



A VISION FOR THE EVOLUTION OF EU BRAZIL RESEARCH COOPERATION BASED ON THE LESSONS OF IBE

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Introduction

This chapter presents a vision for the future of the work of the Institute of Studies Brazil Europe (IBE) based around support for the development and implementation of policies aimed at fostering inclusion and combating inequalities of various kinds in Brazil through cooperation with Europe. It begins with a perception of the context of the work of IBE with a focus on transdisciplinary and interdisciplinary approaches to tackling big societal challenges around social exclusion and inequality. It is argued that the core dilemma facing IBE is that it sits at the forefront of the battle ground for the cultural and social focus of higher education in Brazil and in Europe for the next decade.

The major achievement of IBE to date is descriptions of the transdisciplinary and interdisciplinary links for each participating discipline to the societal 'grand challenges' of Horizons 2020 and Brasil 2022. By discussing, as an exemplar, aspects of the implications of some of these links for work that needs to be done in the area of Information and Communication Technology (ICT) research, possible future directions for the work of IBE are proposed. Crucially, it is argued that many of the actions on EU Brazil cooperation identified as having the potential

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to deliver significant mutual benefit do not necessarily involve academia, are formative, and are not narrowly technical, but that nevertheless there are significant opportunities for joint EU Brazilian academic research around some of these challenges. Accordingly, possible future directions for the work of IBE are proposed under a unifying umbrella of policies support.

A perception of the context

The context of the IBE has been described as one in which the EU aims to promote European studies in Brazil in areas where the EU has accumulated more experience, in order to share solutions to Brazilian problems. In the course of discussion around how this could be done, disagreement arose in two directions: a) consolidating in Brazil an Institute of European Studies, where Europe would be studied; and b) consolidating an Institute for Studies Brazil Europe, which would define topics of mutual interest to Brazil and Europe, and develop these themes in a cooperative way, in order to actually use the European experience to accelerate Brazilian development and decrease its inequalities.

From the outset the 'carrot' for the European participation in IBE was the potential for joint research projects with Brazil and for the recruitment students funded under the Brazilian government's Science without Borders scheme. This led the European associate partners to concentrate their attention on identifying opportunities for funding for joint EU Brazil research likely to become available through the upcoming Horizons 2020 and Brasil 2022 programmes.

This focus was acceptable to many Brazil participants in IBE because fundamental social issues of governmental priority are set out in the initial guidance on the framing of the Horizon 2020 and Brasil 2022 programmes as grand challenges. Thus objective b) could be progressed rapidly by identifying common themes in Horizon 2020 and Brasil 2022, and related to this seeing if it could be established whether themes in Brasil 2022 had already been addressed to some extent in Europe and if so to what extent Brazil could learn from the European experience of addressing these themes. However, apart from driving discussions in IBE excessively from a research funding point of view the nature of the programmes being scrutinised is that they lead naturally to an emphasis on Science and Technology, Biology and Health, often with at best a supporting role for disciplines outside these areas resulting in tensions within IBE.

Perception of tensions within IBE

Perceived tensions, in particular, between academic disciplines in the IBE could be viewed as follows:

Objective b) is a very different objective from objective a) to the extent that at some point these objectives need to be addressed separately. A rationale for this view is:

Within the overall framework of IBE, objective b) can be addressed by, for example,

- Identifying common areas where a linked approach to policies can be of benefit. Examples would be combating terrorism and drug smuggling.
- Trying to ensure that as Brazil becomes a global research player that unnecessary duplication of research effort between Brazil and Europe is avoided
- Making sure as Brazil addresses certain social issues it does not waste money by attempting approaches that the Europeans have learned the hard way do not work
- Related to the above by Brazil learning from European experience to improve the effectiveness of its own programmes

It should also not be forgotten that there are important areas where Europe can learn from Brazil.

An 'educational' concern about objective b) interpreted in this way becomes that the issues it addresses are economically driven and relate to transdisciplinarity. While transdisciplinarity offers substantial potential advances in research in terms of the evolution of research methodologies and fundamental understanding, there are profound long term dangers in university research being driven excessively by funding models. With current funding models focusing on Science and Technology, and Biology and Health, it can be argued that objective a) offers the opportunity to bring balance to the disciplinary focus of IBE as it potentially concentrates more on the cultural and social aspects of EU Brazil cooperation at the university level. A rationale for this focus is as follows:

Brazil is a post-colonial society with, apart from the very obvious Portuguese influences, major influences from Italy and to some extent Germany shaping the evolution of its culture and institutions. A number of old European universities have significant documentation/records in their archives related to Brazil for

example on colonial governance, trade, and emigration. These are invaluable records for getting a more complete understanding of how the Brazil of today came to be. Such understanding can provide insight into how Brazilian institutions and policies can be best shaped in the future.

At a fundamental level Brazilian culture emerged out of European foundations and understanding how it differs and relates to European culture is a way of cherishing what is unique about Brazilian culture.

The main defence in support of this argument is that in the context of social cohesion and inclusion culture is critical. True social inclusion means that everyone has access to their cultural heritage, not just privileged elites.

The Core Dilemma

The core dilemma of IBE is that it sits at the forefront of the battle ground for the cultural and social focus of higher education for the next decade. Horizons 2020 and Brazil 2022 represent a paradigm shift towards needs driven funding of research. This drives interdisciplinary research and as this feeds through into education it is expected to result in some more socially relevant education. It will result in more readily defensible spending on research and education and more employment driven education resulting in more employment relevant education and the addressing of fundamental social challenges at a time of chronic economic problems in Europe. All this sounds, and is, wonderful but it poses a huge danger to Europe in particular.

The greatest capital Europe has is its fabulous cultural heritage with its extraordinary range of highly sophisticated national cultures. The primary links Europe has to the rest of the world are through its cultures having

seeded national cultures across North and South America and Australasia and the impact of its cultures on the Indian subcontinent and in South East Asia and Africa. This is what really distinguishes the European impact on the modern world from that of say China or India or the US. What is striking about Europe is just how relatively stable its societies are, a major contributory factor being their relatively strong social cohesion.

Much is made of inequality in Brazil but it is the lower per person GDP resulting in a more severe impact of being at the wrong end of that inequality that makes Brazil better known for its inequality than say central London. But this difference in perception goes deeper than that. In London there are by global standards remarkably low levels of violent and indeed other crime given the economic imbalances. This is a reflection of the equally notable social cohesion of the UK and of a London identity on top of that. This is an important lesson for Brazil but it should also remind the Europeans of the importance of their social cohesion and its' basis in a sense of national identity, which in the case of London emerges out of an almost uniquely multicultural milieu.

In the content of IBE Brazil needs to acknowledge the crucial role of a strong awareness of national culture across the social classes and Europe needs to recognize that its impact in certain parts of the world is largely thorough this culture which can itself only be strengthened by a greater awareness of its impact on other parts of the world. Brazil could benefit from a greater social awareness of what it is to be Brazilian. Europe could benefit from a better understanding of how cultures in other parts of the world with a base in European culture evolved from that base in ways that diverged from their European counterparts. Furthermore, Europe

could better relate to countries outside of Europe when it better understands its impact on those countries and, in the case of Africa in particular, the moral legacy of that impact.

Consequently, the IBE has been perceived by some of its participants as have two strands, one embracing all the benefits of Horizons 2020 and Brasil 2022, the other defending traditional humanities and social science education with a view to promoting a better mutual cultural understanding of EU Brazil relationship and fostering greater social cohesion within Brazil and deepening it within Europe.

Main challenges and achievements to date

Addressing Horizons 2020 and Brasil 2022 is hugely difficult in itself because it they are driven by inter and transdisciplinarity and academics can at times feel highly unqualified and exposed trying to make sense of issues of fundamental importance to disciplines outside of their own. However, the role of IBE inevitably takes its participants out of their disciplinary comfort zone.

On the embracing the benefits of Horizons 2020 and Brasil 2022, the hard work in addressing the discomfort has been done probably as far as is possible, and the early part of the work of this strand of IBE is a pre-requisite for meaningfully addressing the second strand. The early part of the work has involved identifying the interdisciplinary and transdisciplinary needs of Horizons 2020 and Brasil 2022.

To completely further address the first strand the second step is to give hard detail on the actions that should result from 'one-line' descriptions of the trans-disciplinary and interdisciplinary links for each relevant discipline. An attempt will be made to illustrate the extent of this challenge by attempting to do this below for areas of Information and Communication Technology (ICT).

This work needs to be done before the second strand of the work of IBE can properly be addressed because knowing what needs to be done can highlight gaps in or limitations of humanities and social science education that need to be addressed to effectively address the challenges of Horizons 2020 and Brasil 2020. More importantly it highlights those areas for which research funding will be available so those areas for which funding will not be available become apparent. If Horizons 2020 and Brasil 2022 were to result in large parts of humanities and social science education withering away because of a lack of research funding

for then it could be a disaster with dire social consequences for social cohesion further down the line. In any case priorities change and there would then be no guarantee that in that eventuality the required expertise would be available or even exist.

In the following examples will be given of what could be done in IBE in aspects of ICT that are chosen as exemplars because it is relatively easy to explain how collaboration between the European Union and Brazil could lead to significant mutual benefit and because the aspects chosen are considered particularly hot topics at the moment for economic and social reasons. Indeed several of them are the subject of on-going 'debate' in the popular press.

This should give an indication of the depth of knowledge that underpins the seemingly simple highlighting of possible areas of activities for possible cooperation between Brazil and the Europe Union by the IBE and hopefully make more visible the real extent of the achievements of IBE to date. It should also give a better appreciation of the implications of what has been done in IBE, the nature of potentially mutually beneficial collaboration between Brazil and the European Union, and why public money has been spent on the IBE.

Some areas of possible EU Brazil cooperation in ICT

Across much of the world, the demand for internet access which offers high bit rates, the so called demand for bandwidth, has increased dramatically in recent years. The driver for much of this growth has been the rapid growth in demand for electronic media such as video clips which are made up of many more bits than typical text files. The European Networked Electronic Media Technology Platform (NEM) has identified Strategic innovation Areas the most notable of which are digital content, distributed media applications, and new user devices and terminals. In the context of appreciating the likely development path of next generation smart mobile devices it is crucial to understand that the devices evolution is service and application driven and that the services and applications are entirely dependent on content so there is a synergy between the evolution of the content industries and the platforms on which the content is expected to be consumed. For Brazil it is a key national interest that the reach of TV Globo into Europe is sustained by appropriate development of the capacities of its content providers. It is in the national interest that Brazil ensures that user

interfaces are developed for new user devices and terminals, for Brazilian consumers to access Brazilian networked electronic media services and applications in a way that reflects the particular preferences of Brazilian consumers, so that there is good take up of such services and applications in Brazil which would drive a domestic content creation sector. Such interfaces can be repurposed if necessary to provide interfaces to Brazilian networked electronic media applications for the European market. The European Union has world leading expertise in networked electronic media which could be leveraged to rapidly realize world class user interfaces for accessing Brazilian networked electronic media applications.

For Brazil there is a significant interest in the development of open source software and tools for the integration of multimedia communications applications targeted at specific Brazilian user groups for social networking, smart cities applications etc. In Europe the development of open source and standardized tools for content creators and service and application providers with a view to providing support for the design of rich media content is a strategic objective of NEM. Any potential cooperation between Brazil and Europe on the development of such open source tools would significantly assist the standardization of such tools and promote their adoption.

Microelectronics are now familiar to most of the world's population even if only in the form of a small smart card inside their mobile phone and which has to be 'active' for calls to be possible from the phone. Such microelectronics which sits inside another device is an example of an embedded system. Europe has world leading expertise in the design of microelectronics and embedded systems even though it has limited manufacturing capacity as most of the manufacturing of European designed microelectronics is outsourced to the Far East. Based on established outsourcing models, for Brazil to get the best return on its investment in microelectronics manufacturing capacity to support its need for microelectronic components for smart meters for measuring power consumption in the home etc. it may be appropriate to take advantage of European Union based design expertise. However, to enable this, international agreements on the distribution and protection of the associated intellectual property may be required as the resulting designs would likely be implemented in microelectronic components of Brazilian designed and specified devices such as smart meters and protection of such devices would be a key part of the protection of Brazilian critical national infrastructures such as power distribution networks.

The Brazilian Government's wish to realize the huge potential benefits of the Internet of Things (IoT) in terms of, for example, energy, water, and gas efficiency through smart metering offers other opportunities for mutually beneficial collaboration with the European Union. Such applications are characterized by networked embedded systems. The IoT is a major driver for IPv6 as it hugely increases the demand for IP addresses, a demand which IPv4 cannot meet. Significantly, IPv6 brings additional benefits over and above providing many more IP addresses. It accommodates more naturally easily secured and reliable information exchange using IPSec and Quality of Service differentiation. The take up of IPv6 and the benefits it offers is a strategic challenge for Europe as a whole. Major telecoms operators will play a significant role in the roll-out of IPv6 as fourth generation telecoms network technologies have been designed with an all IPv6 operator's backbone network in mind. Telecoms driven broadband roll-out is potentially particularly beneficial for Brazil because its large dense urban populations and huge geographical area make the economics of providing broadband to rural populations particularly demanding and wireless broadband offers the best hope for digital inclusion in many parts of Brazil. Brazilian requirements in the area of the IoT include smart networked video cameras for enhancing security in urban environments. By Europe and Brazil cooperating on the challenges of making IPv6 based broadband available to all significant resource savings and more rapid deployment may become possible and major social issues such as digital inclusion and the combating of crime in the urban environment more rapidly addressed.

The logical first step in developing a policy for EU Brazil cooperation in the area of nanotechnology is to

promote dialog between Brazilian and European counterparts in this area with a view to making recommendations on the content of dedicated calls for funding in this highly strategic area. This also makes sense in terms of the available human resources as the pool of expertise in this area is relatively limited in both the EU and Brazil and therefore it is essential that funding programmes make best use of the available human resources. Given the obvious relationship to the possible collaboration highlighted above in conventional microelectronics and embedded systems care must be taken to ensure that a unified approach to collaboration in these areas is taken. The Brazilian nanotechnology networks may be able to play a key leadership role here as they will have a clear vision of what nanotechnology brings to embedded systems that microelectronics does not and of what distinguishes nanotechnology from microelectronics.

Intelligent Transportation Systems (ITS) aim to provide safer and more efficient transport networks. For example, Vehicular Ad Hoc Networks (VANETs) are being developed globally to become a component of road transport networks to ease congestion, reduce the risk of accidents, and improve the management of all aspects of the consequences of road traffic accidents. VANETs are a promising technology for providing the communication platform between vehicles on the roads and road side units (RSUs) needed for enhanced traffic management. VANETs are a special type of wireless networks where vehicles and RSUs are the communicating nodes. Data collected from sensors on a vehicle can be displayed to the driver or sent to RSUs or be broadcast to neighbouring vehicles depending on certain requirements. In Sao Paulo state landslides caused by heavy rainfall can be a major threat to drivers and dealing with this threat is a priority of Brazil

2022. VANETs could be a major component in a solution as they can notify driver rapidly of changing road conditions and loss of a number roadside units could indicate landslide conditions. VANETs have particular potential in the Brazilian context because road side units are an effective mechanisms for monitoring road usage in Brazil's high density cities and can be used to better enforce road usage rules such as those of Sao Paolo which are number plate based, and they can be used to identify the presence of untaxed/uninsured vehicles on a stretch of road. Car theft is a particular big issue in some Brazilian cities and such technologies could be used in support of law enforcement and homeland security. VANETs are a strategic challenge for Europe as a whole because, for example, traffic lights and other traffic network conditions are expected to cause frequent network partitions in VANETs that make the routing process very demanding. However, the breakages in network connections occurring at traffic lights could be mitigated by VANET and/or IoTs type technologies which in the Brazilian case could be merited by the need for monitoring for broken traffic lights, a particular problem in some Brazilian cities. Cooperation between Brazil and Europe on all aspects of the development and exploitation of Intelligent Transportation Systems offers clear and rapid mutual benefits.

Future Networks refers to next generation heterogeneous wireless and mobile broadband systems based on flexible spectrum usage and reduced Electromagnetic Field (EMF) and interference. The reduction in EMF implies a reduction in the power consumed by radio transmission. In the context of telecommunications networks 5G development is primarily focused on more efficient spectrum usage and more energy efficient networks. Such networks have obvious global appeal. One of the most efficient ways to promote the future generations of the European high-speed broadband and mobile network infrastructure is to contribute to standardization and regulation. Brazilian involvement in European initiatives in future network standardization and regulation and vice versa will greatly improve the chances of the initiatives succeeding. As has already been pointed out Brazil has a particular stake in the evolution of wireless access to super broadband systems for reasons of digital inclusion, in particular of rural communities, and a common desire for greener technologies.

A key driver of developments in future networks are the anticipated future super-broadband applications which are expected drive an enormous increase in

the demand for bandwidth due to the emergence of new services, such as triple play and quadruple play services. The triple play service consists of High-Speed Internet Access (HSIA), voice and video telephony, and TV broadcast. Such packages of integrated services are expected to be used on a variety of devices such as fixed line telephones, TV's, PC's, and mobile devices and tablets. Significant demand for such service packages in dense urban areas would have to be supported by high throughput low-latency infrastructures. These are very likely to be based on dynamic all-optical networks and hybrid wireless and cable networks. It is expected that in many parts of Brazil the demand patterns for super-broadband applications will follow the demand patterns of much of Europe giving rise to several areas of common interest in terms of the realization and deployment of dynamic all-optical networks and hybrid wireless and cable networks such as, for example, the deployment of Analogue and Digital Radio-over-Fibre transmission techniques. Opening Brazilian industry dialogue with the European Technology Platform for photonics may be a good starting point.

Cloud Computing is widely anticipated to be the dominant emerging paradigm for the resourcing of the information technology needs of business for the next 10 years. Cloud computing represents the realization of data processing and storage facilities residing in data centres that can potentially be located anywhere in the world which host services which can be accessed by large numbers of consumers remotely. This is made possible by the seamless interconnection of high speed networks which are accessible through access networks to potentially huge numbers of devices which could be static or mobile. According to [1] cloud computing is best envisaged as a series of business models for outsourcing of IT services and applications. In this context, categories of cloud service provider include Software as a Service (SaaS) providers that offer customers access to applications on shared infrastructure, Platform-as-a-service (PaaS) providers offer access to development platforms on which applications that will belong to the customer can be developed, and Infrastructure-as-a-service (IaaS) providers providing access to processing power, e.g., part of a hard disc. Such services offer enormous potential to small and medium sized enterprises and start-ups in terms of a low cost access to information technology capabilities. An important enabler of cloud computing is a suitable application programming interface (API) for customers of cloud services to manage their cloud services

particularly in terms of controlling access to them, and self-provisioning their cloud resources. This gives rise to a major issue with cloud services, namely that providers usually require the use of their own unique API so it is very difficult to achieve interoperability between applications hosted on different clouds. This is partly because cloud service providers are usually happy to lock their customers into their basket of service offerings.

For regulatory reasons it might be necessary to know where customer data has been located and when. The locations in which particular data is stored, and its paths and associated times of movement, is known as Data Lineage. Accurate reporting of the data lineage of data stored on a public cloud may not currently be possible. The requirement that data is computationally accurate is called provenance and is important, for example, if financial calculations are carried out on data to generate new information. Establishing provenance in cloud computing may currently be impossible where cloud resources are shared. Privacy in an information context refers to the rights of an individual, and the obligations of the holders of an individual's personally identifiable information, with respect to the individual's personally identifiable information. In the context of cloud computing privacy raises questions like: is personal information in the cloud aggregated in such a way that it can no longer be tied to an individual and cannot therefore be considered as personally identifiable information. The privacy obligations of cloud service providers based in the EU include ensuring the integrity of personally identifiable information stored in the provider's cloud.

Opportunities for European and Brazilian collaboration in the area of cloud computing relate to initiatives promoting the use and development of open interfaces and tools for cloud computing and international initiatives to enable data lineage to be established and privacy obligations to be enforced, and the establishment of guidelines on data provenance. The Brazilian government may wish to engage in the discussion in Europe on cloud governance ([2]).

Big data analytics has been defined, and some of its uses outlined, in [3] as follows: "the process of examining large amounts of data of a variety of types (big data) to uncover hidden patterns, unknown correlations and other useful information. Such information can provide competitive advantages over rival organizations and result in business benefits, such as more effective marketing and increased revenue. The primary goal of big data analytics is to help companies make better business

decisions by enabling data scientists and other users to analyze huge volumes of transaction data as well as other data sources that may be left untapped by conventional business intelligence (BI) programmes. These other data sources may include Web server logs and Internet click stream data, social media activity reports, mobile-phone call detail records and information captured by sensors.”

New sources of big data are expected to arise in two fundamentally different ways. From content stores which are no longer largely text based but may comprise millions of videos or images commonly anticipated to be tied to social networking sites or community content stores, and from data collection of data provided by possibly millions of smart meters connected to the Internet and other IoTs devices. Such data stores raise important security concerns which go beyond familiar issues surrounding safe use of the Internet to concerns about personal security which are closely linked to issues around personal privacy and to important concerns of national security. When stored on the Cloud IoT data gives rise to governance issues and issues around critical infrastructure protection. Social web site related content can be correlated with other personal data to endanger the individual. This gives rise to the need for regulation in the European Union and Brazil for the protection of the privacy of individuals, private and public organisations’, and the protection of critical infrastructures in the context of the risks posed by big data analytics.

Using big data analytics effectively for valid economic or social benefit gives rise to the need for new kinds of highly efficient and rapidly working search engines, for example, search tools dedicated to quickly identifying video frames with particular features and new ways of correlating information obtained by the processing

of the sources identified. There is significant scope for public investment in research into big data analytics for health care and other purposes. With appropriate tools applying big data analytics to data on cancer treatments and their outcomes could lead to major cost savings in and effectiveness of cancer treatments. The cost of such developments for the public good could usefully be shared between Europe and Brazil for mutual benefit.

From a technology perspective enabling the full potential of social networking involves protecting the privacy of the users involved in the networks and making available open user friendly content creation and use tools and ensuring the necessary broadband capacity is available. Content creation and use related issues and broadband availability related issues have already discussed. Regarding the privacy issue:

From [4]: Internet users are being increasingly tracked and profiled and their personal data are extensively used as currency in exchange for services. This document makes recommendations addressed to regulators, policy stakeholders, researchers and developers which include: “Development of anti-tracking initiatives and solutions for mobile applications; the users of mobile devices are more exposed as most anti-tracking initiatives are not focusing on mobile devices; Development of easy-to-use tools for transparency and control; awareness is important but there is a need to enhance transparency tools to allow the users to know how their personal data is collected, managed and transferred; Enforcement solutions should be deployed to block misbehaving players and to force compliance with rules and regulations regarding personal data protection; mechanisms should be defined by regulatory bodies both for compliance and for monitoring and detection of violation of the

rules; Privacy-by-design should be promoted; regulations have an important role in boosting the adaptation of privacy-preserving solutions, i.e. by enforcing the rules, and by ensuring the existence of complete, compliant, concrete and meaningful privacy policies.”

The Brazilian government may wish to engage in discussions with the EU around these issues as a prelude to deciding how Brazil may support the implementation of the outcomes of the discussions.

Possible future directions for the work of IBE

What should be striking is that many of the actions on EU Brazil cooperation identified in the preceding section as having the potential to deliver significant mutual benefit do not necessarily involve academia, are formative, and are not narrowly technical. Notably, Brazilian government participation in the on-going discussion in Europe on cloud governance and in European forums discussing issues around privacy on the internet; the joint promotion of international initiatives to assist in enabling the data lineage of cloud based data to be established; working together to establish guidelines on data provenance. Review of international agreements on the distribution and protection of the associated intellectual property to ensure they adequately address the value chains of embedded systems; actions around the standardisation of open source tools for new media content creators; cooperation on IPv6 deployment; opening Brazilian industry dialogue with the European Technology Platform for photonics; discussions on sharing the costs of developing big data analytics tools for medical research. Nevertheless, significant opportunities for joint academic research exist around some of these challenges.

Accordingly, in its two strands it is proposed that the work of IBE needs to be progressed as follows: In strand 1 with its focus on Horizons 2020 and Brasil 2022, the work of phase 2, which has already begun, should be to add the hard technical detail needed to explain the nature of the transdisciplinary links identified in phase 1 and the work that needs to be done that these links give rise to, so that any associated need for or potential benefits of cooperation between Brazil and Europe can be identified. This second phase should be much easier to complete than the first phase because the framework has been put in place and work can proceed on a discipline by discipline basis with the people responsible back in their discipline

based comfort zones. Phase 3 of strand 1 is then probably one of disseminating of the totality of the information on actions needed identified in phase 2 in a structured way in Brazil and Europe. For example, as the basis for Brazil Europe networking events between the disciplines and relevant industrial and social stakeholders concerned to create the consortia needed to address a particular challenge or realise the benefits of potential EU Brazil collaboration. With phases 1 and 2 in completed this third phase could possibly be handled by appropriate consultants.

The first phase of work on the second strand of IBE, with its focus on establishing an institute of European Studies, is largely complete. It involved establishing what needed to be done in order that Brazilian universities with different regulations for the award of higher degrees could participate on an equal footing in a pan-Brazilian institute of European Studies. As phase 2 of strand 1 nears completion work can begin in earnest on the second phase of the second strand of the work IBE. This should comprise an analysis of the results of phase 2 of strand 1 to identify potential gaps and/or weaknesses in current humanities and social sciences educational provision in Brazil that need to be addressed if the needs of Brasil 2022 for expertise in these areas can be met. Then which of these gaps/weaknesses could benefit from a joint EU Brazil approach to tackling them can be decided. In parallel to this, an analysis can be done in order to establish which important areas of potential EU Brazil joint research in the humanities and social sciences lie outside current funding schemes. Again this can be done on a discipline by discipline basis so should be less challenging than what has gone before. The third phase of strand 2 would then probably involve two parallel activities each leading on from the two parallel activities of phase 2 of strand 2, one of developing an EU Brazil action plan to address perceived weaknesses and needs and the second activity being one of detailing what can be done through joint EU Brazil initiatives to support the identified 'at risk' areas explaining what could be done and why it should be done.

To more fully appreciate the need for a humanities and social sciences led strand to the work of IBE consider the societal challenge posed by an ageing population. With increasingly large numbers of Brazilians living into advanced old age can Southern European care models for older people be relied on in Brazil? These models with their focus on family based care have deep seated roots in cultural and religious traditions which also influence attitudes to disability, but are

also connected to affordability. The social and economic conditions of Portugal are closer to those of Brazil than Swedish social and economic conditions are but should Brazil be aspiring to Swedish care models or learning from Portuguese efforts to maximise the effectiveness of scarce social care resources, or as is more likely the case learning from both.

Within IBE there has been an uncomfortable process of convergence, between humanities and social sciences academics on one side and science and engineering and biology and health academics on the other, towards a mutual realization of what needs to be done with respect to EU Brazil collaboration particularly among the Brazilian partners with their preoccupation with inclusion. European involvement has been driven partly by hopes of some joint applications for research funding or science without borders students being forthcoming because of the current financial situation in Europe and the economy driven model higher education being adopted in Europe at the moment. On both the EU and Brazilian sides the coming to an awareness of the unifying role of policies across both strands of the work of IBE has been crucial to the reaching of some consensus at least on what needs to be done going forward.

In connection with ensuring the outputs of IBE can result in concrete actions there is a further vital role for policies in monitoring, and if necessary developing, instruments for funding the joint work that needs to be done and in driving governmental involvement in on-going discussions on how issues of major social importance may best be addressed. In turn the outputs of funded joint initiatives have a potentially key role to play in providing support and expertise needed for effective policy development.

Concluding remarks and recommendations

The main lesson coming out of IBE is of the unifying framework that policies provide for thinking about transdisciplinary and interdisciplinary in terms of meeting the grand social challenges of our time. When drafting the work programmes for Horizons 2020 and Brasil 2022 it may be productive to always keep this in mind.

Going forward the work of IBE is at a critical juncture and having done the most difficult part there is a strong case for splitting the work into a group led by humanities and social sciences academics looking at taking forward an Institute

of European Studies in Brazil focussed on traditional academic studies but targeted at promoting more effective policies development in Brazil, and with a commitment to promoting cultural inclusion in Brazil wherever possible as a mechanism for fostering a more stable and inclusive society. A second group looking at an Institute for Studies Brazil Europe led by science and technology, and biology and health academics, the membership of which in the longer term will need to be expanded to include other stakeholders in Brazil 2022, in particular Brazilian industry, focussed on gaining cost efficiencies in when addressing the grand challenges of Brazil 2022 by close cooperation with Europe. Although led humanities and social sciences an Institute of European Studies in Brazil would not exclude science and technology or biology and health academics but rather they would be brought in on an as needed basis. A good example of an area of study where such expertise can be introduced in this way is ageing where cultural and social studies around perceptions of, and care for, older people need to be linked into their implications for patterns of health care and the use of assistive technologies. The need for the Science and technology, Biology and Health academics addressing the grand challenges of Brasil 2022 to bring in academics from other disciplines should be evident from what is already in the public domain on the approaches that will be fostered by Brasil 2022, and in Europe by Horizons 2020.

To ensure the coherence of the work of both groups an oversight committee would need to be established. Obvious candidates for leading the work of such a committee are policies academics but they would need to be supported by an advisory board the membership of which could be changed on a needs driven basis according to pre-agreed guidelines. It would be the direct responsibility of this committee to ensure work was carried out in line with Brazilian government policies and advise on the cost effective implementation of these policies and moving forward how they could best be refined and, if appropriate, even proposing new policy initiatives.

Looking to the future, now that the point has been reached that it is possible to do so, the assignment of leadership responsibilities for activities within IBE in more specifically disciplinary terms should enable more rapid progress to be made than has been the case to date.

Finally, the work of IBE has highlighted the importance of ensuring humanities and social sciences expertise will be there when a need for it emerges and the importance of protecting and fostering cultural heritage in the context of inclusion.

From a European perspective this experience sends some ‘amber warnings’ on the future of European higher education in the humanities and social sciences in the current economic climate. More closely relating the work of humanities and social sciences academics to the pursuit of social policies of fundamental importance to the public in their daily lives as is being done in IBE should help mitigate the risks in this regard.

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