project in R1 (baseline collections) and to a lesser extent in N6 (external communications). Furthermore, out of the 28 consortium members, 24 are already working successfully together in the current FP6 funded ENSCONET Co-ordination Action. The other four members are either current associate ENSCONET members or have long and well-established bilateral working relationships with individual consortium members. This means that ENSCRI should inherit the momentum established in ENSCONET. While the management and co-ordination of ENSCONET is challenging, the initial difficulties with setting up a large network have been ironed out. As a result, ENSCRI will be well equipped to face new challenges based on a membership that understands and, more importantly, trusts one another. ENSCONET has also been an important experience for RBGK in that it has gained significant management and co-ordinating experience with regard to EU-funded projects. On the basis of institutional strengths that have emerged in ENSCONET, it has been possible to select well-balanced teams to deliver ENSCRI.

Based on experiences with ENSCONET, the Consortium Agreement will be overhauled to incorporate several management tools and financial contingency plans. These will help clarify expectations on different parties at the very start of the project, provide a legal framework for resolving any disputes that might arise and minimise off some of the significant risks noted in section B1 1.3 (v).

All of the above added to the fact that one of ENSCONET's key aims has been to draw up collecting plans for Europe that can be enacted under R1, means that ENSCRI is the logical successor to ENSCONET.

Critical mass

The combined efforts and expertise of formerly independently working institutions across Europe enable the consortium to achieve the critical mass required to achieve the project objectives. All consortium members take part in the Networking activities which build on the foundations created by ENSCONET both scientifically (e.g. database structure, high standard seed curation protocols etc) and with regard to public relations (e.g. newsletter house style).

It is proposed to augment the consortium by 'associate membership' for interested institutions outside the ENSCRI project (e.g. members of the Austrian, French, Italian or Norwegian national seed bank or botanic garden networks). This would encourage their participation in the networking activities for the purposes of sharing knowledge and cascading both expertise and best practices more widely within Europe. Such members might receive invitations to the Annual General Meeting or specific meetings in order to facilitate their participation. Associate membership has worked well within ENSCONET and has helped identify 'new blood' now included within ENSCRI.

In addition, all Consortium members are members of the work package R1 (Development of baseline collections). By this, the almost complete coverage of the bio-geographical regions in Europe is ensured (the only region not covered is the Steppic region in the southern parts of Ukraine, Russia and Moldavia); over 90% of Europe's total flora can be covered. The three countries richest in species, Spain, Italy and Greece, are represented by five, four and two members respectively. Sampling of plant material is coordinated on a regional level, the sampled material and data are subsequently processed, the plant material is duplicated, data are being stored centrally, and both, plant material and data are made available for scientists across Europe. Central to this are the use of six infrastructure hubs that will not only co-ordinate the collecting

within each region but also be the duplicate store and access point. This ensures continuity of action within each region.

Complementarity

While nine Consortium members participate in only a few work packages, there are eight key partners that participate in seven or more work packages. Among these key partners there are the most experienced wild species seed banks in Europe (and indeed, the world) and some relatively young seed banks. The latter bring in a freshness of approach. Within the project, the Consortium members complement each other by bringing an array of different skills and experiences. This is a reflection of the diverse institutional backgrounds of membership ranging from botanical gardens (at the local, national and international level), national agricultural research institutes, universities, natural history museums and one zoological garden. All have expertise on their national floras but research expertise ranges from genetics, post-harvest technology, germination to seed storage diagnostic techniques; skills range from plant identification of specific taxonomic groups to computing and horticulture. As will be appreciated, effective seed conservation requires an extensive range of skills and few, if any of the existing facilities have backgrounds in all.

There is also a good geo-political balance. The Mediterranean and Central European countries are well represented. The new EU member states are represented with five partners from four countries (Hungary, Poland, Slovakia, and Bulgaria). There is also a good gender balance. Seed bank infrastructures traditionally have a comparatively high proportion of female staff and particular measures are in place to promote equal opportunities for men and women (see below).

Although there are national networks for wild species seed banks on other continents (e.g. USA, Australia) and even one international network (Millennium Seed Bank Project), Europe is the only continent with such a network (ENSCONET). ENSCRI offers the opportunity to pull the infrastructures represented into a cohesive unit strengthened by a continent-wide collecting programme linked to access and with weak points (germination, short-lived species and *ex situ* fern storage) addressed. This makes ENSCRI unique on a global scale and will strengthen the EU's position in international biodiversity fora.

2.4 Resources to be committed

Resources that complement the EC contribution

The overall percentage of the EC contribution of the total budget is 85%. For the individual consortium members, this value varies between 77 and 90% meaning that they will mobilise between 10 and 23% complementing resources.

The planned project activities dramatically expand and integrate work that is going on in many of the partner institutes. This enables the participants to mobilise the required complementing resources in-kind from existing institutional budgets without major difficulties. This especially refers to staff costs in Joint Research Activities and other eligible costs, such as expenses related to the sampling of plant material in work package R1. The participants will sign up to this commitment in the agreement that they sign with the Commission. It will also be covered by the internal Consortium Agreement. The commitment will vary year by year but overall will amount to the committed level.

Integration of the resources in a coherent way

The project tasks are arranged into three activities and 17 work-packages.
The budget (and in parentheses, the EC contribution) is partitioned: networking 31.8% (37.4%); access 8.5% (10.0%); and Joint Research Activities 59.7% (52.6%). Within these figures, those for R1 at 52.0% (52.6%), N6 at 9.2% (10.9%) and N1 at 9.1% (10.7%) are the largest individual work-packages. This is because R1 and N6 involve all of the participants and N1 contains all of the Secretariat costs. It has been necessary to involve all of the participants in R1 in order to give the necessary collecting, conservation and germination coverage. With regard to collecting, it is not possible for single institutes to cover whole regions either logistically or with regard to knowledge of the flora. The Mediterranean and Canary Islands present a particular problem with respect to logistics. Consequently, consortium members are based in Gran Canaria, Mallorca, Sardinia, Crete and Cyprus. Furthermore, additional allowance has been given to NKUA in recognition that it has to cover a large number of Greek islands.

It has been necessary to include all participants in N6 because experience in ENSCONET has shown that it is essential to give allowances for all to contribute to external communication. N1 at 9.1% is within the guidelines (5-10%) recommended by the Commission.

All of the other work-packages each require less than 5.5% of the budget. This seems sensible given their specialist nature. The overall access component is small because of (a) the relatively small size of each of the access hubs, (b) the 20% attribution and (c) the nature of the access provision. Seed samples can be provided relatively cheaply to users. To increase the access provided in terms of visitors would have involved a significant step up in scale of each of the hubs. It should be noted that other members of the consortium will probably offer significant other access to European users that is not included in this bid. For instance, RBGK through the Millennium Seed Bank Project provides several access opportunities each year for European seed conservation and research scientists; it is likely that this support would continue.

Of the Consortium members, RBGK as Co-ordinator and leader of N1, N2, N6 and R2 requires 11.1 % of the budget (11.7% of the EC contribution). In addition, it holds some general budget positions in trust for the consortium, e.g. the travel budget for the International Advisory Board or financial support for associate members to participate in Networking Activities. The access banks require between 3.5 – 10.9% (3.6 – 10.9%) depending upon the level of access and other commitments to the project; FUB BGBM leads R1. The other members have budgets of between 0.6 – 4.1% (0.5 – 4.1%). This variation reflects currency exchange rates and levels of involvement or leadership.

Of the total budget, 47.1% relates to personnel costs, 0.6% relates to sub-contracted audit costs, 16.8% to direct other costs (see below), 28% to indirect costs and 7.5% to access costs (excluding personnel and indirect costs relating to service provision in A7). Of the direct other costs, the following has been allocated: Euro 567,400 to internal project travel, meetings and workshops; Euro 66,872 to the International Advisory Board and External access proposal evaluators; Euro 48,110 to the workshops for external users; Euro 136,474 to publishing, educational material and open access fees; Euro 25,907 for recruitment; Euro 53,073 to associate member participation; Euro 435,912 to collecting costs (including joint collecting trips); Euro 114,637 to participation at external conferences; Euro 44,253 for a data-server, web-licences etc; Euro 120,422 for laboratory consumables; and Euro 30,105 for trialling laboratory and field equipment.

The personnel costs are based directly on estimate staff times and institutional costs for the different grades of staff that will be required to complete the tasks. The total number of months budgeted (excluding that included under the access charges) is 1175.5. This is comprised of 383.4 months for networking, 771.8 months for joint research activities and 20.3 months for data provision under Access. The number of months involved reflects the large number of participants and the ambition of the project. The individual partners have a commitment varying from 11 months up to 106.8 months.

Items not covered by the budget are the 80% share of the costs for maintenance and running of the Access infrastructures which will be secured from institutional sources. Additionally, all participants will find 25% of their budget contribution for research.

The project budget has been assembled in a very detailed way with staff times and associated costs carefully estimated (in most cases on the basis of previous experience). Furthermore, we believe that all of the work-packages are all necessary and well integrated. Consequently, we believe that the budget is well balanced and integrated to meet the needs of the project.

How the overall financial plan for the project is adequate

As mentioned in the section above, the project budget was built up from a detailed base. This approach worked well with the ENSCONET project (which is well within budget). It should be noted that RBGK as ENSCRI co-ordinator also planned and managed the Millennium Seed Bank Project (Euro 97m) which is being delivered on budget. The 28 participants have individually accepted that the sums involved are sufficient for them to complete the tasks for which they are involved.

Because of the care taken to develop the budget, we believe that it should be adequate to successfully deliver the ENSCRI project.

Access costs

Calculation of the Unit costs for Transnational Access (work packages A1 to A6, 12 tables) and of the Access Cost for Scientific Services (work packages A7, 1 table)

Calculation of the Unit Cost for Transational Access

Participant number	**3**	**Organisation short name**		**FUB-BGBM**	
Short name of Infrastructure	**Dahlem Seed Bank**	**Installation number**	**1**	**Short name of Installation**	**BGBM-SAMPLE**
Name of Installation	**Distribution of seed samples**			**Unit of access**	**Seed sample (1 accession)**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs

Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
All BGBM costs based on figures from 2006 audited according to German	
regulations	
BGBM Consumable costs (20% of costs in 2006, multiplied by 4 years project time)	20,208
BGBM Maintenance costs (20% of costs in 2006, multiplied by 4 years project time)	834,675
Total A	**854,883**
of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time

Category of staff (scientific and technical only)	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
(hourly rates based on 2007 data)			0
Scientific staff	7307	43.68	319169.76
Technical staff	13654	24.97	340940.38
			0
			0
			0
			0
			0
			0
Total B			**660,110**

C. Indirect eligible costs = 7% x ([A-A']+B)	106,050
D. Total estimated access eligible costs = A+B+C	1,621,043
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	27,468
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**59.01**
H. Quantity of access offered under the proposal (over the whole duration of the project)	4,000
I. **Access Cost** [2] **= G x H**	**236,040**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**3**	**Organisation short name**		**FUB-BGBM**	
Short name of Infrastructure	**Dahlem Seed Bank**	**Installation number**	**2**	**Short name of Installation**	**BGBM-VISIT**
Name of Installation	**Access to Dahlem Seed Bank**			**Unit of access**	**1 Visitor day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
	All BGBM costs based on figures from 2006 audited according to German	
	regulations	
	BGBM Consumable costs (20% of costs in 2006, multiplied by 4 years project time)	2,307
	BGBM Maintenance costs (20% of costs in 2006, multiplied by 4 years project time)	95,300
	Total A	**97,607**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff (scientific and technical only)**	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
	(hourly rates based on 2007 data)			0
	Scientific staff	834.3	43.68	36442.224
	Technical staff	1559	24.97	38928.23
				0
				0
				0
				0
				0
				0
	Total B			**75,370**

C. Indirect eligible costs = 7% x ([A-A']+B)	12,108
D. Total estimated access eligible costs = A+B+C	185,086
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	687
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**269.53**
H. Quantity of access offered under the proposal (over the whole duration of the project)	100
I. **Access Cost** [2] **= G x H**	**26,953**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**8**	**Organisation short name**		**MAICh**	
Short name of Infrastructure	**Seed Bank MAICh**	**Installation number**	**1**	**Short name of Installation**	**MAICh-SAMPLE**
Name of Installation	**Distribution of seed samples**			**Unit of access**	**Seed sample (1 accession)**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs

Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
Maintenance	5,049
Consumables	3,001
Utilities	9,971
Total A	**18,022**
of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time

Category of staff (scientific and technical only)	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
Researcher Senior	210	19.33	4,061
Researcher Junior	420	15.33	6438.6
Assistant Researcher	420	13.33	5598.6
Technical Assistant	1050.4	12	12604.8
			0
			0
			0
			0
			0
Total B			**28,703**

C. Indirect eligible costs = 7% x ([A-A']+B)	3,271
D. Total estimated access eligible costs = A+B+C	49,995
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	1,000
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**50**
H. Quantity of access offered under the proposal (over the whole duration of the project)	200
I. **Access Cost** [2] **= G x H**	**10,000**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**8**	**Organisation short name**		**MAICh**	
Short name of Infrastructure	**Seed Bank MAICh**	**Installation number**	**2**	**Short name of Installation**	**MAICh-VISIT**
Name of Installation	**Access to Seed Bank MAICh**			**Unit of access**	**1 Visitor day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs

Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
Maintenance	20,187
Consumables	11,999
Utilities	39,869
Total A	**72,055**
of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time

Category of staff (scientific and technical only)	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
Researcher Senior	840	19.33	16,236
Researcher Junior	1680	15.33	25754.4
Assistant Researcher	1680	13.33	22394.4
Technical Assistant	4199.6	12	50395.2
			0
			0
			0
			0
			0
Total B			**114,780**

C. Indirect eligible costs = 7% x ([A-A']+B)	13,078
D. Total estimated access eligible costs = A+B+C	199,913
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	750
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**266.55**
H. Quantity of access offered under the proposal (over the whole duration of the project)	150
I. **Access Cost** [2] **= G x H**	**39,983**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**13**	**Organisation short name**		**HUBG**	
Short name of Infrastructure	**Seed bank HUBG**	**Installation number**	**1**	**Short name of Installation**	**HUBG-SAMPLE**
Name of Installation	**Distribution of seed samples**			**Unit of access**	**Seed sample (1 accession)**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	Eligible Costs (€)
	Maintenance: premises reserved for seed bank only	8,191
	Maintenance: 10% of other premises of HUBG (estimated share allocated to	
	seed bank acitivities)	7,372
	Utilities	4,681
	Consumables	2340
	Total A	**22,584**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time	Category of staff (scientific and technical only)	Nr. of hours (1)	Hourly rate (2)	(3) = (1) x (2)
	Technical: seed bank technician (50% of total time)	1,170	20	23,404
	Scientific: curator (20% of total time)	468	30.5	14274
	Scientific: head of unit (10% of total time)	234	42	9828
				0
				0
				0
				0
				0
				0
	Total B			**47,506**

C. Indirect eligible costs = 7% x ([A-A']+B)	4,906
D. Total estimated access eligible costs = A+B+C	74,997
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	1,000
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**75**
H. Quantity of access offered under the proposal (over the whole duration of the project)	200
I. **Access Cost** [2] **= G x H**	**15,000**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**13**	**Organisation short name**		**HUBG**	
Short name of Infrastructure	**Seed bank HUBG**	**Installation number**	**2**	**Short name of Installation**	**HUBG-VISIT**
Name of Installation	**Access to Seed bank HUBG**			**Unit of access**	**1 Visitor day**

	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
A. **Estimated direct eligible costs of providing access within the project life-time excluding personnel costs**	Maintenance: premises reserved for seed bank only	19,809
	Maintenance: 10% of other premises of HUBG (estimated share allocated to seed bank acitivities)	17,828
	Utilities	11,319
	Consumables	5660
	Total A	**54,616**
	of which subcontracting (A')	

B. **Estimated personnel direct eligible costs needed to provide access within the project life-time**	**Category of staff (scientific and technical only)**	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
	Technical: seed bank technician (50% of total time)	2,830	20	56,596
	Scientific: curator (20% of total time)	1132	30.5	34526
	Scientific: head of unit (10% of total time)	566	42	23772
				0
				0
				0
				0
				0
				0
	Total B			**114,894**

	C. Indirect eligible costs = 7% x ([A-A']+B)	11,866
	D. Total estimated access eligible costs = A+B+C	181,375
	E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	600
	F. Fraction of the Unit cost to be charged to the proposal [1]	100%
	G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**302.29**
	H. Quantity of access offered under the proposal (over the whole duration of the project)	120
I.	**Access Cost** [2] **= G x H**	**36,275**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**15**	**Organisation short name**		**UPM**	
Short name of Infrastructure	**BGV-UPM**	**Installation number**	**1**	**Short name of Installation**	**UPM-SAMPLE**
Name of Installation	**Distribution of seed samples**			**Unit of access**	**Seed sample (1 accession)**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs

Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
Maintenance of building including utilities, and repairs reposition	35,809
Consumables	5,707
Total A	**41,516**
of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time

Category of staff (scientific and technical only)	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
Technician	221	20.09	4,446
Professor	22	34.65	762.3
			0
			0
			0
			0
			0
			0
			0
Total B			**5,209**

C. Indirect eligible costs = 7% x ([A-A']+B)	3,271
D. Total estimated access eligible costs = A+B+C	49,995
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	1,000
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**50**
H. Quantity of access offered under the proposal (over the whole duration of the project)	200
I. **Access Cost** [2] **= G x H**	**10,000**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**15**	**Organisation short name**		**UPM**	
Short name of Infrastructure	**BGV-UPM**	**Installation number**	**2**	**Short name of Installation**	**UPM-VISIT**
Name of Installation	**Access to BGV-UPM**			**Unit of access**	**1 Visitor day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs

Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
Maintenance of building including utilities, and repairs reposition	125,991
Consumables	20,078
Total A	**146,069**
of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time

Category of staff (scientific and technical only)	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
Technician	779	20.09	15,644
Professor	78	34.65	2702.7
			0
			0
			0
			0
			0
			0
			0
Total B			**18,346**

C. Indirect eligible costs = 7% x ([A-A']+B)	11,509
D. Total estimated access eligible costs = A+B+C	175,925
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	750
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**234.57**
H. Quantity of access offered under the proposal (over the whole duration of the project)	150
I. **Access Cost** [2] **= G x H**	**35,186**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**20**	**Organisation short name**		**MNHN**	
Short name of Infrastructure	**Banque de Graines – MNHN**	**Installation number**	**1**	**Short name of Installation**	**MNHN-SAMPLE**
Name of Installation	**Distribution of seed samples**			**Unit of access**	**Seed sample (1 accession)**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs

Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
Maintenance	4,567
Consumables	3,276
Utilities	17,171
Total A	**25,015**
of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time

Category of staff (scientific and technical only)	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
Technical staff	1,208	24.5	29,594
Scientific staff	331.6	32.61	10813.476
			0
			0
			0
			0
			0
			0
			0
Total B			**40,407**

C. Indirect eligible costs = 7% x ([A-A']+B)	4,580
D. Total estimated access eligible costs = A+B+C	70,002
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	1,400
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**50**
H. Quantity of access offered under the proposal (over the whole duration of the project)	280
I. **Access Cost** [2] **= G x H**	**14,000**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**20**	**Organisation short name**		**MNHN**	
Short name of Infrastructure	**Banque de Graines – MNHN**	**Installation number**	**2**	**Short name of Installation**	**MNHN-VISIT**
Name of Installation	**Access to Banque de Graines – MNHN**			**Unit of access**	**1 Visitor day**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
	Maintenance	18,573
	Consumables	13,324
	Utilities	69,829
	Total A	**101,725**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff (scientific and technical only)**	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
	Technical staff	4,912	24.5	120,346
	Scientific staff	1348.4	32.61	43971.324
				0
				0
				0
				0
				0
				0
				0
	Total B			**164,317**

C. Indirect eligible costs = 7% x ([A-A']+B)	18,623
D. Total estimated access eligible costs = A+B+C	284,666
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	1,000
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**284.67**
H. Quantity of access offered under the proposal (over the whole duration of the project)	200
I. **Access Cost** [2] **= G x H**	**56,934**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**21**	**Organisation short name**		**UNI-PAV-CFA**	
Short name of Infrastructure	**LSB**	**Installation number**	**1**	**Short name of Installation**	**LSB-SAMPLE**
Name of Installation	**Distribution of seed samples**			**Unit of access**	**Seed sample (1 accession)**

A. Estimated direct eligible costs of providing access within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	**Eligible Costs (€)**
	Maintenance	6,883
	Utilities	3,442
	Consumables	2,294
	Total A	**12,619**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access within the project life-time	**Category of staff (scientific and technical only)**	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
	Graduate 1	198	35	6,938
	Technician 1	198	18.5	3667.28869
	Group leader	198	60	11893.90927
	Graduate 2	198	35	6938.113739
				0
				0
				0
				0
				0
			Total B	**29,437**

C. Indirect eligible costs = 7% x ([A-A']+B)	2,944
D. Total estimated access eligible costs = A+B+C	45,000
E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time	900
F. Fraction of the Unit cost to be charged to the proposal [1]	100%
G. **Estimated Unit cost charged to the proposal** = F x (D/E)	**50**
H. Quantity of access offered under the proposal (over the whole duration of the project)	180
I. **Access Cost** [2] **= G x H**	**9,000**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Unit Cost for Transational Access

Participant number	**21**	**Organisation short name**		**UNI-PAV-CFA**	
Short name of Infrastructure	**LSB**	**Installation number**	**2**	**Short name of Installation**	**LSB-VISIT**
Name of Installation	**Access to LSB**			**Unit of access**	**1 Visitor day**

A. **Estimated direct eligible costs of providing access within the project life-time excluding personnel costs**	Describe the direct eligible costs for providing access to the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .			**Eligible Costs (€)**
	Maintenance			23,117
	Utilities			11,558
	Consumables			7,706
			Total A	**42,381**
			of which subcontracting (A')	
B. **Estimated personnel direct eligible costs needed to provide access within the project life-time**	**Category of staff (scientific and technical only)**	**Nr. of hours (1)**	**Hourly rate (2)**	**(3) = (1) x (2)**
	Graduate 1	666	35	23,302
	Technician 1	666	18.5	12316.71131
	Group leader	666	60	39946.09073
	Graduate 2	666	35	23301.88626
				0
				0
				0
				0
				0
			Total B	**98,867**
	C. Indirect eligible costs = 7% x ([A-A']+B)			9,887
	D. Total estimated access eligible costs = A+B+C			151,135
	E. Total estimated quantity of access provided to all normal users of the infrastructure (i.e. both internal and external) within the project life-time			600
	F. Fraction of the Unit cost to be charged to the proposal [1]			100%
	G. **Estimated Unit cost charged to the proposal** = F x (D/E)			**251.89**
	H. Quantity of access offered under the proposal (over the whole duration of the project)			120
I.	**Access Cost [2] = G x H**			**30,227**

[1] If only a fraction of the unit cost is being charged, please indicate the value of this fraction (in %) in line G. If not, insert 100%.

[2] In the case of a participant giving access to more than one infrastructure/installation with different unit costs, please report in the administrative forms the sum of all the amounts coming from the individual unit cost calculation forms

Calculation of the Access Cost for Scientific Services

Participant number	8	Organisation short name		MAICh	
Short name of Infrastructure	ENSCRI db	Installation number	1	Short name of Installation	ENSCRI db
Name of Installation	ENSCRI database				

A. Estimated direct eligible costs of providing access to the service within the project life-time excluding personnel costs	Describe the direct eligible costs for providing access to the service offered by the installation over the project life-time (e.g. maintenance, utilities, consumable costs). All contributions to capital investments of the infrastructure are not eligible .	Eligible Costs (€)
	There are no direct costs for providing access to the service (i.e. external access to	
	the ENSCRI database) which should be described here. Cost related to the	
	database itself are described under Networking activity Work package N3.	
	Total A	**0**
	of which subcontracting (A')	

B. Estimated personnel direct eligible costs needed to provide access to the service within the project life-time	Category of staff (scientific and technical only)	Nr. of hours (1)	Hourly rate (2)	(3) = (1) x (2)
				0
				0
				0
				0
				0
				0
				0
				0
				0
				0
			Total B	**0**

C. Indirect eligible costs = 7% x ([A-A']+B)	0
D. Total estimated access eligible costs = A+B+C	0
E. Percentage of the operation costs to be charged to the proposal [1]	20.0
F. **Access Cost [2] = D x E**	**0**

[1] The percentage of the operation costs to be charged cannot exceed 20%. .

[2] In the case of a participant giving access to services offered by more than one infrastructure/installation with different access costs, please report in the administrative forms the sum of all the amounts coming from the individual access cost calculation forms

3. Impact

3.1 Expected impacts listed in the work programme

ENSCRI will have both immediate and very long-lasting significant and beneficial impacts on Europe. It will support EU policies on environment and sustainable development. This project will support the further building of the European Research Area and it will enable Europe's scientific community to remain world leaders in their respective fields of environmental and life sciences. It will greatly strengthen Europe's long-term seed banking infrastructure for native plant species and will ensure its optimal use. It will do this by:

- building on the programme of cohesion instigated by the FP6 Co-ordination Action ENSCONET
- co-ordinated collection, conservation and distribution of key yet threatened building blocks upon which the European environmental and life science research communities depend and which could play a major role in mitigating some of the potential negative effects of climate change in Europe
- enhancing the quality of the science that underpins the infrastructure and improving the services provided to the scientific community
- providing a 'one-stop shop' to the embodied expertise, facilities and collections of the infrastructure for a potentially vast array of users, thereby contributing to the further integration of the European research landscape.

ENSCRI will be directly relevant for the third pillar of the renewed Lisbon Strategy, the environmental pillar, which was added at the Göteborg European Council meeting in 2001. This pillar draws attention to the fact that economic growth must be decoupled from the use of natural resources. In addition, ENSCRI is ultimately relevant to the first column of the renewed Lisbon Strategy, the economic pillar.

One of the achievements of ENSCONET is that the consortium has helped to overcome the previous fragmentation of wild plant species seed conservation inside the European Research Area. The earlier local and national approaches to the conservation of Europe's flora have started to be synthesised into a pan-European activity. ENSCRI will build on this legacy; it will better structure and integrate the seed conservation infrastructures, exchange knowledge and provide a wider and more efficient access to and use of these infrastructures. Through the activities and achievements of ENSCRI, the scientific community will be better positioned to tackle new or unexpected challenges in their fields. For example, it will become capable of addressing the major global challenge of biodiversity loss.

In the EU, two particular threats to biodiversity have been highlighted as major drivers. The first is unsustainable use of natural resources and ill-considered land use. The second is the increasing impact of climate change, a major global challenge in its own right. As Europe was both originator and major beneficiary of the industrial revolution, early and vigorous actions to minimise consequence of climate change are appropriate. Climate change is expected to exacerbate biodiversity loss. The European Commission/EU Parliament Green paper 'Adapting to climate change in Europe' (2007) (SEC(2007)849) identifies Southern Europe, the Mediterranean Basin, mountainous areas (in particular the European Alps), coastal zones, floodplains, Scandinavia and the Arctic region as the areas most vulnerable to climate change. In these areas the risk of extinction will be increased for those species where population numbers are low, habitats are restricted or patchy, and climatic/geographic ranges are limited.

The EC communication 'Halting the loss of biodiversity – and beyond: sustaining ecosystem services for human well–being' (2006) reports the Millennium Ecosystem Assessment's finding that Europe's ecosystems have suffered more human–induced fragmentation than those of any other continent. For example, only 1–3% of Western Europe's forests can be classed as 'undisturbed' by humans. Since the 1950s, Europe has lost more than half of its wetlands and farmland with a high value for nature. At the species level, some 800 plant species in Europe are at risk of global extinction whilst many once common species are in decline.

With the economic development strategy presented in the Lisbon Strategy focussed on the life sciences and biotechnology, the casual and unintended loss of any potential "biodiversity building blocks" within Europe would not be sensible. At the ecological level, by having such building blocks secured, Europe will have provided itself with the opportunity of assisting the migration of plant populations such that they can be re-established and re-assembled in response to changes in climate. Securing Europe's plants therefore has current and future beneficial impacts scientifically, economically and morally. There is a 'moral imperative' that Europe should secure current plant germplasm for future generations. ENSCRI complements efforts made to conserve plant diversity *in situ*.

ENSCRI will through its activities not only boost integrated research, technological development and innovation to tackle the challenge of biodiversity loss, it also directly assists through its own activities. A key element of ENSCRI's work is the seed collection, conservation and germination in work package R1 and access to the fruits of this work for European researchers through work packages A1 to A7. This will be the first time that Europe's seed-bearing flora has been collected in a concerted way. Furthermore, the intended users will have helped to steer the process. Consequently, the needs of conservation, climate change migitation and the needs of the environmental and life science base will be synthesised.

It is envisaged that the unique access offered to the facilities, research, expertise and data services within the infrastructure to users from all over Europe will have several valuable impacts. It is anticipated that those using the access will be other seed conservation scientists, those involved in seed research and those using the facilities and expertise for other types of research. In total, the six access seed banks expect 250 different users visiting the installations, and more than 5000 seed samples to be send out for investigation. Compared with the current situation, the number of research infrastructure visitors from abroad will increase significantly. To give a few of many possible examples[2]:

- Researchers undertaking provenance trials to understand how species from different latitudes respond to climate change and whether they might be able to move into their new suitable climate space. Access to data could help in modelling, especially where research is focused on the leading edges of ranges. Also, data from within a species' range could be interesting to determine the environmental factors affecting growth across their range

- Other climate change scientists may wish that certain indicator species are targeted such that genetic variation frozen early in the 21st century can be compared with that in the field. Restoration ecologists may wish that certain species assemblages from certain habitats are collected. Yet others are interested in seeds from other provenances in relation to re-planting experiments.

- Biotechnologists may have a particular interest in incorporating particularly traits from wild germplasm into new food and industrial crop varieties for example, tolerance to increased salinity.

- Forestry, agricultural and horticultural research institutes will be interested in having access to the research infrastructures to test e.g. the germination and establishment rates of potential new crop and ornamental species.

[2] These examples are drawn from a consultation exercise within ENSCONET and their collaborators. They include Professor Harris, Chair in Environmental Technology, Cranfield University; Dr Berry, Environmental Change Institute, Oxford University; Professor Grabherr, University of Vienna (GLORIA Project); Dr Nawrath, University of Frankfurt; the Directorate general for species protection, Regional Ministry of the Environment, Balearic Government; Drs Racz and Debreczy, Hungarian Natural History Museum, Budapest.

- The service provision of data from the main ENSCRI database will help inform conservation scientists and practitioners within Europe at both the national and continental levels. It will be a key element in helping monitor achievement of continental and global conservation goals such as those currently enshrined in Countdown 2010 and the European Plant Conservation Strategy. Because the database contains information on populations, the data may also be valuable in current and future conservation assessments. The data are likely to have value for those involved in large-scale comparative biology studies.

- We expect the user community to extend beyond the environmental and life sciences. We expect that a portion of the users will come from disciplines as varied as forensic sciences and archaeology, either to identify plant material, to enlarge their existing scientific depositories or for comparative studies and extracting chemical compounds.

- The user community will include governmental bodies interested in obtaining direct access to seeds and the services that ENSCRI will provide, e.g. in order to apply species protection actions in protected natural areas.

This four year project will initiate a greater collaboration in these areas. Previously, wild species seed banks collected with an agenda primarily directed towards conservation. Through this project, we expect to bring them more towards the agenda of the crop seed banks where use and conservation go hand-in-hand. There is the opportunity that ENSCRI will build a useful bridge between the two types of infrastructure which have previously worked somewhat independently. This will create new synergies on a European level.

One benefit of the project will relate to the concerted effort to collect, conserve and supply material to a high standard. This will principally be overseen by work package N2. The quality of material being offered by botanic gardens and their seed banks has often been variable with respect to germination and identification. ENSCRI will ensure high standards of quality assurance. By collecting seeds and making them accessible, pressure will be taken off wild populations. The new infrastructure will provide well-documented, high quality samples under simple rules that controls use in a way that is compatible with the Sustainable Development Strategy, the renewed Lisbon partnership for growth and jobs and the precautionary principles inherent in the environmental policy. Making access with one joint infrastructure will be much more efficient than having to contact a large number of disparate infrastructures. As part of the access service, researchers in Europe will have free online access to the ENSCRI database with search menus for e.g. species and localities.

The quality and extent of seed conservation within Europe will be enhanced through the optimised use of the seed conservation research infrastructures by the users. ENSCRI will seek to have an impact in neighbouring countries and more widely. With small national and local seed storage facilities being established every year in Europe for both conservation and restoration, it is essential that this effort makes the most impact. Access to ENSCRI expertise will therefore be valuable to such newly-created facilities. ENSCRI comprises world-leading expertise in general seed biology and seed technology. The project participants are key actors within Europe and in their national and regional research systems. This expertise and the associated facilities will be valuable to those involved in seed biology from the academic, horticultural and agricultural disciplines and those carrying out research that calls on and complements this expertise. Indeed, such synergies could generate new lines of research that are attractive to young able scientists wishing to be at the forefront of translating theory into practice regarding e.g. the sustainable use of plant biodiversity.

The research data from work package R2, the germination predictor, will have a significant impact to those using seeds academically and commercially by reducing the number of tests required to break dormancy and by maximising the release of genetic diversity from the accessions. It is intended that this tool becomes self-improving using direct feedback of positive and negative test results. It will have an impact within the four years both inside and outside the project. If subsequently it becomes well established not only on a European but on a global scale then it will

take on a very great significance. If successful, it will create the possibility for a paradigm shift in the quality assurance offered by companies selling seed propagated from wild species. The activities planned in work package R3 on short-lived species will make an impact on how seed research and conservation is carried out in Europe and more widely.

At a broader level, ENSCRI will have beneficial short- and long-term impacts for the citizens and businesses in the EU. The project will contribute to sustainable scientific and economic development.

Businesses including small and medium enterprises (SMEs) will benefit from the positive impacts on the European life science base indicated above of which they are either part or by which they are supported. Clearly, a more efficient and effective seed conservation infrastructure will feed through to them, making them more competitive and ultimately ensuring the aspirations for jobs outlined in the renewed Lisbon Strategy. A good working relationship from the field to the laboratory to the market place should provide an exemplar of integration which would encourage other countries outside Europe to follow suit by demonstrating that conservation and commerce can successfully sit side by side.

Europe's citizens are increasingly aware and concerned about the environment in which they live. In many countries, certain plant species have cultural or iconic status. The public will welcome help to secure, for their offspring, those plant populations and species (and their associated cultural, provisioning and ecosystem services) that they have enjoyed. Furthermore, scientific work applied to conservation work that offered some mitigation against the projected impacts of climate change is seen as making a useful impact on Europe's well-being and social cohesion. This is borne out by comments from the public received by members of the potential consortium. The public wants scientists to stop talking and to actually do something about species loss.

In line with the objectives of the FP7 Capacities Work Programme, the European Native Seed Conservation Research Infrastructure project will optimise the development and use of the world's leading regional infrastructure for the seed banking of wild species. The use of this infrastructure will enable all the scientific communities in Europe and others to remain world leaders in their respective fields of environmental and life sciences. The project will encourage exchange of knowledge, information and personnel, to the benefit of both, the advancement of the European Research Area in general and the European seed conservation in particular.

There is a narrow window of opportunity to secure Europe's plant diversity before it is lost to culture, science and commerce. The sooner we act, the more we will save.

3.2 Dissemination and/or exploitation of project results, and management of intellectual property

The details of the Communication work package are described under N6 in section 1.3 (iii). The key approach to dissemination will be on-line publication where possible. This allows open access and allows the network to keep updated the data that are made available. This is particularly useful for protocols and standards that may change fairly frequently as new information and new scientific evidence becomes available. However, it is clearly recognised that potential recipients of the information need to be informed that the project exists and that it has a website with specific types of information. This will be done by the publication of a printed annual newsletter "ENSCONEWS" (which will be carefully targeted to have the maximum impact) and through a certain number of carefully released news items. In the ENSCONET project major stories have linked, for example, to the work of colleagues at PAV-UNI-CFA regarding Alpine plant population shifts in relation to climate change. Such news releases raise the profile of the project and an opportunity to publicise the website. A significant objective of the project's dissemination activities is to make scientific findings understandable for the general public, as ultimately their tax money will fund this project.

The website will present raw data via the virtual seed bank database and via specific files. The germination predictor (work package R2) will also be available from the website via a link to the RBGK Seed Information Database that is fast becoming a ‘one-stop shop’ for seed information and currently receives some 66,000 focussed enquiries per year.

Potentially, there are intellectual property issues relating to the development of the European Germination Predictor in R2 because it could have commercial value. Because the UK Germination Predictor on which it is based will be made free on-line, it is likely that the European version will be released in a similar fashion. If it is felt appropriate by the network, RBGK as Co-ordinator will seek advice from its legal team and intellectual property advisers. Furthermore, there will be intellectual property issues that relate to the commercialisation by users of research resulting from the supplied seeds. This will be covered by the Material Supply Agreements (see N7) which will be influenced by the Bonn Guidelines developed by the botanic gardens community. These demand that each party to the supply (land-owner, supplier or user) are clear from the start about the expectations of the other parties.

There could be intellectual property issues related to those data that are derived from intellectual input such as taxonomic identification and germination. It is assumed that the ownership of the data will remain with the respective donor institutes. However, the Consortium Agreement will cover issues of data transfer to the ENSCRI virtual seed bank database and its free use by the project subject to certain issues of site confidentiality. Certain non-derived data may be confidential. For instance, there may be restrictions placed on the location data of certain rare plant populations. This is prudent to prevent the database being used by unscrupulous private or commercial collectors and, in any case, this may be required by national legislation. In cases where making the data available outside the network might prejudice future publication, a delay in transferring the data to the visible part of the database may take place, giving participants time to submit their findings to refereed journals.

The ‘open-access’ publication of research publications will be encouraged preferably by the option of downloading pdf reprints via the website.

4. Ethical issues

ENSCRI shares the values laid out in the European Charter of Fundamental Rights (ECFR). Ethical issues are an integral part of this project. All project activities are being carried out in compliance with fundamental ethical principles, as it is outlined in Art. 6 of the Seventh Framework Programme (Decision no. 1982/2006/EC).

The International Advisory Board (IAB) advises the Project Steering Group on any ethical issue that might emerge in the course of the project. It will supervise the compliance of the project activities with the principles of the ECFR.

The protection, storage and use of personal data of access users is dealt within work package N7.

ETHICAL ISSUES TABLE

	YES	PAGE
Informed Consent		
• Does the proposal involve children?		
• Does the proposal involve patients or persons not able to give consent?		
• Does the proposal involve adult healthy volunteers?		
• Does the proposal involve Human Genetic Material?		
• Does the proposal involve Human biological samples?		
• Does the proposal involve Human data collection?		
Research on Human embryo/foetus		
• Does the proposal involve Human Embryos?		
• Does the proposal involve Human Foetal Tissue / Cells?		
• Does the proposal involve Human Embryonic Stem Cells?		
Privacy		
• Does the proposal involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)		
• Does the proposal involve tracking the location or observation of people?		
Research on Animals		
• Does the proposal involve research on animals?		
• Are those animals transgenic small laboratory animals?		
• Are those animals transgenic farm animals?		
• Are those animals cloned farm animals?		
• Are those animals non-human primates?		
Research Involving Developing Countries		
• Use of local resources (genetic, animal, plant etc)		

• Impact on a local community		
Dual Use and potential for terrorist abuse		
• Research having direct military application		
• Research having the potential for terrorist abuse		
I CONFIRM THAT NONE OF THE ABOVE ISSUES APPLY TO MY PROPOSAL	**X**	

5. Consideration of gender aspects

Article 2 of the Treaty establishing the European Community (consolidated version 2006) mentions the equality between men and women. Article 137(i) defines the “equality between men and women with regard to labour market opportunities and treatment at work”.

Although the managers of several participating research infrastructures are female (MAICh, CJBG, FUL, UPM, CYARI, UiO, IB-BAS, JB Soller, UVEG) and although already a significant proportion of the personnel involved in seed banking are women (e.g. 60% of staff belonging to RBGK’s Seed Conservation Department operating the largest wild species seed bank in Europe, are female), it is recognised that there is a need to better balance the ratio of male to female staff especially at the higher management levels.

ENSCRI aims for a balanced employment structure within the consortium, including early stage researchers. It will encourage women’s participation in all project activities and more generally seed banking and related disciplines.

Special Gender Actions, e.g. work/life balance programmes, are in place in most participating Research Infrastructures as part of their institutional gender policy.

ENSCRI aims not only to achieve a better staff gender balance but also a gender balance of the facility users, as research stays from female scientists are currently less frequent than those from male scientists (at FUB-BGBM for example, about a third of the scientific visitors are women). In the calls for access which will be published every six months, applications from female researchers as well as from young and early stage researchers are explicitly encouraged. One of the tasks of the International Advisory Board (see above) is to oversee the equal involvement of female and young researchers.

The training events being organised in the Networking activity work package N4 are directed equally towards men and women.

During the development of the project products (such as protocols, seed bank procedures and Access rules), the views of the female seed bank managers among the participants and other female staff will be actively sought in order to address women’s and men’s needs equally.