ResIST Brussels Policy Seminar

Final Report

South African Mission to the EU
Brussels, Belgium
31 March 2009

ResIST is a specific targeted research project - contract no CIT5-CT-2006-029052 - under Priority 7 of the European Commission's Sixth Framework Programme: *Citizens and Governance in a Knowledge-Based Society*. We gratefully acknowledge the Commission's support.

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1 Introduction

This report presents the major findings and discussions from the ResIST policy seminar. The seminar took place on the afternoon of March 31st, 2009 at the South African Mission to the EU in Brussels, Belgium. The list of attendee's, the seminar programme and brief write-ups on the findings can be found in the appendix, at the end.

1.1 Background

The origins of ResIST lie in a workshop and period of co-working in South Africa in 2003 sponsored by the South African Department of Science and Technology. Later, the project received funding to develop further from the UK Economic and Social Research Council. ResIST, or *Researching Inequality through Science and Technology* has been a European Union Framework Programme 6 funded project since 2006; a later parallel but separate project, *Resultar*, was funded by the US National Science Foundation and has enabled case studies from a range of countries in the Americas to contribute to work package 4. Overall ResIST's team of some 50 researchers from 11 institutions in 10 countries have been analysing "the ways in which regulatory regimes, policies and practices involving S&T [Science and Technology] contribute to the reproduction of social and economic and inequalities within and between European member states, and between the EU and candidate and developing countries". During the project ResIST has undertaken fieldwork and held meetings with policymakers and practitioners in Latin America and the Caribbean, Southern Africa and Europe, with a sharp focus on lessons that can be learned by the EU, and in development contexts. Utilising its findings, ResIST will proposes more methodical ways to assess the distributional and accountability issues raised by research policies, new research proposals and the introduction of new technologies. The project was divided into five 'Work Packages' (starting with WP0 and continuing to WP4). Work Package 1 looked at the policy environment, while Work Packages 2, 3 and 4 dealt with developing and retaining human resources, accountability & inequality, and technological impact, respectively. Work Package 0 acted as an integration and dialogue medium between the other Work Packages as well as practitioners and policy makers.

At the very beginning of its work, ResIST hoped that its efforts will allow practice and policy related to S&T to be reframed by acknowledging and endeavouring to limit the most negative potential distributional effects it can have whilst enhancing the positives. It also hoped to contribute to the introduction of new channels of accountability in scientific governance that would reflect these aims. Now, in 2009 the research was complete and the results were discussed at this seminar in Brussels.

1.2 Goal

The goal of the ResIST Policy Seminar was to report the results of this 36 month project. To do so, members of each of the work packages presented their findings. Members of the ResIST Advisory Group and other potential users from the three main worlds regions where ResIST had been working had also been asked to give their feedback on the project and the future research agenda. Finally, staff and advisers of European Commission's DGs for Research, Development and Information Society and Media as well as other policy makers and practitioners were invited to both be present for the presentation and give their thoughts and comments. The results of the Policy Seminar would be written up and influence the final report that was also in the process of being written.

2. Results

Peter Healey, the Co-ordinator of ResIST opened the meeting by saying that there had been talk of crisis at the beginning of the ResIST project. At that time the Doha Round of trade negotiations had not yet broken down but were in crisis and there was talk regarding how the Bretton Woods institutions needed reform. We had little idea of the scope of the financial crisis that would unfold and the extent to which, three years later, it would propel a number of issues that ResIST touches upon to the front of the international agenda.

2.1 Work Package 1

The objective of Work Package 1 (WP1), which was presented by Dr. Egil Kallerud, had been to provide a conceptual overview for the ResIST project to work with in the early stages while continually following it throughout the project, revising and updating it as necessary in response to results and workshop discussions. To do this, WP1 analysed and addressed the Science, Technology and Innovation (STI) policy frameworks in various countries and how these frameworks affect the production, distribution and redistribution of knowledge resources. This was used as a basis for exploring and articulating the scope for alternative policy suggestions.

In looking at policy frameworks, the team found that the dominant contemporary framework of STI policy is predicated on the Knowledge Economy concept. It may be seen as a policy paradigm, the "Knowledge Economy Policy Paradigm" (KEPP) which focuses policy on economic contexts and objectives, such as (aggregate) growth, productivity and competitiveness, and designates innovative firms as the main innovation actors. It is, however, the tenet of the ResIST project that inequality needs to be recognised as a core objective of S&T policy in response to the uneven distributional

benefits of growth and persistent and exacerbated global inequalities which are not dealt with through the Knowledge Economy paradigm. WP1 questions common arguments for separating economic/innovation policies from social/distributional policies.

To look further at policy paradigms the team contrasted the ideal type policy paradigm of KEPP, seen to be a single-objective STI policy, where economic objectives are primary and economic and distributional policy objectives are separated, with what the team calls the Social Cohesion Policy Paradigm (SCoPP). SCoPP frames a multi-objective STI policy where distributional and economic objectives are equally important and integrated. The two policy paradigms differ on several key policy dimensions. The results of the policy dimension research are summarised in Table 1, below.

In analysing several specific policies, the WP1 team found that the EU's "Lisbon Strategy" is an explicit multi-objective policy agenda, while EU STI policy is strongly linked to the Knowledge Economy pillar of the Lisbon agenda and predicated on the KEPP paradigm. It also found that while distributional issues are rarely salient in STI policies of developed countries, they are often explicit and central in STI policies of developing countries. SCoPP emphasizes that issues of representational (in)equality (power, influence, accountability) are essential for (in)equality issues to be taken effectively into account.

Questions were raised at the end of the WP1 presentation which related to the environment and sustainable development, EU research areas and the Lisbon Strategy, and the risk of SCoPP putting itself in a marginal position. For the concerns relating to environmental and sustainable development issues, it was stated that that is there are important parallels in ways of thinking about inequality and sustainability, ResIST and WP1 research has only looked at inequality. The ResIST team confirmed its awareness of the 2008 joint programming approach in ERA policy development, which focussed on societal challenges driving community strategy, but as the research was conducted before the 2008 Lisbon Strategy the WP1 team had primarily focused on the KEPP-dominated Barcelona Process. Finally, to prevent SCoPP from becoming an marginal issue, it was answered that KEPP and SCoPP should not be seen as separate and mutually exclusive, but as a type of Gestalt switch, by which KEPP elements are retained in SCoPP during the shift or reorientation from a KEPP to a SCoPP approach to STI policy.

Table 1: Policy Dimensions of KEPP and SCoPP

Policy:	KEPP	SCoPP
Goals/Objectives:	(Aggregate) growth, competitiveness, productivity	Distribution of benefits and costs of growth and innovation
Agents:	Private firms	Wide range of actors (firms, organizations, communities, citizens)
Drivers:	Market demand	Social Needs
Knowledge/Technology:	Science, research-based knowledge, high-tech sectors (STI)	Experience-based (DUI) , low-tech sectors, traditional and indigenous knowledge
Capacity:	Excellence, concentration, critical mass	Pervasive distribution of capacity throughout society and the economy
Intellectual Property Rights:	Strong, standardized ("one size fits all") IPR protection	Flexible levels of protection (development, needs), protection of public domain
Indicators:	STI indicators (e.g., EIS)	Social indicators (societal impact, distribution of benefits and costs)
Governance/Participation:	Exclusive (elitist) partnerships	Inclusive governance, comprehensive PPPs, including communities, NGOs, consumers....
Accountability:	(STI) indicators	Participatory
Public Policy:	Facilitate	Active policy (funding priorities, procurement ...)

2.2 Work Package 2

Presented by Dr. Liz Oliver of the University of Liverpool, WP2 had a goal of studying human capital flows between EU Member States and 'third countries' which would allow consideration of the individual equity and regional equality of the impact of this type of scientific mobility. It also hoped to identify the appropriate policy and resource environments capable of supporting sustainable and reciprocal human mobility and encourage a closer alignment between policy in the fields of science and technology, and migration. In looking at these issues the WP2 team studied the patterns and trends in the scientific mobility of highly skilled persons (HSP) between Turkey and Germany and between South Africa and the United Kingdom, some who still lived in the host country and others who had returned to the sending country. The state of public service in the Southern African Development Community (SADC) was also studied, through a web-based survey of scientists and academics in 14 SADC countries and field visits to 11 of the SADC countries.

It was found that the loss of HSP's impacted negatively on the state of scientific institutions through the loss of human capital and reproductive capacity. As well, the continuing emigration of HSP's has become a major cause of deinstitutionalisation which is the erosion of the institutions of science and describes a decline in scientific output, changes in modes of scientific work, the devaluing and degrading of the profession of science and the emigration of HSP's. Analysing the motivations to migrate showed that factors relating to the employment conditions of the sending country were key in the decision to move. Thus, the research environment factors are important to address.

Local contexts were highlighted by the WP2 team as necessary for understanding these complex interactions. For example, policies are rarely transferable in any direct or simplistic sense and may generate unintended consequences. Policy developed in areas distinct from science or migration, for example national employment policies, may generate important externality effects shaping the attractiveness of both sending and receiving regions and migration behaviour. For example, post-apartheid employment/equity policies raise concerns in terms of patterns of outward migration and the propensity to return and contribute. Any attempt to stem or reverse the loss of scientific expertise will fail if it does not also consider interventions and initiatives that restore and eventually make academic institutions sustainable research institutions. Governments and international funders should be encouraged to support research centres and institutes which either have already achieved some critical mass or have the potential to do so.

Science networks were also highlighted as important factors relating to the migration of human resources in science and technology. Rather than compensating for mobility, it was suggested that professional networks actually facilitate the migration of human resources in science and

technology. Nonetheless, strong and weak networks based on face-to-face and indirect contact helped to ensure access to the latest ideas and researchers based in research rich countries had more developed networks. It was also shown that while abroad, migrant scientists were engaged with professional activities involving the sending country and also kept active links with their peers in the sending country as well.

In conclusion, WP2 suggests that asymmetrical flows of HSP's (between institutions, countries and regions) invariably lead to unequal reservoirs of human capacities (structural inequalities) and these flows are caused by a whole range of international, regional, national and institutional policies and programmes and very often the "tensions" between these different levels. In short, the study not only confirmed the plausibility of social capital and cumulative advantage theories at the individual and institutional levels, but also how different science and innovation paradigms (KEPP & SCoPP) impact on scientific migration dynamics.

Following the presentation, a number of comments were made. The first suggested caution relating to making general comments about the impact of affirmative action, to which Dr. Oliver agreed that the impact of the policy was complex and context specific. The second question related to the length of time individuals migrate for; it was suggested that researchers who move under fellowships which entail a return and reintegration element may attempt to remain in the host country despite the return clause. In reply it was stated that it may be the case that highly skilled migrants are not able to continue their research back in the sending country, return and reintegration clauses alone cannot assure effective knowledge transfer. The final comment on WP2 informed the participants about a networking tool for European researchers in the US called EURAXESS Link. A feasibility study is currently being undertaken on creating a EURAXESS Link for non-European researchers in Europe Dr. Oliver replied that formal networks such as these may be useful for disseminating information about research and funding initiatives but it is also important to be aware of, and to understand, the links that migrant researchers already have with the sending country and then to find ways to support the associated networking activities. What is happening on the ground and how can we better support it?

2.3 Work Package 3

Dr. Daniel Neyland presented WP3 on the articulation of new accountability systems. The role of WP3 was to identify and analyse the emergence of accountability systems that could address inequalities and distributional issues and, simultaneously, generate new forums for making science and technology projects and political action more publicly accountable. This was done by two teams, the Oxford team, which focused on accountability and electronic waste, textiles and neglected

disease, and the Coimbra team, which focused on experiments in participatory accountability. The reasons for looking at accountability was its contemporary rise to prominence and the fact that it can be central when it comes to questions of inequality; who takes part in science and technology projects and forms of political decision making, under what terms, and with what consequences?

The WP3 team wanted to look at accountability in a broad sense, not limiting itself to the common idea of political or numerical accountability. It did this by considering accountability in four broad forms; face-to-face (meetings, inspections, conversations), directive (measures, metrics, milestones, indicators), demonstrative (transparency, audit, public good) and participatory (process, inclusion, outcomes).

In looking at the Oxford cases of diseases, textiles and e-waste (malaria, fair trade, and hazardous substances specifically) the team looked at a number of factors. These included possible multiple natures of problems and solutions and the ways in which accountability relations were often built from a particular understanding of the problem and/or solution. From these it was able to ask questions of type of accountability, inclusion/exclusion, and the consequences of accountability as well as the nature of the problem and/or solution.

The Coimbra cases looked at experiments in participatory accountability, specifically participatory budgeting in Brazil, Spain and Portugal, and urban planning, ICT, and public health developments. These cases focussed on the challenges of participation. These included the need for a broader conception of the 'policy maker' and showed that the capacity to participate does not emerge spontaneously but rather requires specific training procedures. These training procedures are not simple either as the training itself may encourage participants to frame or select issues. To overcome these challenges the Coimbra team suggests developing specific training for participation and integrating participatory procedures in development practises.

In looking at the challenges of accountability, the WP3 team showed that the articulation of new systems of accountability expands accountability systems beyond the standard convention. Questions relating to whose knowledge counts and who is entitled to come forward with claims and participate in the discussion, elaboration, enactment and monitoring of proposals in the domain of public policies are brought up, as is an opportunity to question dominant approaches to development. Accountability might also have unintended consequences as well, and it must be kept in mind that there are limitations to accountability. Thus, it is sometimes important to step back from systems of accountability and look at alternative problems and/or solutions, to look beyond just directive accountability. Finally, it was suggested that a continuous look at the consequences of accountability is necessary.

Following the presentation it was asked if the WP3 team looked at malaria. The reply was in the affirmative, they did indeed look at who shaped policies in relation to malaria. It was also noted that WP3 researchers had difficulty eliciting pharmaceutical firms to participate, but they finally did agree on the condition that it was done anonymously. Further, WP3 felt that the anonymous reporting limited the usefulness of the results. Another participant asked if government policy was looked at during the research, to which an affirmative reply was given. Finally, a staff of the European Commission stated that the Commission had paid for research to look at malaria vaccine and that DG research could handle the vaccine. However, the South African Government had no mechanism to use it so DG research funded a local programme which was successful and suggested therefore that everyone should take their own rights and obligations. Dr. Neyland replied that the research tried to cover many of these issues of accountability however it became difficult when dealing with the long time-spans of things like malaria vaccine work.

2.4 Work Package 4

Professor Mark Knell presented the findings from WP4 which was a distributional assessment of emerging technologies. The main objective of WP4 was to model the distributional impact of new science-based technologies on business opportunities, employment, benefits, and costs to develop a framework for assessing whether new technologies were likely to increase or decrease inequalities. It is hoped that policy actors can use such a framework prospectively to analyze the distributional valence of a specific new technology in a particular national context. To accomplish this task, research teams from Germany, Malta, Mozambique, Norway and the United States carried out research on five emerging technologies (mobile telephones and telecommunications, open source software, genetically-modified maize, tissue culture for crops, recombinant insulin) across eight countries with varying levels of development (North: Canada, Germany, Malta, USA. South: Argentina, Costa Rica, Jamaica, Mozambique).

A number of differences were found in the distribution of business opportunities, employment and of benefits/costs. The availability of skills was an important constraint in the distribution of business opportunities, especially in areas of open source software and tissue culture. Intellectual property rights were an important constraint in to the distribution of opportunities around mobile phones, recombinant insulin and GM maize. Multinational corporations often have a tight control of intellectual property around a new technology, limiting the opportunity for other firms to enter the market. Direct employment effects of the emerging technologies were small except for mobile communications, which added many new customers as well as enticed many people away from having a fixed line telephone. For other technologies, high technology manufacturing jobs tended to

stay in affluent countries. The distribution of benefits/costs showed that all of the emerging technologies looked at provided benefits and diffusion of the technology is an important indicator of the distribution of those benefits. Also, declining prices can increase distribution, but they do not necessarily create a mass market, especially with open-source software. Despite being free in principle, diffusion of the technology was slow because it required a computer and other complementary assets, such as skills, to utilise it.

The WP4 team also found that institutional arrangements, such as national innovation systems and national learning systems, have important distributional consequences. However some infrastructural conditions are provided by national action and intervention. For example, deregulation in the mobile phone industry increased competition and led to an expansion of pre-paid plans in several countries and hence a rapid proliferation of mobile telephones worldwide. Another example is recombinant insulin which was made more available through public procurement by national health services in most countries in our study. But in the United States, the private insurance system creates significant gaps in coverage which limits it use there.

In conclusion it was shown that national conditions matter a great deal in crafting policy options to spread the benefits of new technologies broadly. The WP4 study also suggests that intellectual property protection should be moderated so that it is not used to suppress business opportunities for local enterprises in developing countries or limit their access to essential goods. Also, pockets of highly-skilled workers can be critical in giving developing countries local access to new technologies and basic infrastructure and education are important for increasing the capacity of highly unequal countries to absorb and diffuse new technologies widely.

The WP4 presentation brought up quite a number of questions and comments from those in the audience. The first related to terminology, specifically ‘emerging’ versus ‘emerged’ technologies and what this means in relation to policy and why they aren’t called ‘new products’. The response to this was that things like nanotechnology and telecommunications are not products, but rather technologies. The follow-up statement suggested that there was a problem in using this terminology and it relates to how science is framed and issues within industry when looking at causal change reactions in emerging technology. Prof. Knell replied that WP4 was focussing on the distributional consequences of emerging technologies along the North/South dimension. The next statement was regarding the use of genetic modification and the individual wanted to know if it was at the breeding or production stage? Also, at what level are the tissues treated, as it is important to be careful what level you bring an issue up? Professor Susan Cozzens, co-leader of this WP, affirmed that the deepest story is recombinant insulin. Intellectual property rights still protect some aspects of the technology, which makes it difficult to create a generic version, and hinders it from being used on a global basis.

Also, Mozambique just opened its first plant tissue culture lab, which relies heavily on open source technology. There are different ways of dealing with plant tissue culture (i.e. US vs. Canada), which has distributional consequences.

A member of the staff of the European Commission questioned whether WP4 adequately dealt with the distributional consequences of emerging technologies. In reply, various members of the WP4 team stated that emerging technologies generally reinforce almost all forms of inequalities. Recombinant insulin is a good example as it is far superior to the non-recombinant types, but its high costs have made it difficult for relatively poor countries to import and distribute this type of insulin. There are numerous examples of inequality in association with mobile telephones. This brought up another statement from a member the staff of the European Commission who suggested the researchers have to be careful not to infer causality between the emerging technology and inequality policies or how the technology is utilised are most important. The reply was that the agenda of research and development can have strong influence on outcome. Finally, another member the staff of the European Commission stated that the technologies presented by WP4 seemed to be all KEPP-type technologies and wondered if WP4 has looked at SCoPP-type technologies. The response was that the design of study was to look at KEPP technologies and the team proposed that SCoPP technologies be looked at in a follow-up project.

2.5 Regarding Assistance

Before the next session started Mr. Healey raised a problem relating to establishing a policy dialogue during the course of the project. Within the Commission, the prime intended beneficiaries of ResIST's research were DG Research and DG Development – both individually and in helping to contribute to the growing dialogue between them. Considerable effort had gone into requesting help from DG Research on this, early in the project's life-cycle, but after a number of attempts, over some time, the project was told that was told that representation from the Commission on the ResIST Advisory Group – the latest formulation we reached for policy dialogue – was impossible as it would be a conflict of interest since DG Research was funding the ResIST project. Mr. Healey then stated that he wondered how much one could acknowledge this issue and there had to be some way to ensure dialogue to enhance the focus and effectiveness of research for which the Commission is an intended beneficiary.

3 Questions and discussion on the themes of 'ResIST, Future Policies, Future Research'

3.1 Dr. David Walwyn – Arvir Technologies, South Africa

Dr. Walwyn stated that he felt that the ResIST project provides a wealth of information, ideas and policy proposals and that there were many interesting suggestions which bring new perspectives/solutions to old issues. He also felt that contrasting the KEPP with SCoPP was a very attractive concept in policy formulation and monitoring and suggested that all policies have components of both and that KEPP and SCoPP could be seen as if it was a audio-control of either left or right (or a continuum). However, he noticed a conflict in the recommendations as WP1 suggests stronger intellectual property protection while WP4 suggests that intellectual property should be moderated. Another conflict was in relation to WP1 which suggests diversification of centres of excellence with WP2 and WP4 which only suggest the development of centres of excellence. This is an important issue as having a centre of excellence requires focussing resources in one area.
Continuing, it was shown that continued research into the ResIST topic is possible for a few reasons including answering some of the questions left open by the Work Packages which would further develop the theories. As well, it would help answer the reoccurring national treasury question "What is the cost/benefit analysis?" for SCoPP projects. Recently, an analysis similar to ResIST has been employed in the Biotechnology Actor System of Innovation (BASI) approach to analyse capacity. BASI has four components, of which three are dealt with within the ResIST project. These are knowledge/skills (seen in WP2), demand/social acceptability (WP1/WP3), industry/supply (WP4) and a finance/industrial development component which are missing from ResIST. It was also speculated that the language which is being used is possibly contributing to inequality.
The one question that was asked of Dr. Walwyn related to capacity building, which is thought to be key in South Africa, and how he envisioned it. The response was that what South Africa lacked was enough options for highly-skilled workers which would hold them within the country. As they would be able do less if they were to stay, there was less reason for them to do so.

3.2 Dr. Ricardo Thompson - Mozambique National Institute of Health

Dr. Thompson highlighted three areas of interest within the ResIST project when looking towards the future; scientific mobility, accountability systems, and the distribution of emerging technologies. With scientific mobility, scientific 'brain drain' or 'brain circulation' is considered by many people a worsening problem in developing countries, however Mr. Thompson feels that this brain drain can be turned into a 'brain gain'. To do so, research on this issue must involve not only those in the

Diaspora, but also those who remain in sending countries, the local governments and institutions. As well, mutual advantages must be identified and programs should be defined and implemented in the hopes that trust will be built and continuously consolidated. At the same time, even with these policies, one hundred percent success should not be expected.

In terms of accountability systems, most design and development of new technologies takes place mainly in developed countries with results occurring in rather controlled settings. Only recently have issues of practical distribution been taken into account at the early stages of design and the result of past work was that many technologies are not effective at tackling the problems they were designed to solve. New systems of accountability will thus allow individuals, institutions and governments to get increasingly involved in the design of new technologies so that barriers for adequate effectiveness can be removed early in the process. As well, on the side of the developed countries there is a need for improved dialogue between the research and development side of aid to developing countries. To do so, developing countries should work on the establishment of accountability systems directed to analyse and remove the barriers to distribution and access to technologies.

With the distribution of emerging technologies Dr. Thompson highlighted what he saw as the two main influences on the distribution of emerging technologies; intellectual property protection and the limited availability of skilled human resources. Human resources are required to absorb and expand the use of new technologies on one hand, and conduct research needed to understand the specific socio-anthropological and economic issues related to the efective use of new technology. Researchers have, in the past, been more inclined to look at 'hard science' while ignoring the necessary look at 'soft science' in understanding the determinants of distribution and access to new technologies.

Dr. Thompson's conclusions were that there is a need to change the approach regarding scientific mobility and institutions and countries need to establish systems and programs aimed at accounting for relevant but poorly absorbed technologies and the related human resources needed. As well, more effort should be made to build capacity in 'soft science' and that a key point in addressing inequalities in S&T in developing countries is equal opportunities in acessing research funds.

3.3 Dr. Ahmet Ademoğlu - Boğaziçi University and TUBİTAK, Turkey

Focussing on local innovation platforms, Dr. Ademoğlu focussed mainly on the enhancement of regional cohesion as well as local innovation strategy. He started out by discussing his home country of Turkey and how it has been recently been giving more support towards academic research funding in practically every region. The fact that 180 universities and research institutions

throughout Turkey now had access to scientific journals, conference proceedings was also brought up, as was the growing support for secondary school research projects, in the form of contests. Public interest in science seems to be growing also as the number of popular science books published and sold has been rising recently while the Turkish Popular Science magazine and its website received 7 million visitors and 446 million hits in the last 12 months.
Local innovation platforms aim to reveal the scientific, economic, social and cultural potential that serves for global competitiveness and convert it into economic and social benefit via scientific and technological investment. The focus is now on towns, as in 2007 there was a national focus while in 2008 there was a sectoral focus. Prof. Cozzens then asked if this was an example of SCoPP in action to which the reply was that it is in the planning stages, but being worked on intensivly.

3.4 Dr. Eduardo Viotti – University of Brasilia, Brazil

Dr. Viotti had a number of comments and suggestions for future research. He brought up the remarkable advances in science and technology, but contrasted this with the continuing problems of humanity such as hunger, fresh water supply and sanitation. Science and technology, he suggested, is being used by those who are already privileged by past S&T achievements. Thus, he asks how S&T might be at the service of equity and sees that some problems require the advancement of S&T while others depend on the use or adaption of already existing knowledge. The first type of problem requires the conventional and narrow concept of both S&T and S&T policy, while the second type requires either an encompassing understanding of S&T policy or must deal simultaneously with S&T policy together with several other policies, like industrial, agricultural, educational and health policies. It is therefore important to broaden the concept of S&T policy, for if the prevailing concept of S&T is kept narrow, it will become mainly a business of the scientific community and hard to include in the agenda considerations about social cohesion.
There is no assumption on Dr. Viotti's part that such a broadening would be a simple affair. He saw for himself how the current existence of a relatively important segment of the Brazilian S&T policy directed specifically to the promotion of social inclusion was achieved in spite of the opposition of the scientific community. This lack of integration with older S&T policy and a S&T policy that targets social inclusion is just one case of the general difficulties to integrate the narrow understanding of S&T policy (the one strictly related with R&D and the production of new knowledge), with the broad concept of S&T policy that also incorporates the process of knowledge and technology diffusion. Thus, the challenge is to integrate the analysis of different policies within the framework of new theories of development.

3.5 Ms. Myrna Bernard – CARICOM Secretariat, Guyana

Mrs. Bernard highlighted the fact that the Caribbean Community is focussing on integration. ResIST, she suggested, has shown that current policies focus more on the KEPP side of the coin and that brings into sharp focus the need to examine and integrate issues of inequality at the outset of policy determination. It is important for CARICOM to increasingly focus on social cohesion, especially in the context of regional integration efforts and the need to build capacity for integrated policy development. Since a greater quality of life is the driving force behind the integration push, SCoPP is important for all members of CARICOM.

3.6 Ms. Maureen Manchouck – Caribbean Council for S&T, Trinidad

Mrs. Manchouck appreciated the usefulness of both the KEPP and SCoPP models in understanding policy outcomes. She saw elements of SCoPP running throughout Caribbean Council priority areas including productive sectors, social services sectors and technology drivers. As well, policy orientation can be seen as reflected in the rationale, vision and priority areas contain elements of both policy paradigms. Specifically, the more explicit focus on enhancing growth, diversification, productivity and competitiveness within KEPP, compared with the consultative process, environmental management and sustainability, use of appropriate technology and indigenous resources, and socio-economic considerations in SCoPP.

As well, it was proposed that future policy research should encompass a more holistic and integrated approach to policy formulation in priority areas and social impact considerations should be made more explicit in the policy framework and in policy implementation. Also, social indicators should be developed to shape and measure policy impacts. Finally, it is essential for the Caribbean Council to explore possibilities for cooperation between EU and the Caribbean to undertake above research under the FP7 programme.

Appendix 1 - List of Participants

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31 March 2009

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Appendix 2 – Meeting Programme

ResIST Policy Seminar, 31 March 2009
South African Mission to the EU, Rue Montoyer 17-19, B-1000 Brussels
(nearest Metro Troon/Trône)

Joining Instructions and Programme

Programme

11.45 -12.00	Registration, coffee
12.00 - 12.05	Welcome, Daan du Toit, South African Mission
12.05 - 12.10	Introduction, Peter Healey, ResIST coordinator (chair)
12.10 - 12.35	Egil Kallerud: *Policy Dimensions of the Global Knowledge Economy*
12.35 - 13.00	Elizabeth Oliver: *Promoting Scientific Mobility and Balanced Growth*
13.00 - 13.25	Daniel Neyland: *Articulating New Accountability Systems*
13.25 - 13.50	Mark Knell: *Distributional Assessment of Emerging Technologies*
13.50 - 14.30	Lunch
14.30 - 15.30	Questions and discussion on the themes of *ResIST, future policies, future research*, chaired by Daan du Toit, including contributions from: David Walwyn - Arvir Technologies, South Africa Ricardo Thompson - Ministry of Health, Mozambique Ahmet Ademoğlu - Boğaziçi University and TUBİTAK, Turkey Eduardo Viotti - University of Brasilia, Brazil Myrna Bernard - CARICOM Secretariat, Guyana Maureen Manchouck - Caribbean Council for S&T, Trinidad
15.30	Seminar ends

Appendix 3 – Work Package Summaries

Work Package 1

Policy Dimensions of the Global Knowledge Economy

Introducing Work Package 1

The overall objective of this Work Package has been to "provide[..] a conceptual overview for the project to work with in its early stages and follows through with the framework, revising it and updating in response to results and workshop discussions" (ResIST DoW). Our work has addressed how the policy contexts for key S&T processes affect the production, distribution, and redistribution of knowledge resources, as a basis for exploring and articulating the scope for alternative policies. The specific objectives of this WP has been to produce and present position papers (project deliverables #1 and #2) as a basis for interaction with policy stakeholders in world regional ResIST meetings in Europe, Southern Africa, Latin America and the Caribbean, and – as deliverable #3 – subsequently develop these papers into a scientific publication.

What is the problem?

Social cohesion – the extent to which a society works together towards the inclusion, integration and opportunity for all – depends on the reduction of inequalities. If the gaps between rich and poor are widening; if enduring ethnic identities are also persistently correlated with economic opportunity; if women do not have the opportunity to contribute their talents – social cohesion suffers. Science, technology, and innovation policy will contribute to social cohesion – a stated goal in many countries – if these decrease inequalities rather than increase them. Our studies in the ResIST project, through the variety of contexts analysed, suggest that science, technology and innovation (STI) policies can make a positive contribution to enhancing social cohesion by incorporating among its policy objectives that of decreasing inequalities.

Our study

The study analysed STI policy frameworks in a diverse set of countries, at the EU level, and at the global level. In particular, it analysed the extent to which different STI policy objectives addressed, in an explicit or implicit way, concerns with the social impacts of these policies.

For STI policies to include social cohesion as an objective and to consider the wider impacts of policies explicitly and systematically into account, a change of orientation is required. We identify two opposite STI policy approaches, or *paradigms*, which differ fundamentally in the way they deal with issues of distribution, inequality and social cohesion. On the one hand we consider what we call the "knowledge economy policy paradigm" (KEPP), which delineates an approach or framework which has become dominant during the last decades, in particularly in developed countries. It is narrowly focused on economic objectives, such as growth, productivity and firm performance, and is often seen to be strongly concerned with the economic role of advanced, science-based knowledge. An alternative approach, which we call the "social cohesion policy paradigm" (SCoPP), differs from KEPP in applying a broader conception of innovation, and take the impacts and implications of STI policies on (un)equal social distribution of the benefits and costs of innovation explicitly into account. Our main argument is that a new, SCoPP-based approach in STI policy needs to be developed by addressing objectives that are concerned both with the development of innovations and their social impact, which have up to now been strongly divided under separate social policies and innovation policies.

In our analysis we concluded that STI policy, in both developed and developing countries, has had a central focus on aggregate economic growth and on innovation geared to the competitiveness of national firms. Although social objectives are increasingly included in official statements, these are often not translated into resources or implementation in the STI area as often as competitiveness

goals. This is reflected in the structure underlying the dominant STI policy paradigm. On the actors involved, this focuses on private firms as the key site of innovation and gives them a privileged place in decision processes; on the forms of knowledge considered, the paradigm primarily recognizes and encourages knowledge that arises from formal research; and on the structure of knowledge production in industry, its primary focus is science-based technology and high-technology manufacturing and services. In such a structure, STI policies tend to encourage excellence and critical mass in existing centres of knowledge production, often leading to the concentration of research efforts.

The existing KEPP model clearly focuses on the distribution of benefits through the market, in a 'trickle-down' process, and on the importance of market signals for shaping the direction of innovation. In this way, implications of IPR policies for regulating distribution processes and social benefits are considered less relevant *vis-à-vis* its impact as an incentive for innovation. As such, the default STI policy is a standardized, "one size fits all", approach to intellectual property protection.

Regarding questions of representation and of accountability, STI policy tends to over-rely on the input of experts in decision-making, and judging performance based on indicators of efficiency. Accountability processes are often technocratic, dominated by elites, and indicator-based. Similarly, STI policy analysis following this model also focuses on indicators of the operation of the science and engineering enterprise with an eye to economic growth, and with a lower concern on identifying wider social impacts.

Under this dominant paradigm, STI policy assumes that the role of the state is to provide the proper conditions for the development of innovations by the private sector.

Recommendations

- National governments should not only articulate broader goals for the innovation process but also translate those goals into specific policies and programmes.
- STI policies and programmes should promote the conditions for the development of innovation by a wide range of actors and organizations, including public services, communities, and civil society, and involve these in the definition of STI policy decisions, through an active, steering role.
- STI policy should recognize the value of many kinds of knowledge and incorporate them into the innovation processes, specifically including traditional knowledge.
- STI policies should encourage the innovation process in traditional, medium, and low technology areas, in order to spread the benefits of improvements in technology across the board.
- STI policies should also balance the development of excellence with active efforts to develop capacity and excellence in new places and among new actors.
- STI policy-makers should develop a broader set of indicators that address the impact of S&T on social cohesion, that identify and/or assess institutional diversity, public engagement in S&T and inclusive processes and their effects; the new approach should also incorporate wider social indicators (such as health, education, environment, inequality, happiness).
- STI policy should encourage transparency in accountability, and employ direct public engagement.
- STI policy should build on broad governance processes and extended public-private partnerships to identify collective needs and create the conditions for the development of collective/public goods.
- The intellectual property system should provide stronger protection for diffusion of innovations that meet basic needs; provide mechanisms that protect the public domain; and incorporate flexibility to adapt systems to different levels of national economic development.

Want to Know More?

Reports are available on the ResIST website (www.resist-research.net). These include:

- Susan E. Cozzens (TPAC, Georgia Tech., USA), Egil Kallerud (NIFU-STEP, Norway),

Louise Ackers & Bryony Gill (U. of Leeds, UK), Tiago Santos Pereira (CES, U. of Coimbra, Portugal) *(2007) Science, Technology and Inequalities in the Global Knowledge Economy: Policy Dimensions. Preliminary Position Paper.* http://www.resist-research.net/cms/site/docs/WP1-Preliminary%20position%20paper_Del_1_Final_09-11-06.pdf

- Susan E. Cozzens (TPAC, Georgia Tech., USA), Egil Kallerud (NIFU-STEP, Norway), Louise Ackers & Bryony Gill (U. of Leeds, UK), Jennifer Harper (U. of Malta), Tiago Santos Pereira (CES, U. of Coimbra, Portugal), Noel Zarb-Adami (U. of Malta), (2008)*Problems of Inequality in Science, Technology and Innovation Policy.* http://www.resist-research.net/cms/site/docs/WP1-2_final.pdf
- Susan Cozzens (TPAC, Georgia Tech., USA), Rob Hagendijk, (University of Amsterdam, The Netherlands), Peter Healey (Institute for Science, Innovation and Society, University of Oxford, UK), Tiago Santos Pereira (CES, Coimbra University, Portugal), (2008) 'The CARE Cycle: A Framework for Analyzing Science, Technology and Inequalities'. Journal article submission. http://www.resist-research.net/cms/site/docs/CARE%20Cycle%20May%2013%2008%20final.pdf

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Work Package 2

Policy Tensions in Relation to the Pursuit of Equality:

Promoting Scientific Mobility and Balanced Growth

Introducing Work Package 2

The aim of WP 2 was to investigate the availability and effective utilization of human resources in science and technology between key 'donor' regions and a host region. In order to understand this process better it the project concentrates on case studies that focus on different country contexts and different sectors. The WP 2 partner countries include Turkey and South Africa (identified as sending countries) and Germany and the United Kingdom (identified as receiving countries).

What is the problem?

The production, utilisation and commercialisation of scientific knowledge are underpinned by the availability, and effective use, of human resources. But human capital in science and technology is not equally distributed within and across countries and regions of the world. With the increasing globalisation of science and technology, longstanding concerns about the (unbalanced) flows of human capital moving from less developed countries to developed countries have become even more pronounced. The received wisdom on 'brain drain' and 'scientific migration' is increasingly being challenged with recent studies looking more systemically at notions of 'brain circulation', 'diaspora networks' and the like. Nevertheless, there are still important questions to be asked about the impact of researcher mobility on the sustainability of science and technology labour markets, in both 'sending' and 'receiving' countries. This study addresses these issues by considering the implications of mobility on:

- The production of scientific knowledge,
- The reproduction of knowledge in relation to the training of the next generation of researchers
- The sharing of knowledge through transfer across borders

Work package 2 builds upon a body of literature that promotes new ways of understanding the impact of highly skilled migration and blurs clear distinctions between the "winners" and "losers" of migration flows. The focus of much Highly Skilled Migration literature is on brain circulation and network approaches to understanding migration. Caution is expressed against applying these concepts whole sale to the experiences of developing countries which continue to experience a loss of skilled personnel. The importance of gaining a more accurate and nuanced understanding of the processes behind highly skilled migration is stressed.

Generating New Insights

The study sought to generate new insights through conducting fieldwork in four countries. The objectives of the research were as follows:

- To study human capital flows between EU Member States and 'Third Countries'
- To consider the impact this kind of scientific mobility has on the individuals and regions concerned both in terms of individual equity and regional equality;
- To identify the appropriate policy and resource environments capable of supporting sustainable and reciprocal human mobility;
- To encourage a closer alignment between policy in the fields of science and technology, and migration.

In order to promote in depth understanding of the migration motivations of scientific migrants themselves interviews were conducted with mobile scientists. Each of the four research teams involved in the study interviewed around 25 scientists generating a bank of 96 'case studies' of highly

skilled migrants in total. The focus of the case studies was designated as follows:

- South African researchers in the health sciences in the UK
- South African researchers in the health sciences who have returned to South Africa
- Turkish researchers in the physical sciences and engineering in Germany and
- Turkish researchers in the physical sciences and engineering who have returned to Turkey

The Findings

The data was analysed thematically and four papers based on pertinent issues were produced (details below). The thematic papers look in depth at specific issues relating to migration decision making, knowledge transfer and exchange and the capacity of academic institutions in developing countries to generate and harness knowledge.

It is important to recognise the diversity of contexts in which migration occurs. Policy recommendations need to pay careful attention to national context: policies are rarely transferable in any direct or simplistic sense and may generate unintended consequences (backlash). Policy developed in areas distinct from science or migration, for example national employment policies, may generate important externality effects shaping the attractiveness of both sending and receiving regions and migration behaviour.

Looking at the sending countries, it is important to address factors that impact on emigration. Scientific mobility is shaped by push factors as well as the attraction of receiving countries. It is important to address factors relating to research environments such as access to facilities and resources as well as adequate working conditions and sufficient remuneration. In the context of developing countries and specifically African institutions, institutional capacity (and the deinstitutionalisation of universities) continues to have a marked effect on emigration and vice versa. Any attempt to stem or reverse the loss of scientific expertise will fail if it does not also consider interventions and initiatives that restore and eventually make academic institutions sustainable research institutions. Governments and international funders should be encouraged to support research centres and institutes which either have already achieved some critical mass or have the potential to do so. Such centres should be sufficiently resourced to enable them to undertake both basic and fundamental research in critical areas of national interest and not to become completely dependent on commissioned contract research.

Destination countries have a role to play in promoting return and contributing to capacity building within the donor countries. This study supports the view that effective return coupled with professional reintegration is seen by science professionals as the most important mechanism for knowledge transfer. However, prior to and in lieu of return, individual scientists often engage in knowledge exchange with colleagues and friends in the sending country. Such 'knowledge remittances' are generally individually motivated and directed. Moreover such knowledge exchanges occur in the context of international networks of resources involving sending, receiving and further countries. Innovative and flexible schemes supporting short term travel (such as ‘Diaspora grants’) encourage both return and continued professional links/knowledge transfer. Where established links exist between research teams in the sending and receiving countries, targeted capacity building will help to ensure that doctoral and professional exchanges do not result in knowledge and human resources being lost to the sending country. It is important to stress that the effectiveness of forms of knowledge contribution ‘at a distance’ is dependent on institutional capacity within the sending country.

Want to Know More?

The four thematic papers, which integrate the work of this work package, are available on the ResIST website at:

http://www.resist-research.net/paperslibrary/full-and-final-results.aspx

- Thematic Paper 1, '*Giving Something Back': Exploring Making a Contribution at a Distance,* Dr Liz Oliver (Deliverable # 9)
- Thematic Paper 2, *Scientific Fields, and Resourcing and Migration Decisions and Trajectories - Where have all the Health Scientists Gone? A South African question,* Simone Esau and Liezel de Waal (Deliverable # 10)
- Thematic Paper 3, *Excellence, Migration and Equality Policy: Managing Unintended Consequences,* Prof Louise Ackers (Deliverable # 11)
- Thematic Paper 4 *Scientific Mobility and Institution Building in Science in Developing Countries* Prof Johann Mouton, Nelius Boshoff and Roland Waast (Deliverable # 12)

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Work Package 3

Articulating New Accountability Systems

Introducing Work Package 3

The last decade has seen a dramatic increase in calls for, and declarations regarding, the advantages of accountability systems. However, within these calls for more accountability, there has been little investigation of the terms, effectiveness, consequences or most appropriate means of achieving accountability. Redistributive initatives often fail because they do not examine assumptions about what constitutes 'effectiveness'. The role of Work Package 3 was to identify and analyse the emergence of accountability systems that could address inequalities and distributional issues and, simultaneously, generate new forums for making political action more publicly accountable.

What is the problem?

Systems of accountability are the means by which the potential distributional consequences of science, policy and practices can be recognised and assessed — and potentially incorporated — by formal elements of the political system. Accountability systems attuned to the needs of the disadvantaged are thus an important prerequisite for reorienting scientific governance towards greater social inclusion in building science and technology priorities and in distributing its products.

Our study

In this research, two different but complementary contexts were investigated. These were: first, experimental initiatives of capacity building and priority setting; and, second, redistributional issues associated with the design, development, access to and use of mundane, everyday technologies.

The first context focused exclusively on participatory modes of accountability. These initially covered the participatory budgeting processes in Belo Horizonte (Brazil), Seville (Spain) and S. Brás de Alportel (Portugal), and enabled exploration of the areas of urban planning and information and communication technologies. Subsequently, we added cases focused on the creation of a public health system (including national and local levels of intervention) and the control of endemic diseases, both in Brazil, as well as the controversy between the European Union and the Brazilian environmental justice movement on the imports of used/retreated tyres.

In the second context, three areas were defined: textile lifecycles, vaccines and e-waste. For textile lifecycles, the research work identified two central modes of textile accountability with inequality issues. First, textile import and export quotas were analysed in order to understand their redistributional consequences. Second, fair trade textile initiatives were investigated as an accountability system which held out the promise of poverty alleviation. The vaccines case focused on malaria as a neglected disease and analysed attempts to produce a vaccine within a broad suite of interventions (from policy initiatives through to the distribution of bed nets). Public-Private Partnerships with combinations of state, private and philanthropic funding were identified as key sites of intervention where novel forms of accountability were played out. The E-waste case was used to analyse the development of European Directives aimed at tackling e-waste and preventing movement of waste to developing countries, by rendering industry accountable and responsible.

Results and recommendations

This Work Package has proposed four modes of accountability, summarised in the table:

Accountability Mode	Characteristics	Setting	Relation to Inequality	Challenge
Face to face	Face to face accountability relations to constitute sense of interaction	Formal and informal	Face to face meetings can include broader membership	Informal, non-codified, impossible to assess impact
Directive	Metrics and measures used to hold organisation to account	Formal measures often developed outside organisation	Can look to pro-poor metrics	Metrics don't measure, they shape action
Demonstrative	Means by which organisation demonstrates its accountability	Information made available for external audiences	Information made available might enhance transparency	Info made available may match internal activities. Is it useful?
Participatory	Means by which otherwise external audiences can take part in accountability	Usually a set-piece occasion where audience engages with organisation, process, etc.	Broader membership of active participants in, e.g., decision making	Who gets to participate, in what, with what outcome? The training paradox is part of this.

The first set of cases drew up recommendations concerning the design and implementation of public policies, particularly those aimed at addressing inequality through citizen participation:

- In participative modes the 'user' or 'policymaker' is identified by the process. A broader conception of "policy maker" therefore needs to be adopted, based on the articulation of several actors in policy development, including technical staff, citizens, civic organizations or social movements;
- The capacity to participate and deliberate does not emerge spontaneously; specific training procedures, such as the citizenship schools implemented in some experiences of participatory budgeting, should be organised to enhance citizen participation. However, there is a central paradox here, in that such training may frame issues, select issues and modes of contribution in a way that limits the extent of participation and the range of outcomes that can be achieved.
- The integration of participatory procedures in development policies, allowing the inclusion of bottom-up contributions, must take into account that the move from consultative to deliberative modes carries the strong implication that the decision making process has binding powers.

The second set of cases, focused on redistributional issues in mundane science and technology, had the following accountability recommendations:

- The users of modes of accountability should be conscious of their consequences in shaping the direction and success of development projects. eg too much attention to the very prevalent directive (mostly numerical) forms of accountability may blind the user to a range of unanticipated consequences. Combined use with other forms of accountability may help to check that and control for other distributive effects.
- Accountability processes don't guarantee outcomes – these still require scrutiny.
- Drawing forms of accountability together can be useful for managing financial, reputational and opportunity risks in multi-partner pro-poor projects.

Want to Know More?

Work Package 3 has produced 3 analytical reports along with reports on each individual case-study. These are available on the ResIST website: http://www.resist-research.net/paperslibrary/full-and-final-results.aspx

- Integrated Accountability Framework
- WP3a Policy Report
- WP3b Policy Report
- Individual Case-Study reports

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Work Package 4

Distributional Assessment of Emerging Technologies

Introducing Work Package 4

The main task of Work Package 4 was to develop a framework for assessing whether new technologies are likely to increase or decrease inequalities. To accomplish this task, research teams from Germany, Malta, Mozambique, Norway and the United States carried out research on five technologies across eight countries with varying levels of development. In partnership with the project *Resultar*, funded by the U.S. National Science Foundation under Grant 0726919, we are working toward the production of an edited volume reporting on the research.

What is the problem?

Emerging technologies are new, science-based technologies that have a high potential to increase both economic growth and social inequality. Inequality becomes an issue because high research costs and skill requirements generates distributional consequences through high relative prices. For this reason, emerging technologies have a higher potential than older technologies for generating inequalities in access and employment. The benefits and costs of creating, producing, and using the new technology varies considerably across countries and people, a situation which is shaped by policy interventions.

The main objective of Work Package 4 was to model the distributional impact of new science-based technologies on business opportunities, employment, benefits, and costs. To accomplish this task, the research aimed to:

- Describe the dynamics that link emerging technologies to patterns of inequality;
- Identify the roles of public interventions in those dynamics; and
- Develop a framework that policy actors can use prospectively to analyze the distributional significance of a specific new technology in a particular national context.

Our central research question is how policy interventions affect distributional outcomes for the same technology under different national conditions.

Our study

This work package studied the distributional consequences of five technologies in eight countries. We looked at the distribution of business opportunities, employment, benefits, and costs. To capture the full impact of emerging technologies across different development levels, the project focused on technologies that emerged some time ago to be able to track actual effects rather than projecting them. The cases were information and telecommunications technologies and biotechnologies. Examples from the past were used to develop a framework for thinking about the future for new areas such as nanotechnology or synthetic biology. The five cases studied are: genetically modified (GM) maize, mobile phones, open source software, plant tissue culture, and recombinant insulin. They represent both proprietary and public ownership models, and range from simple to highly complex. The eight countries included are: Argentina, Canada, Costa Rica, Germany, Jamaica, Malta, Mozambique, and the United States. Half are high-income and half are low or middle-income countries.

Results and recommendations

Two factors were clearly significant in the distribution of business opportunities. One was intellectual property protection. In some of our cases, multinational corporations held tight control of intellectual property around a new technology, limiting the opportunity for other firms to enter the market. In GM maize, corporate control limited business opportunities even in related industries in countries far from headquarters. In recombinant insulin, the control is so tight that generic manufacturers had a hard time entering the market even after the original patents expired. In contrast, plant tissue culture, a public sphere technology, has created business opportunities in both developed and developing countries in our study.

A second constraint on business opportunity, however, is skill. If an environment does not have enough people at a high enough skill level to support or extend the technology, the ownership question is moot. Open source software illustrates this. Open source software is more likely to be used in large firms or universities than small ones. The reason appears to be that in order to benefit from the open source code, the organization must have sufficient programming skill to be able to make adjustments to the software itself. For the same reason, open source software businesses appear to develop only in places where there is already a software industry; we did not find evidence of open source-based businesses in the developing countries in our study.

Direct employment effects of the emerging technologies in our study were small, except for the mobile telecommunications industry. In this industry, employment increased with the new form of service, and declined as landline subscriptions decreased. For the other technologies, high-technology manufacturing jobs tended to stay in affluent countries (e.g., in recombinant insulin), and there was a modest shift from lower-skilled, more dangerous jobs to somewhat higher-skilled, less dangerous ones. For example, GM maize allows for less pesticide use, a benefit to farm workers. By raising and stabilizing yields, the agricultural technologies we studied also stabilize incomes for family farms and their employees. Our study did not include any of the countries that experienced rapid growth in employment through electronics manufacturing – indicating that those experiences may be the exception rather than the rule.

Public policy had several effects on the distribution of benefits and costs from the five technologies. Environmental regulation in Europe raises production costs for farmers who grow GM maize to fend off European corn borers. Deregulation in the mobile phone industry increased competition and led to an expansion of pre-paid plans in several countries and hence a rapid proliferation of mobile telephones worldwide. Nevertheless the cost per call unit is higher in pre-paid plans, and the share of family income consumed is also disproportionate for low-income families and in less developed countries. Even the pre-paid plans, however, cannot reach the poorest consumers in areas where electricity is not dependable and the wireless equipment not installed. Thus we found that in Mozambique, mobile phone use is largely confined to the capital city, and men are much more likely to use them than women.

Recombinant insulin was made more available through public procurement by national health services in most countries in our study. But in the United States, the private insurance system creates significant gaps in coverage. And in Mozambique, doctors are hesitant to prescribe an insulin regimen for use in very poor households, as they have difficulties keeping up its complicated requirements. Public procurement also made tissue culture for banana plants available to poor farmers in Jamaica, but when the public subsidy disappeared, these farmers could not afford to import the material, as more affluent farmers could. These examples show that the distributional boundary for the technology is drawn partly by public action and partly by family conditions.

The study shows that national conditions matter a great deal in crafting policy options to spread the benefits of new technologies broadly. Furthermore, it suggests that:

- Intellectual property protection should be moderated so that it is not used to suppress business opportunities for local enterprises in developing countries or limit their access to essential goods.
- Creating pockets of highly-skilled workers is critical in giving developing countries local access to new technologies.
- Basic infrastructure and education are important investments in increasing the capacity of highly unequal countries to absorb and diffuse new technologies widely.

The project has produced a framework of questions to pursue about proposed technological projects, plus established patterns in expected answers, together constituting Distributional Technology Assessment (DTA).

Want to Know More?

Research carried out in the work package will be available on the ResIST website at: http://www.resist-research.net/paperslibrary/full-and-final-results.aspx

A background paper by Susan E. Cozzens, Sonia Gatchair and Dhanaraj Thakur, 'Distributional Assessment of Emerging Technologies: A framework for analysis' is available on:

- http://www.resist-research.net/paperslibrary/research-summaries.aspx

Papers based on the project presented at professional meetings in 2008 include:

- http://prime_mexico2008.xoc.uam.mx/papers/Susan_Cozzens_Emerging_Technologies a_social_Cohesion.pdf
- http://globelics_conference2008.xoc.uam.mx/papers/Dhanaraj_Thakur_The_Distributional.pdf
- http://globelics_conference2008.xoc.uam.mx/papers/Isabel_Bortagaray_Analyzing-the_interactions.pdf
- http://prime_mexico2008.xoc.uam.mx/papers/Dhanaraj_Thakur_Technology_Policy_and_Distributional.pdf

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