GBRCN Business Plan

DRAFT

Confidential

Executive summary

Strategic Interest

Biological Resource Centres (BRCs) are the modern generation public service culture collections. A call for their networking resulting in the OECD-BRC-Initiative to establish the Global Biological Resource Centre Network is regarded as absolutely timely. Particularly, as it is now recognised that Research Infrastructures provide the new dimension in life science research. The main drivers for the establishment of the GBRCN are the need to better utilise biological diversity in biotechnology to enable nations to deliver the Bioeconomy and deliver natural solutions to today's global challenges. Innovation has been placed at the heart of the Europe 2020 strategy and is the best means of successfully tackling major societal challenges, such as climate change, energy and resource scarcity, health and ageing, which are becoming more urgent by the day. At a time of public budget constraints, major demographic changes and increasing global competition there remains too much fragmentation and costly duplication. Harnessing the power of networking of collections is essential.

Product and Services

Supporting Governments to

- Coordinate legitimate access to high quality resources for research and development helping deliver the national bioeconomy
- Implement international conventions and legislation particularly in biosecurity and the CBD Access and benefit sharing
- Reduction of duplication providing cost effective and efficient cross network approaches

Supporting Innovation by

- Focussing essential services such as identification of novel organisms, targeting specific chemistry in organisms for further study and protection of public investment made in the isolation of organisms and the generation of information and knowledge by maintaining the link between the biological material and the information
- The honest broker in the conservation and utilisation of genetic resources

The Market

585 collections listed in the World Data Centre for Microorganisms with 1.7 million strains

- 506,333 fungi representing 100000 fungal species described, 25.5% of types
- 758,831 bacteria representing the 9000 Type species, around 80% coverage

Of 20,200 prokaryotic research strains in 835 articles in eight European journals in 2008 only 190 strains (0.94%) were deposited in public service collections

Some 0.5 million strains are supplied each year World Data Centre for Microorganisms (WDCM)

If 99% of strains supplied are not from collections then 50 million strains are provided often without provinence

100 000 described species of fungi and the estimated 1.4 million yet to be described

Operational Environment

There is a lot of work to be done (see *The Market* above) this needs to be coordinated and within a legal operational framework is needed to comply with the CBD ABS Nagoya protocol and other legislation such as that governing biosafety, biosecurity and IP.

Competition

Existing federations have no mandate for change, to implement best practice or coordinate and focus activities. The major global, regional and national collection communities will work with the GBRCN to help achieve the necessary goals.

Risk/Opportunity

1. European move to consolidate resources and establish research infrastructure

2. Global interest in conserving, managing and utilising biodiversity
3. Vast estimated numbers of species yet to be isolated
4. New technologies and data mining opportunities
5. Diminishing expertise
6. National legislation impeding the exchange of materials and information
7. False expectations that organisms will contribute to solutions
8. Companies and academia continuing to use non validated strains
9. Output of the GBRCN Demonstration project and interest in joining in its success

Robust Governance with links to country authorities and the broad expertise in the interested partners will take up the opportunities and reduce impact of threats.

Business Strategy

- Robust governance structure and Governmental involvement through a Memorandum of Understanding
- Membership agreements that will enable implementation of common practices, procedures and collaborative work programmes
- A user community partnership to ensure the network provides the resources and services required
- Operations using clusters of relevant expertise to deliver efficient solutions and output relevant to the whole network
- Associated capacity building programmes to accelerate development

Capital Requirement

A relative small budget to run the Secretariat less than €800Kp/a
Most cluster activities will be funded independently through donor programmes

Financial Plan

There is a need for alternative funding arrangements for the secretariat depending upon what is possible and preferred in each country. Engagement at the Government level has been difficult and more work is needed to engage them. Some countries have preferred the BRCs to contribute with the costs to be met either from additional budget allocation or from existing budgets. History has shown that the collections (BRCs) themselves have no funding for networks and if it costs then they tend not to join. The two main alternatives are therefore:

- Country contributions based upon a country's GDP
- Institutional contributions

Recommendation

Governments commit to support the GBRCN by agreeing and signing the MoU and contribute to the funding of the GBRCN Secretariat to ensure its continuity.

Strategic Interest

Biological Resource Centres (BRCs) are the modern generation public service culture collections. A call for their networking resulting in the OECD-BRC-Initiative to establish the Global Biological Resource Centre Network is regarded as absolutely timely. Particularly, as it is now recognised that Research Infrastructures provide the new dimension in life science research. The European Strategy Forum for Research Infrastructures (ESFRI) was established in 2002 to support a coherent and strategy-led approach to policy-making on research infrastructures in Europe, and to facilitate multilateral initiatives leading to the better use and development of research infrastructures, at the EU and international level. ESFRI are establishing pan-European structures to drive innovation to provide the resources, technologies and services as the basic tools necessary to underpin research. The ESFRI strategy aims at overcoming the limits due to fragmentation of individual policies and provides Europe with the most up-to-date Research Infrastructures (RI), responding to the rapidly evolving Science frontiers, advancing also the knowledge-based technologies and their extended use. The microbiology collection community led by the GBRCN Secretariat have succeeded in placing the Microbial Resources Research Infrastructure (MIRRI) on the ESFRI roadmap. The resultant high quality global platform will be designed to accommodate the future needs of biotechnology and biomedicine. Additionally, the emerging strategy for the EU, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Europe 2020 Flagship Initiative, *Innovation Union* SEC(2010) 1161, European Commission Brussels, 6.10.2010.

Innovation has been placed at the heart of the Europe 2020 strategy and is the best means of successfully tackling major societal challenges, such as climate change, energy and resource scarcity, health and ageing, which are becoming more urgent by the day. At a time of public budget constraints, major demographic changes and increasing global competition there remains too much fragmentation and costly duplication. Resources must be spent more efficiently and achieve critical mass. The Innovation Union sets out an integrated and strategic approach, exploiting and leveraging strengths in new and productive ways. The capacity to create millions of new jobs to replace those lost in the crisis depends on our ability to drive innovation in products, services, business and social processes and models. This demands reforms to get more value for money and tackle fragmentation. EU and national research and innovation systems need to be better linked up with each other and their performance improved. Researchers and innovators must be able to work and cooperate across the EU as easily as within national borders with frameworks for a truly free movement of knowledge. There is a need to get more innovation out of research. Cooperation between the worlds of science and the world of business must be enhanced, obstacles removed and incentives put in place. Europe needs to work better with our international partners. That means opening access to R&D programmes, while ensuring comparable conditions abroad. Establishing a common EU front reducing fragmentation and working together to achieve more effective and efficient advances is what the *Innovation Union* is all about.

Biological Resources, such as microorganisms and their derivatives, are the essential raw material for the advancement of biotechnology, human health and research and development in the Life Sciences. The complexity of legitimate collection, distribution and use of living biological material demands the coordination and sharing of activities. The quality and range of service required by today‘s biotechnology and biomedicine will be delivered more easily through a coordinated network rather than through individual collections. The GBRCN can provide the research infrastructure to help deliver the EU Innovation Union. The biological materials held in biological resource centres are employed in fundamental research and find applications in the pharmaceutical area, in agriculture as well as in food industries. It is essential that these materials are not only easily and directly accessible but also that they are of high quality and authentic. The task of *ex-situ* conservation of biodiversity is enormous and exceeds the technical potential of an individual collection in any individual country. It is a known fact that only a small proportion of microbial diversity is represented in culture collections. Additionally, the number of valid

descriptions of e.g. novel bacterial species (which requires deposition of the type strain in a collection) is steeply increasing and this task alone already exceeds the abilities of most collections. The same holds true for other types of biological material as well, e.g. fungi and algae. Adequate collection management of well preserved and authenticated organisms is essential to guarantee quality and safety in the various areas of application, to allow controlled access to potentially hazardous organisms and to ease and improve the advantageous utilisation of the materials for health and the environment.

The EU initiative for a knowledge based bio-economy considers the transformation of knowledge from the life sciences into new, sustainable, ecologically efficient and competitive products as an enormous challenge. It expresses the expectation that by 2030 the products of white biotechnology and bioenergy will constitute around a third of industrial production. The information system that will be embedded in the future GBRCN (Global Biological Resource Centres Network) will address this challenge. It will not only provide improved access to biological resources and their related data, but it will allow the combination of related data from other disciplines to produce data landscapes and through modern, interactive tools will allow new interpretations and innovation.

The recent OECD report *The Bioeconomy to 2030: designing a policy agenda* (2009)[1] emphasises that the biological sciences are adding value to a host of products and services, producing what some have labelled the "bioeconomy". The report explains that from a broad economic perspective, the bioeconomy refers to the set of economic activities relating to the invention, development, production and use of biological products and processes. If it continues on course, the bioeconomy could make major socioeconomic contributions in OECD and non-OECD countries. These benefits are expected to improve health outcomes, boost the productivity of agriculture and industrial processes, and enhance environmental sustainability. The bioeconomy's success is not, however, guaranteed: harnessing its potential will require coordinated policy action by governments to reap the benefits of the biotechnology revolution.

Harnessing the power of networking of collections is bearing fruit. The World Federation for Culture Collections has been fighting the cause for over 4 decades (http://www.wfcc.info) and in Europe the European Culture Collection's Organisation (ECCO – http://www.eccosite.org). However, a lot of work needs to be done both by collections and Governments if they indeed wish to harness the power of microbial diversity which is already the source of wondrous drugs and chemical products. We need to harness the microorganisms if we are to tackle the big global challenges of today in poverty alleviation, food security, healthcare, climate change and the environment. ECCO has incubated several European initiatives that have helped collections survive for example, recent European Community Framework Programme projects such as the Common Access to Biological Resources and Information (http://www.cabri.org), EBRCN (European Biological Resource Centres Network – www.ebrcn.net) and the European Consortium of Microbial Resource Centres (http://www.embarc.eu). Project funding is not the answer but networking to improve coverage, provide high quality products and services will help access funds that will keep them going as a pipeline to research, development and the bioeconomy.

Product and Services

The GBRCN through its activities such as MIRRI will build on:

- The foundation set by the OECD BRC Task Force providing best practice[2]
- The GBRCN demonstration and the EMbaRC projects
- Voluntary scientific-technically based collection network activities, such as WFCC and ECCO

The goal is to bring added value:

[3] *The Bioeconomy to 2030: designing a policy agenda*. OECD Publications 2009

[2] *OECD Best Practice Guidelines for Biological Resource Centres (Online),* http://www.oecd.org/dataoecd/7/13/GGTSPU-styx2.bba.de-7664-3281383-DAT/38777417.pdf Accessed January 20, 2011.

- Establishing a co-ordinated approach to coverage of organisms, the expertise to handle them and the delivery of mechanisms to ensure implementation of best practice in the provision of the resources and services.
- Creating a distributed platform for microbial taxonomy to ensure best use of the remaining expertise and putting in place a human resource development programme.
- Tackling key obstacles to research needs in a co-ordinated way, enabling provision of services above what is currently supplied by individual microbial resource collections:
    i. Enabling a cross network focus on delivery of resources that meet specific needs
    ii. Implementation of common policies that work across international boundaries to facilitate access
    iii. Establishing facilities and resources in countries rich in microbial diversity but without resources and facilities to make them readily available for research
    iv. Creating linkages to data in other systems relevant for data mining and enabling targeting of specific microbial resources for specific tasks – bringing all microbial collection data together creates the critical mass to make this action meaningful
    v. Establishment of common operational procedures within the existing legal framework for facilitated while legitimate and safe access

The network will focus efforts through the cluster model to deliver an improved resource to meet user needs. User demands are varied and cannot normally be serviced by one collection alone; a co-ordinated response to their needs is required. International co-operation is the only way forward to provide:

- enhanced worldwide accessibility to information and biological material
- co-ordination of standards
- linkage between scientific needs and government policies
- frameworks for regulatory initiatives
- linking mechanisms for countries without BRCs
- enhanced efficiency and reduced redundancies
- improved transparency.

Supporting Governments to

- Coordinate legitimate access to high quality resources for research and development helping deliver the national bioeconomy
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Supporting Innovation by

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- The honest broker in the conservation and utilisation of genetic resources

What the GBRCN will do

- Network networks of BRCs for improved effectiveness and efficiency – value for money
- Set and implement coordinated policy and strategies in line with legislation, policy and user needs
- Focus activities to deliver services and resources to meet needs
- Implement best practices in quality management and legitimate operations

What the GBRCN needs

- Engagement in the GBRCN Governance structure

- Financial support for the secretariat activities
- To be consulted as a source of information on policy development in the area of genetic resource conservation and utilisation, biosafety and life science research

The benefits of creating a global network of BRCs was described in the OECD publication on *Biological Resource Centres*[3] the report stresses:
International co-operation is needed to provide enhanced worldwide accessibility to information and biological material, co-ordination of standards, linkage between scientific needs and government policies, a framework for regulatory initiatives, a linking mechanism for countries without BRCs and enhanced efficiency reducing redundancies, improve transparency and efficiency and help participants to harness resources.

Issues that can be delivered better through a research infrastructure over and above what is currently supplied by individual microbial resource collections are:

i. Capacity and strategies to enable a broader coverage of products (organisms)
ii. Facilitate access to limited numbers of microbial specialists
iii. Human resource development programmes to train successors
iv. Bringing together working groups to focus on delivery of resources that meet specific needs
v. Implement common policies that work across international boundaries to facilitate access
vi. Help establish facilities and resources in countries or regions rich in microbial diversity but without resources and facilities to make them readily available for research
vii. Create linkages to data in other systems relevant for data mining and enabling targeting of specific microbial resources for specific tasks – bringing all microbial collection data together creates the critical mass to make this action meaningful
viii. Provide a comprehensive coverage of reference strains
ix. Co-ordinated interaction with other ESFRI RIs
x. Establishment of a legal operational framework for legitimate and safe access

The Market

Microorganisms are used for many different purposes, as reference strains in identification, as standards in tests, as producers of chemicals, as whole organisms in products or for specific use such as biocontrol. The source of these strains are many, individual scientists, private collections and the public service collections. It is difficult to estimate the total number of strains isolated, preserved, identified, supplied and utilized each year. If there were more strains available would more be utilized? If more information on properties was available would this help target and reduce numbers that were used for some purposes? It is certainly the case that if there was a access to all strains and associated data through one portal then access would be more efficient and effective.

There are currently 1.7 million strains available via the 585 collections listed in the World Data Centre for Microorganisms http://wdcm.nig.ac.jp/statistics.html accessed 20 January 2011. There are 506,333 fungi representing the approximately 100000 fungal species described, of the strains in the WDCM 25,578 (25.5%) are type of species or sub-species. There are 758,831 bacteria representing the 9000 or so valid species; amongst the bacteria strains held by the WDCM registered collections are 20,458 type of species or sub-species of bacteria (but not all valid around 80% coverage of all types). There are obvious gaps in availability of representative strains of the species but given the immense variation of expressed properties of species the gap is considerable.

[3] *Biological Resource Centres – Underpinning the Future of Life Sciences and Biotechnology* (http://oecdpublications.gfi-nb.com/cgi-bin/oecdbookshop.storefront) .

Deposit of strains that are cited in the literature in collections to facilitate their availability as vouchers for confirmation of results and further work is dismal. Of 20,200 prokaryotic research strains in 835 articles in eight European journals in 2008 only 190 strains (0.94%) were deposited in public collections[4]. BRCs provide biological resources (living organisms) and preservation services to microbiologists working in the fields of education, environment, agriculture, and biotechnology. It can be assumed that the American Type Culture Collection (ATCC) supplies around 160 000 individual samples per year (the majority cell lines and not microorganisms), the DSMZ around 20000 but most collections supply a lot less, a more likely figure for those most well used would be 1 to 4 thousand and the majority only a few hundred. Based on this and the fact that there are around 585 collections registered with the World Data Centre for Microorganisms (WDCM) some 0.5 million strains are supplied each year. These cover all cell types such as algae, animal cell cultures, bacteria, fungi, plant cell cultures, protozoa and viruses. Assuming that over 99% of strains supplied are not from collections then strains utilized annually is excess of 50 million. The concern is that many of the strains provided by non-collections are not authentic and not preserved well undermining any research done with them. BRCs, operating best practice, need to provide the majority of these strains rather than the minority to ensure high quality research.

BRCs are not just repositories or suppliers of strains. They provide many essential services, of the 585 WDCM registered collections, 85 provide patent deposit services; 295 provide identification services; 250 provide training services; 261 provide various consultation services. There is a diminishing number of microbial taxonomists, bring together a critical mass is essential to get good coverage and with images from microscopes easily move around the world the specialist resource of the GBRCN will be accessible to resolve problems on a global basis. Exploration of new environments and ecosystems will be enhanced through access to these specialists. Problems solved and innovative solutions possible. CABI Bioservices performs 2000 identifications per year and similar or higher numbers are performed by other collections; the demand is huge; all research in microbiology must be based on well authenticated specimens.

There is a long way to go before we have access to material representing the 100 000 described species of fungi and the estimated 1.4 million yet to be described[5]. Targeted isolation programmes are needed to make inroads into this enormous task. Additionally, only a small fraction of the described fungal species has been screened for the production of natural products. The use of molecular techniques and high through put screening increases our capacity to release fungal potential. Often screening only takes a snap shot of part of an organism's chemistry, expression of genes can be strain specific, indeed genes may have suppressed in some organisms while others may have multiple copies of genes. Knowledge of the fungus' lifecycle, its interaction with its environment, its host or the organisms in its ecosystem are essential to ensure extracts produced for screening access its full potential. The GBRCN has the potential to coordinate targeted isolation programmes in a legitimate ABS protocol compliant manner.

Significant effort is being put into ecosystem based approaches where little explored or extreme environments are being studied. The Iwokrama programme was established to demonstrate how tropical forest biodiversity may be conserved and sustainably utilised for ecological, social and economic benefits[6]. 84 of the isolates were found to have potent anti-insect activity, 14 exhibited potent anti-fungal activities and 13 potent anti-bacterial activities. This provided a tremendous hit

[4] Stackebrandt, E. (2010). Diversification and focusing: strategies of microbial culture collections. Trends Microbiol 18, 283–287.

[5] D.L. Hawksworth, The magnitude of fungal diversity: the 1.5 million species estimate revisited. Mycol Res., 105:1422-1432, 2001;

[6] J. Kelley, P.C. Cannon, M Simmonds, R. Pingal, and C. Simmons, The Iwokrama programme: An approach to the sustainable exploitation of genetic resources. In Biological Resource centres and the Use of Microbes edited by N. Lima and D. Smith. XXII ECCO Meetining Proceedings. Portugal: Micotecca da Universidade do Minho. p185-195. 2003;

rate of 1 in 3 although not all will be new active molecules and quite often it is found that activity is due to a combination of molecules in the extract and as a result not easily exploited. The key to the success in this case was:

- Selection of a unique, unexplored ecosystem
- Targeted organisms with unusual properties
- Sampling techniques and analysis carried out by specially trained experts
- Selection of charcterisation techniques as de-duplicating tools

The properties of a fungus are reflected by the habitat in which they grow (Wildman, 1995) therefore taking isolates from a wide variety of ecosystems will increase the chances of discovering new products. Organism groups that are most likely to provide new compounds include basidiomycetes endophytes, ascomycetes and their anamorphs..

The chances of finding active molecules vary enormously but ensuring a targeted and structured approach, utilising appropriate technologies and the employment of the right skills it can be rewarding. In one large programme 13% of the tropical fungi screened for antifungal, antibacterial, antivirals, insecticidal, antihelminthic agents, anti-cancer, diabetes melitus, anti-inflammatory and endocrinological leads using 2 or 4 methods and 2 extracting solvents yielded active compounds[7]. However, it is not as straight forward as it is estimated that there is only a 1 in 250000 chance for an unknown chemical to reach the market, if you have active compounds this increases to between 1: 5000 to 1: 10000[8] [9] [10]. Chances of active molecule discovery are seen to be enhanced when fungal metabolism can be manipulated[11], linking this to knowledge of ecosystems, targeted isolation programs can give access to the most promising organisms. The Biopharmaceuticals Report (http://www.researchandmarkets.com/reports/39083) values the global market at US$41 billion (£24 billion) growing at a rate of 21% over the past five years. It is considered that the total pharmaceutical market could easily reach US$100 billion (£59 billion) by the end of the decade. There are huge revenues from fungal derived drugs e.g. cyclosporin, £0.8 billion: and amoxicillin £1 billion.

Operational Environment

Bioscience industry and academia require improved access to high quality, value-added products and services from biological resource collections and BRCs are being enhanced to meet these needs. There is a requirement for quality, avoidance of duplication, research, training and networking as part of their main recommendations for development. The ultimate goal is a distributed network of collections concentrating their work in the areas of their expertise and operating to universal high standards.

The awareness of customer needs is essential and MIRRI is designed to bring the resource and user communities together. An information resource must be established and a global "catalogue"" accessible; new products must be developed to meet customer needs. The key factors for success are the wealth of expertise in the network, the proven need for the products and services, and the potential for microbial solutions to the world's problems being discovered. Companies seem less interested in taking organisms for screening and are looking for the provision of active biomolecules.

[7] G.F Bills, A. Dombrowski, F. Paláez, J. Polishook, & Z. An, Recent and future discoveries of pharmacologically active metabolites from tropical fungi. In: Tropical Mycology, Vol. 2, *Micromycetes* (eds R. Watling, J.C. Frankland, A.M. Ainsworth, S. Isaac and C.H. Robinson) CAB International. p165-194, 2002;

[8] G. Crocker, (ed) Ernst & Young's Eighth Annual European Life Sciences Report 2001: Integration. Life sciences Group. London: Ernst & Young International. pp 79, 2001;

[9] K. ten Kate, K. and S.A. Laird, The commercial use of biodiversity; Access to genetic resources and benefit sharing. pp 398. UK: Earthscan Publications Ltd. 1999;

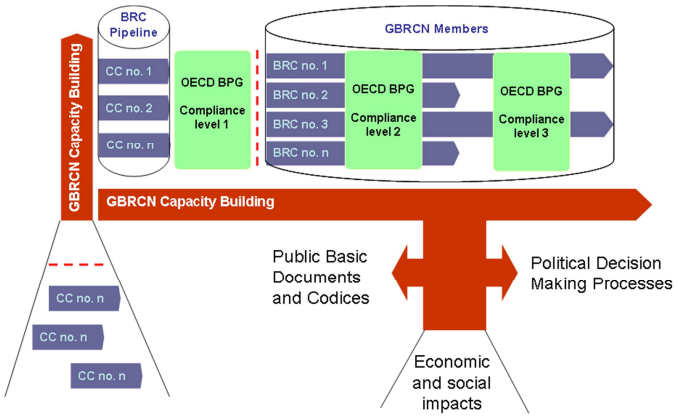
[10] PhRMA, *PhRMA Facts*, Washington DC; 1998

[11] P.K. Chang, & R.B.Todd, Metabolic pathway regulation. In: Handbook of Biotechnology, Mycology 20, second edition, edited by D.K. Arora. New York: Marcel Dekker. p 25-37, 2004

Exploitation of biological materials must be in compliance with conventions, treaties and law for example the Convention on Biological Diversity (CBD). The CBD requires that Prior Informed Consent (PIC) be obtained in the country where organisms are to be collected. Terms, on which any benefits will be shared, must be agreed. The benefits may be monetary but could be information, technology transfer or training. If the organism is passed to a third party it must be under terms agreed by the country of origin. This will entail the use of material transfer agreements between supplier and recipient to ensure benefit sharing with, at least, the country of origin. Access and benefit sharing rules must be followed and signatory countries to the CBD have agreed a voluntary code of practice, the Nagoya ABS Protocol (http://www.cbd.int/abs/). The national implementation of the protocol may well impede access and exchange of materials and information. The GBRCN will work towards a mutually beneficial multilateral operational framework to facilitate science and the discovery process.

Biosecurity impacts heavily on the operations of public service microbial domain Biological Resource Centres (mBRC) hence the activities of the WFCC, GBRCN and EMbaRC. The GBRCN and EMbaRC require the implementation of OECD BRC Best Practice which includes the Biosecurity Guidance as well as aspects of biosafety particularly in regard to implementation of national legislation. Concerns exist on the ability of BRCs/culture collections to implement best practice regarding biosecurity, particularly with the requirement of risk assessment. Another key concern is the lack of easy access to regulations and other information regarding national rules and regulations governing the movement of materials. It is evident that culture collections adopt compliant procedures firstly governed by national laws but specifically compliant with the Biological and Toxin Weapons Convention (BTWC). They must endeavour to reduce the potential for misuse of biological agents, toxins or associated information or technologies. The Biosecurity Code of conduct for BRCs sets out an undertaking by mBRCs to tackle their responsibilities and provides a base line for the operation. To this end the GBRCN and EMbaRC projects have designed a Biosecurity Code of conduct for BRCs which when finalized will be binding for GBRCN members.

Capacity building



Competition

The major regions or countries of the world are serviced by collections providing whole organisms. There are 45 major collections supplying cultures in Europe whilst there is only one, the ATCC, serving the USA. The latter enables the ATCC to generate most of its income on commercial basis whereas the European market is shared. The major competitors in Europe are supported by their Governments and are therefore able to survive without becoming fully commercial. The UK market itself is small and shared for example with the ATCC who have their own UK outlet through the Laboratory of the Government Chemist. However, the GBRCN will not interfere with member collection businesses. Certainly, no single collection would be able to compete with the coverage of the GBRCN members. Although the GBRCN will assist the

development of unique products such products would be jointly owned. The GBRCN will help put in place sustainable BRC business plans as it must help ensure sustainability of each BRC member on which it depends as a whole. Healthy business competition will continue to exist between members. The role of the GBRCN will be more of a Trade organisation in this respect.

Additional competitors that may have greater impact are the biotechnology and distribution companies that are selecting best sellers and repackaging them and selling them in bulk and therefore more cheaply, the 'cherry-pickers'. Competition for culture provision is severe not only between collections globally, but because more organisms are exchanged between individual scientists free of charge than are obtained from collections. To support a living collection through culture sales would take a major shift in scientist behaviour, which is impossible for one collection to achieve on its own.

The competition from other networks with the goals of GBRCN exists. The oldest and largest federation of collections is the World Federation of Culture Collections (WFCC) which has around 120 affiliated culture collections and in Europe the European Culture Collection's Organisation ECCO. These like the majority of other regional and national networks (around 20 in number) are not true networks but scientific communities with no mandate to coordinate activities or implement common practices. They tend to operate on a volunteer basis and have no employed staff to implement activities. These federations will not be competitors as such they will work with the GBRCN and their BRC members will become partners of the GBRCN becoming signatory to a membership agreement that will enable a common operational framework to be established.

Risk/Opportunity

1. European move to consolidate resources and establish research infrastructure
2. Global interest in conserving, managing and utilising biodiversity
3. Vast estimated numbers of species yet to be isolated
4. New technologies and data mining opportunities
5. Diminishing expertise
6. National legislation impeding the exchange of materials and information
7. False expectations that organisms will contribute to solutions
8. Companies and academia continuing to use non validated strains
9. Output of the GBRCN Demonstration project and interest in joining in its success

Business Strategy

A bioinformatics database will be developed incorporating the key characters elucidated through culture characterisation programmes, linking to existing databases of environmental, taxonomic, ecosystem, ecosystems, hosts, chemical structures, protein, DNA sequence data and published literature to create a rich landscape of data to be mined to drive innovation. There is a need to work with other system operators to ensure interoperability and the development of tools to improve data and give appropriate access to associated data. Collaboration with key initiatives such as ELIXIR - European Life sciences Infrastructure for Biological Information and GBIF – The Global Biodiversity Information Facility will be essential. The mission of ELIXIR is to construct and operate a sustainable infrastructure for biological information in Europe to support life science research and its translation to medicine and the environment, the bio-industries and society. Microbial data is one component that would strengthen ELIXIR which seems to have an initial focus on genome information; this would be enhanced by organism data, the phenotypic data essential to facilitate use and innovation from microbial diversity.

A legal operational framework compliant with international conventions, compliant with national requirements to facilitate multilateral activities and agreements and facilitating conservation and utilization of genetic materials.

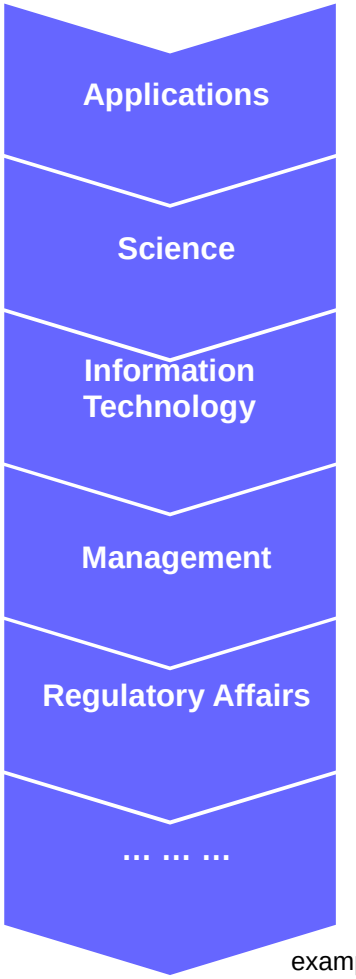
Robust governance structure and Governmental involvement through a Memorandum of Understanding

Membership agreements that will enable implementation of common practices, procedures and collaborative work programmes

A user community partnership to ensure the network provides the resources and services required

Operations using clusters of relevant expertise to deliver efficient solutions and output relevant to the whole network

Example clusters



➢ Food ➢ Energy ➢ Health Care ➢ Environment ➢ Technology

➢ Projects ➢ High Technology ➢ Systematics ➢ … … …

➢ Data Mining ➢ Platforms ➢ Informatics Services

➢ Quality ➢ Communication ➢ Finance ➢ Education

➢ Biosecurity ➢ Biosafety ➢ Standardization ➢ ABS

➢ MIRRI Research Infrastructure activity

Capital Requirement

A relative small budget to run the Secretariat less than €800Kp/a
Most cluster activities will be funded independently through donor programmes

Experience shows with global and regional culture collection organisations such as WFCC, ECCO and national organisations that a small central body of staff is needed to implement network operation and co-ordinate activities. The ultimate size and function of the central secretariat will be developed as the MIRRI concept grows but it will be kept mean and lean, much of the work of the RI will be done by members working in specialised and focussed clusters for example addressing legal and policy issues, taxonomic groups, focus groups to provide solutions to global challenges leaving the secretariat to manage the day to day operations of the RI with the secretariat reporting to the management board and advised by the scientific advisory board. The secretariat would be responsible for:

- **Managing the technical aspects of BRCs**: a quality management system based on international criteria, electronic linkages between BRCs; coordination of catalogues and databases, maintenance and support for BRCs, and development of informatics tools for data analysis, comparison and display.

- **Managing the global network of national BRCs:** responsible for administration e.g. membership issues, reporting, budget management, inter-laboratory testing and validation of protocols
- **Coordinating the BRC initiative with other international initiatives**: coordinating the BRC network with existing international frameworks
- **Providing an intergovernmental forum on BRC issues:** facilitating debate organising the forum
- **Project development and management:** proposal writing, seeking funding, project implementation and management
- **Outreach and publicity:** liaising with users to understand their needs; raising the profile of the Network
- **Organisation and delivery of capacity building programmes:** providing programmes, tools, resources and activities

Alternative financial contributions for the GBRCN Secretariat and core cluster management

There is a need for alternative funding arrangements for the secretariat depending upon what is possible and preferred in each country. Engagement at the Government level has been difficult and more work is needed to engage them. Some countries have preferred the BRCs to contribute with the costs to be met either from additional budget allocation or from existing budgets. History has shown that the collections (BRCs) themselves have no funding for networks and if it costs then they tend not to join. The two main alternatives are therefore:

- Country contributions based upon a country's GDP
- Institutional contributions

Country contributions based upon a country's GDP

Currently there are 15 countries participating in the GBRCN Demonstration Project and there are additional European countries interested in the MIRRI Research Infrastructure activity. If all these interested parties sign the MoU and contribute the following fee structure would provide sufficient funding to cover the secretariat estimated costs of less than €800Kp/a

All figures are in EURO (€)

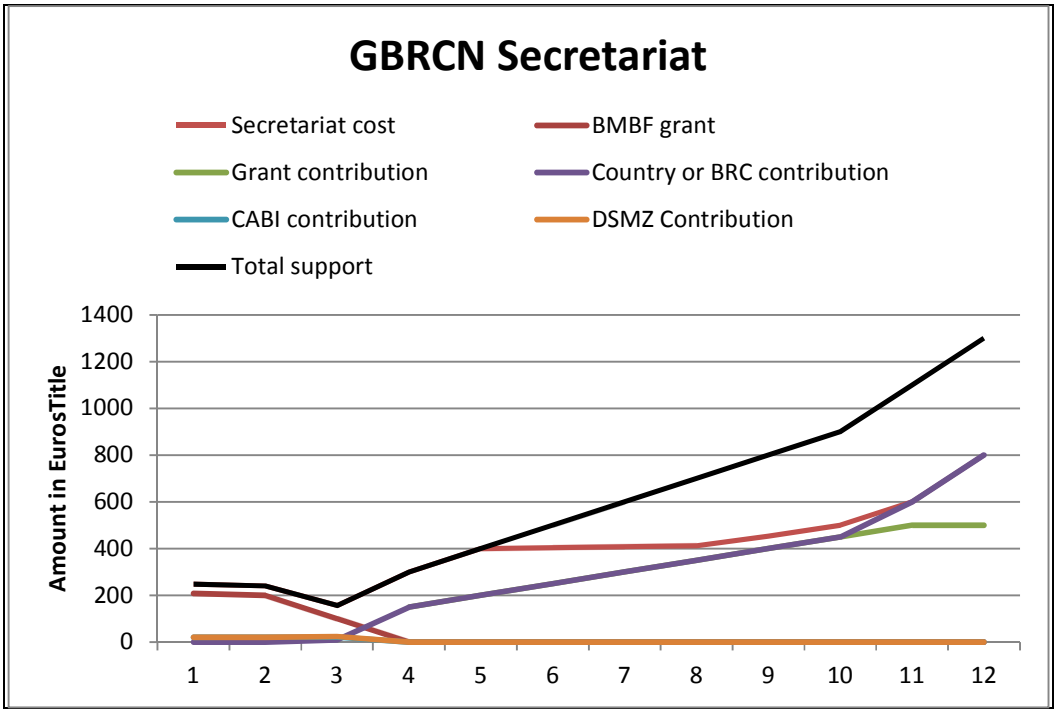
Participant Categories and GDPs	Suggested Annual Basic Financial Contribution	Estimated number of countries
1—GDP > €2215 billion	€60 000	6
2—GDP €1476-2215 billion	€45 000	4
3—GDP €738-1476 billion	€25 000	4
4—GDP €74-738 billion	€15 000	8
5—GDP €37-74 billion	€5 000	6
6—GDP €18- 37 billion	€2 000	4
7—GDP < €18 billion	€500	4
Associate Participant (non-voting)	No monetary contribution; must agree to establish a node and to share data.	
Total	€800	36

Institutional contributions

Currently there are 66 European collections in ECCO, additional BRCs in France (30), plus the non-European partners in the GBRCN and additional interested parties suggests that the initial membership of GBRCN could be over 100 at this level initial payments would have to average €8000 each which would not be acceptable to most BRCs on an annual basis.

Financial Plan

The functioning of the Secretariat would increase as new partners join and additional projects come on line. In the GBRCN demonstration phase the small secretariat set up by the German Government costs around 250-300K Euro to fund per year. To function for the full expanding GBRCN may require further investment particularly if IT and legal assistance is to be provided. However, the graph indicates that as the GBRCN grows the Secretariat at year 10 may require only 500K Euro. Not a significant investment to get co-ordination of the GBRCN members.



Different cost models will be requested from partners reflecting national possibilities and in time projects will be secured to contribute Secretariat costs. One mechanism for reducing central costs is secondment of staff from BRCs to the Secretariat. It is envisaged that MIRRI will secure EU preparatory funding with the GBRCN Secretariat as coordinator this will bring both additional work and funding. It is envisaged that the coordination will be around 10% of the budget allocated potentially around 4-500K over 3 years €150K p/a.

Predicted income to 2020	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**

Total GRC costs include building the collection

Recommendation

Governments commit to support the GBRCN by agreeing and signing the MoU and contribute to the funding of the GBRCN Secretariat to ensure its continuity.