



#### FORESIGHT CHARACTERISTICS AS A PATH TO POLICY DESIGN

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Summer School: The role of the social sciences in the construction of the knowledge-based society: European and Latin American Perspectives August 17-30, FLACSO, Mexico D.C:, 2009

# Outline

- 1. Foresight to Policy Design
- 2. Foresight Concepts and Methodology
  - Evolution
  - Why, How
- 3. Who: Foresight Systems
  - World Main Centres and institutions
  - Colombian Foresight Program
- 4. Case Study: Korea
- 5. Conclusions

### 1. FORESIGHT AND PUBLIC POLICIES

# **Guides & Handbooks**

- The Handbook of Technology Foresight: Concepts and Practice (2008)
- Practical Guide to Research Infrastructure Foresight (2007)
- Global Foresight Outlook (2007)



#### http://prest.mbs.ac.uk/foresight/rif\_guide.pdf

#### http://prest.mbs.ac.uk/efmn/gfo\_2007.pdf

- The Knowledge Society Foresight Handbook
- Practical Guide to Regional Foresight (translated into EU languages)

2

Manual de prospectiva y decisión estratégica: bases teóricas e instrumentos para América Latina y el Caribe

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CEPAL

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Área de Proyectos y Programación de Inversiones



### PROSPECTIVA NA AMERICA LATINA

### EVOLUÇÃO E DESAFIOS

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Organizadores Dalci Maria cos Santos Lélio Fellows Filho Draft for Comment and Internal Discussion only

The Evaluation of the Colombian Technology Foresight Programme

#### **Final Report**

Rafael POPPER lan MILES Luke GEORGHIOU Michael KEENAN

October 2008

University of Manchester (United Kingdom)

# Foresight: Multidisciplinary Area



Gavigan, 2002

# Foresight and public policies levels

- Foresight has emerged as a key instrument for the development and implementation of research and innovation policy.
- The main focus of activity has been at **national level** as governments have sought to:
  - set priorities;
  - *build networks* between science and industry;
  - change the administrative culture & research systems and;
  - encompass structured debates with wider participation leading to the creation of common visions.



Popper, 2008; Medina & Ortegón, 2008

### 2. FORESIGHT CONCEPTS AND METHODOLOGY

# Foresight evolution



# (Technology) Foresight

- Has become extremely prominent across Europe (and many other regions) since 1990s
- Builds on some key elements of futures studies and forecasting, and uses many of their methods.
- Shares basic philosophy of futures studies: not so much *predicting* the future as shaping and planning for the future.
- Takes many forms, and is part of a wider movement towards Foresight culture (?) and Knowledge-Based Economy

# **Technology Foresight**

- Futures studies have been in existence for many decades big upsurge in '60s/70s, then some decline.
- Foresight emerged as a major area of activity in mid 1990s. Especially focused on national S&T programmes, with exercises in many large EU countries – and rapid diffusion more widely.

1995





# Why has Foresight taken off?

- Recognition of the centrality of technological innovation for competitiveness economic growth & social wellbeing
- Difficult decisions about R&D, as new technologies proliferate and converge, and as public budgets come under pressure creating a drive to concentrate available resources on fewer, more strategic options
- Awareness of weaknesses in the *innovation systems* linking scientific knowledge, technology commercialisation, standards-setting, etc.
- Public perception of risk and ethical issues in some major innovations (and even in R&D)
- Inability of any single organisation to marshal all relevant knowledge, and need to combine together insights from a wide range of fields



# **Product and Process**

- Foresight yields Codified Products reports, policy proposals, priority lists, etc.
- But Processes are equally important knowing who has what knowledge and what expectations, what strategies may be adopted in what contingencies



Rationale 1: Directing or prioritising investment in STI (Setting general research directions by identifying previously unknown opportunities)

- Informing funding and investment priorities, including direct prioritisation exercises;
- Eliciting the research and innovation agenda within a previously defined field;
- Reorienting the science and innovation system to match national needs, particularly in the case of transition economies;
- Helping to benchmark the national science and innovation system in terms of areas of strength and weakness, and to identify competitive threats and collaborative opportunities;
- Raising the profile of science and innovation in government as means of attracting investment.

# Rationale 2: Building new networks and linkages around a common vision

- Building networks and strengthening communities around shared problems (especially where work on these problems has been compartmentalised and is lacking a common language);
- Building trust between participants unused to working together;
- Aiding collaboration across administrative and epistemic boundaries;
- Highlighting interdisciplinary opportunities.

Rationale 3: Extending the breadth of knowledge and visions in relation to the future

- Increasing understanding and changing mindsets, especially about future opportunities and challenges;
- Providing anticipatory intelligence to system actors as to the main directions, agents, and rapidity of change;
- Building visions of the future that can help actors recognise more or less desirable paths of development and the choices that help determine these.

# Rationale 4: Bringing new actors into the strategic debate

- Increasing the number and involvement of system actors in decision-making, both to access a wider pool of knowledge and to achieve more democratic legitimacy in the policy process;
- Extending the range of types of actor participating in decisionmaking relating to science, technology and innovation issues.

Popper, 2008

Rationale 5: Improving policy-making and strategy formation in areas where science and innovation play a significant role

- Informing policy and public debates in these areas;
- Improve policy implementation by enabling informed "buyin" to decision-making processes (for example, so that participants in foresight activities are able to use the understanding acquired here to argue the case for change, and to bring it to bear in more specialised areas than the Programme as a whole has been able to).



### **The Foresight Management**



# Methods / TFA



Source: EFMN

#### **Popper**, 2008



### 3. WHO: FORESIGHT SYSTEMS

# **Organisational Forms of Foresight**

S C O P E +

Networks	Programmes
Exercises (one-off projects)	Centres Specialised institutes
-	+

ORGANISATIONAL STRUCTURE

Medina & Ortegón, 2008

#### INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES EUROPEAN COMMISSION (IPTS)

### http://www.jrc.es/home/index2.cfm



### APEC CENTER FOR TECHNOLOGY FORESIGHT

#### www.nstda.or.th/apectf/



# JAPAN NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY POLICY (NISTEP) http://www.nistep.go.jp/index-e.html

- Director General's Message
- About NISTEP
- NISTEP Achievement list NISTEP Report Policy Study Research Material Discussion Paper Evaluation S & T Trends - Quarterly Review -Location TOP

National Institute of Science and Technology Policy

Ministry of Education Guiture Sports Science and Technology

Last Update Feb. 18, 2005

#### ANNOUNCEMENT

Due to the scheduled maintenance of network, this homepage will be unavailable from Feb. 26 9:00 JST to Feb 27 18:00 JST.

#### What's New

- Science & Technology Trends Quarterly Review No. 14 January 2005 (Feb. 2005)
- The NISTEP International Colloquium Seamless Culture Through Science Communication (2004.12.15)
- International Workshop on the Comprehensive Review of the S&T Basic Plans In Japan

- Toward the benchmarking of the effect by integrated S&T Policy - Additional information. (Nov. 2004)

- DISCUSSION PAPER No 37 Determints of growth in Japanese high technology start-up firms (Nov. 2004)
- NISTEP Report No.74 Study for Evaluating the Achievments of the S&T Basic Plans in Japan - FY2003 Highlights -(Oct. 2004)

### KOREA INSTITUTE OF S&T EVALUATION AND PLANNING (KISTEP)

### www.kistep.re.kr/main00/English/main/main.asp



### OBSERVATORIO DE PROSPECTIVA TECNOLOGICA INDUSTRIAL www.opti.org



### PREST INSTITUTE OF MANCHESTER UNIVERSITY les.man.ac.uk/PREST/



#### Laboratoire d'Investigation en Prospective Stratégie et Organisation



### Michel Godet



# William Halal



http://prest.mbs.ac.uk/efmn/efmn\_global\_foresight\_outlook\_gfo\_2007.pdf



#### Mapping Sample





Manchester Manchester Institute of Innovation Research PRFST

MANCHESTER











\*





#### Latin Foresight Panorama (Experiences and Cooperation)

Popper, 2008

Country	State of Evolution *	Level +	Focus #	<b>Objectives</b> ~
Argentina	A/I	R, Se, O, Ac	F/s, P	A, Ne, Act-P
Bolivia	Im	Se	F/s	Α
Brazil	A/I	N, R, Se, O, Ac	F/s, P	A, Ne, Act, Act-P
Chile	Le	N, R, Se	F/s, P	A, Act, Act-P
Colombia	A/I	N, R, Se, O, Ac	F/s, P	A, Ne, Act, Act-P
Cuba	A/I	R, Se, Ac	F/s, P	A, Ne, Act, Act-P
Ecuador	Le	Se, Ac	F/s	Α
Panama	Im	Se	F/s	Α
Paraguay	Im	Se	F/s	Α
Peru	Le	N, R, Se, O, Ac	F/s, P	A, Ne
Mexico	A/I	N, Se, O, Ac	F/s, P	A, Ne
Uruguay	Le	N,R, Se	F/s	Α
Venezuela	A/I	N, R, Se, O, Ac	F/s, P	A, Ne, Act, Act-P

- State of evolution: position of foresight/future activities in the country along a<br/>from imitation [Im], via learning [Le} to adaptation/innovation [A/I]spectrum
- Level: national [N], regional [R], sectoral [Se], organizational [O], academic [Ac]
- Focus: foresight [F/s], policy action [P]
  - **Objectives:** anticipation [A], networking [Ne], action achieved [Act], action pro

#### action proposed [Act-P]

#### **Countries with 1 or more foresight projects with Europe**



COLOMBIA

Uhan

### **Phases of the Colombian Process**



# Foresight in Colombia

#### • Main actors

- Colciencias, SENA, Universidad del Valle, National Centre of Productivity (CNP)
- Ministry of Agriculture, Ministry of Commerce, DNP
- CAF, CAB, UNIDO (incubation)
- Main objectives
  - Building capabilities & foresight culture
  - Fund and execute exercises
- Main methods
  - Brainstorming, Surveys, Panels, SWOT, Delphi, cross-impact
  - Scenarios & recommendations
- Main activities
  - Orientation of national capacities in technological and industrial foresight
  - for the development of strategic areas in science, technology and innovation.
  - These areas should be applied to the knowledge economy

Medina , 2006

### Strategies of the National Program on Industrial and Technological Foresight Medina , 2009



#### Resources- Colciencias /SENA, Ley 344

# Colombian Foresight Programme (1<sup>st</sup> Cycle) – 2003-2004 Medina , 2009

First Cycle of the Colombian Foresight Programme (2003 –04)				
P1	Colombian Milk Sector	sectoral		
P2	Colombian Electricity Sector	sectoral		
P3	Colombian Food Packaging Sector	sectoral		
P4	Tourism Sector in Cartagena City	secto-territorial		
P5	Health Cluster of the Cauca Region	secto-territorial		
P6	Horticulture in the Bogota Plains	secto-territorial		
P7	Vegetable Fibres in Santander Region	secto-territorial		
P8	National Biotechnology Programme	thematic		

# Colombian Foresight Programme (2<sup>nd</sup> Cycle) – 2005-2007 Medina , 2009

	Second Cycle of the Colombian Foresight Programme (2005–07)				
P9	Colciencias: Productive Transformation of Colombia into a Knowledge Economy				
P10	Colciencias / DNP: National STI Plan – Colombia Vision 2019				
P11	Colciencias / MCIT: Micro-Small-and-Medium Enterprises Fund (Fomipyme)				
P12	Colciencias / C. Excellence: Tuberculosis	Environmental Scanning + Foresight (ESF)			
P13	Colciencias / C. Excellence: New Materials (Hardening Surface)				
P14	Colciencias / C. Excellence: Essential Oils and Natural Products (Medicinal Plants)				
P15	Colciencias / C. Excellence: Genetic Resources and Biodiversity (Black Sigatoka in Plantain)				
P16	Colciencias / C. Excellence: Culture, Development and Peace				
P17	Colciencias / EAAB / EPM: Pilot on the Water Recycling Cluster				
P18	Colciencias / CIDET: Pilot on the Electricity Cluster				
P19	Colciencias Programmes: Biodiesel Production Technologies				
P20	Colciencias Programmes: Bioinputs (e.g. biofertilizers)				
P21	Colciencias Programmes: Electronics Applied to Agriculture	Environmental			
P22	Colciencias Programmes: Nanotechnology Manufacturing Methods	Scanning (ES)			
P23	Colciencias Programmes: Malaria Vaccines	×			
P24	Colciencias Programmes: Social Conflicts Resolution				
P25	Colciencias: National Capacities in Higher Education, Research and Innovation				
P26	Colciencias / MADR: Furniture and Wood Products	Environmentel			
P27	Colciencias / MADR: Cacao and Chocolate	Environmental Scanning + Productive Chain Foresight (ES- PCF)			
P28	Colciencias / MADR: Dairy Products				
P29	Colciencias / MADR: Tilapia Fish				
	International Networks Projects				
P30	Productive Transformation and Higher Education in CAB countries (SECAB)				
P31	Scenarios for Research and Technology Development Cooperation with Europe (SCOPE)	ESF			
P32	Strategic Euro-Latin Foresight Research and University Learning Exchange (SELF-RULE)				



Medina , 2006



# Broadening of portfolio of foresight methods and processes Medina , 2006

- The development of skills has been generated from a process of accumulation of experiences, intellectual production, processes, and methodologies: 32 exercises.
- The Program has progressively diversified its portfolio of services:
  - Executes pilot exercises
  - Strategic and demonstrative exercises
  - Sensitivity meetings on foresight and technological watch designed for companies and conducted with local "strategic partners"
  - Conferences by invitation only, and
  - Seminars for the Formation of Trainers motivated by the Program Agenda.
- During the process new practices have been introduced
  - Big an important Intellectual Production (100: papers, books, etc.)
  - Technical profficiency sponsors colaboration. Learning is gained through international cooperation. We have established a wide synergy with international organizations

### 4. CASE STUDY: COREA

Park, and Son, 2006)

# Currently On-going TF activity in Korea

Туре	Sponsoring Ministry	Facilitating organization	Thematic Area or Project Title	Time Horizon	Methodology
TF (2006)	Ministry of Information and Communication	IITA (Institute for Information Technology Advancement)	Foresight for Information Technology	-2030	Delphi
		NCA (National Computerization Agency)	Ubiquitous Korea	+15 yrs	Panel
TF (2006)	Ministry of Health and Welfare	KHIDI (Korea Health Industry Development Institute)	Future Trends in Health care and Life Science	+15 yrs	Delphi
TF (2006)	Ministry of Environment	KIEST (Korea Institute of Environmental Science and Technology)	Future Trends in Environmental Technology	+15 yrs	Environmental Scanning Delphi
TF (2006)	Ministry of Science and Technology	KISTEP (Korea Institute of S&T Evaluation and Planning)	Thematic Foresight -Nanomaterial -Stem cell -Ubiquitous Computing	+15 yrs	Panel Scenario
F	The Presidential Office	Presidential Committee on Education Innovation	Future of Education in Korea -What we do right now?	+15 yrs	Panel
TRM (2001- prese nt)	Ministry of Commerce, Industry and Energy	KOTEF (Korea Industrial Technology Foundation)	Technology Roadmap for - Material and Component - Industries (Robot, Battery, Semiconductor, Automobile etc.)	+10 yrs	TRM Panel
ST (2006)	Ministry of Planning and Budget	Co-Work with KDI(Korea Development Institute)	Vision 2030 - Layout for government Budget Spending up to 2030	-2030	Panel

## Overview of Korean Technology Foresight carried out by MOST Park, and Son, 2006)

- S&T basic Law : Article 13 (enacted in 2001)
- Every 5 years (carried out by KISTEP)
- Provide the vision and direction of emerging S&T area identify new technology that may have high potential for growth of national wealth and betterment of quality of human life
- Has to implement in S&T basic plan (every 5 year, 2<sup>nd</sup> Plan for 2008-2012))
- Ist TF (1993-1994) and 2<sup>nd</sup> TF(1997-1998) were Lab-Directed Research Projects carried out by STEPI \* and KISTEP

\*STEPI (Science and Technology Policy Institute)

3<sup>rd</sup> TF was carried out in 2003-2004 by KISTEP and it is the first TF after enactment of S&T basic Law.

# 3<sup>rd</sup> Korean TF : Characteristics

- Consideration of socio-economic needs and issues in future Korea and enlargement of participation of the stakeholders
- Application of Delphi methods for emerging technology that may solve the future needs and issue
- Scenario writing for future society
  - Future prospect, needs/issues and technology
  - Internal consistency
  - Increase awareness the role of S&T in the knowledge-based society
- Offering of policy alternatives to promote knowledge-based innovative society

Time Horizon : up to year 2030 Project : Duration : 2003.7 - 2004.12 TYPE OF EXERCISE ADDRESSED: National – covering all S&T fields and the entire territory of Korea

# 3<sup>rd</sup> Korean TF : Procedures

Park, and Son, 2006)

2<sup>nd</sup> Phase 1<sup>st</sup> phase Future Technology Future perspectives Subjects and Delphi Needs and Issues of Survey society (4 actors-15 categories-43 subcategories Analysis (Dec. 2003) (Aug. 2004) 3<sup>rd</sup> Phase Future Social Systems Scenario Building (Dec. 2004)

# Korean TF : Sector Expert Panels

# 10 sectors (based on key words)

Space & earth ٠ Material & manufacturing ٠ Information and knowledge • Food & bio-resource ٠ Life & health Delphi Survey ٠ **Energy & environment** ٠ Safety & Securuty ٠ **Provide List of Future Technologies** Social Infrastructure ٠ Management & innovation Scenario S&T and society/culture

Park, and Son, 2006)

# Korean TF : Results

- Technology Foresight with socio-economic consideration (3<sup>rd</sup> Generation Foresight)

  - Future perspectives, assessment of future needs & issues
     Scenario writing on future social systems (education, labor, healthcare, safety)
- Identify 761 future technology subjects 61% of them will realize between 2011-2015

  - Korea is still lagging all future technology area
    Korea has the strong competitiveness in IT area
    Space and earth is most lagging area(7-10 years)
- Strong emphasis on dissemination to the general public - Book, Comics, Movie in addition to formal report
- Heavy media exposures
- Government took follow-up action quickly

   Future Strategic Technology

## National Strategic Future Technology Initiative

- Government launches new project to identify emerging generic technologies at the national level based on 3rd Korean foresight results
- Critical attributes of national strategic technology
  - Emerging
  - Disruptive
  - Converged
  - Strategic area where government should be involved

Park, and Son, 2006)

# Future Strategic Technology 21



 Digital convergence •Smart computing Nano and functional material

 Cognitive science and humanoid robot

•Regenerative •Culture contents medicine

- Information security
- Super efficient transportation
- •Bio-resource
- •Satellite
- fusion

#### Quality of Life

- Bio-safety & defense • Drug discovery & personalized medicine Bio-diversity and natural resources conservation
- Ubiquitous civil infrastructure
- •Hazard? disaster forecast
  - •Climate/weather forecasting/

Global observing system

Public Need

- Next generation nuclear energy Marine territory management and safety
- Clean and renewable energy

Park, and Son, 2006)



### Portfolio Analysis of Strategic Products and Functions Park, and Son, 2006)



### **5. CONCLUSIONS**

# Varieties of Foresight

- Technology Foresight vs Regional, Environmental, etc.
- Geographical Focus
- Time horizon
- Large-scale exercises vs much smaller ones
- Major government initiatives vs specific agencies vs more independent
- Various funding sources
- Varying Objectives







FTA Future oriented Technology Analysis



Interpreting Foresight Process Impacts: Steps towards the Development of a Framework conceptualising the Dynamics of 'Foresight Systems'

Analysis

#### Objectives Hierarchy for Foresight exercises



# *MUCHAS GRACIAS!*

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