TECHNOLOGY - DEVELOPMENT - POLICY

(and all that again)

Flip Notes
on a recurrent theme
that won't go away
(fortunately)

Offered by
Dr. V. Siddhartha

to a

Seminar on "Technology and Development"
held as the second seminar in a series
organised by the Social Affairs Group of the
India International Centre,
New Delhi
04 April 1992

VS : April 1992

SCIENTIFIC POLICIES

What are they?

- The oft-quoted, oft-misinterpreted **Scientific Policy Resolution** (SPR) of 1958 is about scientific policies: SPR is not, primarily, about policies for science, although the development of science is the foundation on which scientific policies are formulated.

- Scientific policies are those policies (of house-holds, enterprises, communities, and governments) which enable the incorporation and utilisation of scientific facts and their applications in the activities of such individuals, house-holds, enterprises, communities and governments. Scientific policy is not, primarily, about whether a particular laboratory, facility or programme of research should be funded and to what extent, although those may well be conclusions drawn from a proper scientific assessment of the subject-area.

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SCIENTIFIC POLICIES ARE FORMULATED

When we ask the question:

Have the findings of science and the possibilities of technology been properly used to design instruments of public policy that are not, in themselves, concerned with science or technology?

As for example:

- Does our drugs policy incorporate the findings of bio-medical science to eliminate dangerous drugs?
- Does our primary education policy incorporate the findings of scientific research into learning abilities of rural children?
- Does our housing policy fully exploit low-cost housing technologies?
- Does our fiscal policy help the exploitation of domestically generated technologies?

And get an affirmative answer

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THE MAIN DIMENSIONS OF TECHNOLOGY POLICY

- Technology Policy concerns the development, application and diffusion of technical and scientific knowledge in the economy. One of the most important characteristics of Technology Policy is that **it cannot stand alone.**

- Technology Policy cannot be separated from development policy because technology has a profound impact on employment, health, availability and distribution of wage-goods, shelter, and other indices of perceived quality of life.

- Technology Policy is inter-dependently enmeshed with economic, agricultural, environmental, and industrial policies. Indeed Technology Policy cannot be effective without the realisation of this inter-dependence.

- Nor can technology policies be considered in isolation from science policies: the basic research fundamental to scientific progress has often provided the inspirational source for remarkable leaps in technological development.

Therefore:
what we need is a full articulation of technology incorporated into other policies

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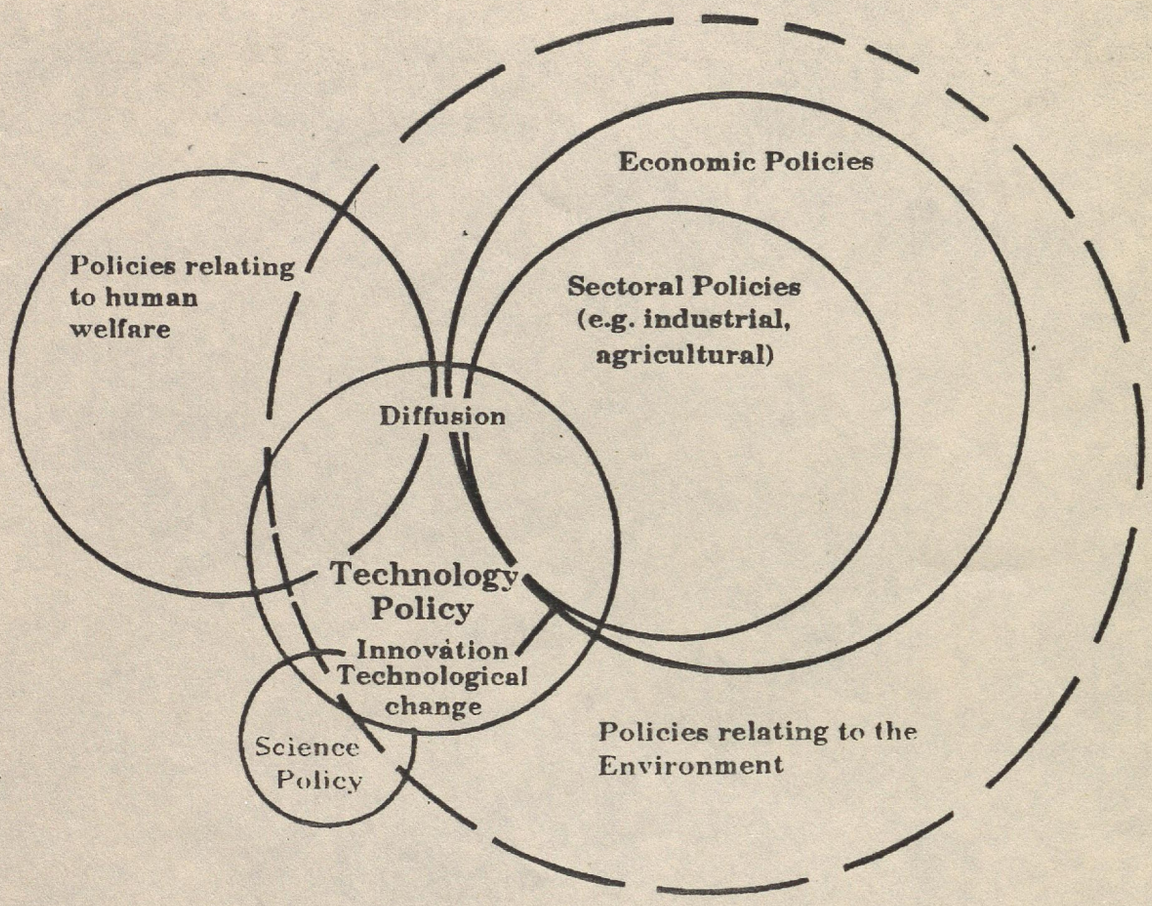
Grown from: "Towards 1990 - Technology Development for Canada."
Ministry of State
Science & Technology, Canada.

VS : April 1992

SCIENCE & TECHNOLOGY-IN-POLICY



The areas of intersection represent arenas of Science & Technology-in-Policy

The main deficiency in policy formulation and implementation is:

Our institutional arrangements to effectively address and resolve issues and conflicts arising from the arenas of intersection and overlap are weak in structure and poor in functional performance.

Diagram grown from: "Towards 1990 - Technology Development for Canada."
Ministry of State
Science & Technology, Canada.

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STRATEGY TO HITCH DOMESTIC TECHNOLOGICAL CAPABILITIES TO NATIONAL PURPOSES

- Recognise that the Indian scientific community, by-and-large, responds to parliamentary/public approbation - not to money "incentives".

- Harness the energies and assets of Indian technologists **working in India** to tangible goals of National Development in the relatively short-run.

- Identify, fund, nurture and **psychologically support** an array of technologically-driven national goals from conception to achievement.

- Design and fabricate Indian institutions for the above strategy.

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TO IMPLEMENT THE STRATEGY WHY CANNOT WE BORROW FROM ABROAD THE DESIGN OF INSTITUTIONS?

- In the absence of operationally significant Grand Ideology, institutional arrangements provide the cement for consensus formation.

- Roots and limits of consensus formation for Science & Technology generation and application in different societies are very different. This is one reason why the impact of the same technology in different societies can be very different. More so in inhomogenous and severely class-divided societies such as ours.

- Institutional arrangements in China, Japan, South-East-Asia often held-up as examples for us. However, colonial political-economy of China, Japan, Thailand were very different from ours.

- Western-European examples held-up include France. Significantly, French society homogenised by the French Revolution. Also, French acumen in science & technology generation and application very largely **endogenously developed**.

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DESPITE SUCH CRUCIAL DIFFERENCES IN HISTORY AND POLITICAL-ECONOMY JAPAN AND "MITI" EXAMPLE PERSISTENTLY QUOTED

What can these examples teach us?

- The Japanese built on their own, pre-war strengths; viz: their cohesive bureaucracy; their Zaibatsu; their banking system; their homogeneous society; their work ethic; and the markets available to them.

- Miti is a product of this Japanese institutional history

- The evolution and role of Miti reveals the lesson that for all of Japan's borrowing from abroad, the Japanese genius rests in the identification and use of their own assets, including their **political assets**.

- In seeking to emulate Japan's achievements, we would be well-advised to fabricate our institutions from our own local materials, including local political material.

Reference: Miti and the Japanese Miracle
Chalmers Johnson,
Stanford University Press, 1983

VS : April 1992

INDIAN ARRANGEMENTS FOR INCORPORATING TECHNOLOGY-INTO-POLICY

- In Government, recognise that the 'Department' is the fundamental unit of executive action in our governmental system.

- In the industry and services sectors, recognise that the corporate unit is often the fundamental unit of executive action.

Continued

THEREFORE

Each department, each industry, each service organisation has to

- Thoroughly understand the scientific and technological basis of the its present policies and practices.

- Assess the present and likely impact of emerging technologies with the full realisation that these "impacts" are not felt on abstract entities **but on people.**

- In this sense, most impact analyses will be environmental impact analyses with two key questions to be answered:

  - Which social groups are paying costs?

  - Which social groups are reaping benefits?

- Recognise that the impact of the same technology in different **policy** circumstances could be very different.

- Recognise further that the impact of the same technology in different **social** circumstances will invariably be very different.

- Since tailoring the technology is often difficult, tailor the policy regime so that costs are minimised and benefits maximised. [Costs ≡ Money; Social; Political; Environmental]

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AND FURTHER, IT IS IMPERATIVE TO UNDERSTAND THE DIFFERENT NATURES OF TASKS PERFORMED BY S&T ORGANISATIONS

Group A: Service Agencies e.g.

- Survey of India (1767)
- Geological Survey (1851)
- India Meteorological Department (1875)
- Proof & Experimental Establishment (1894)

Group B: Infrastructure involving repetitive field activity with considerable technical content e.g

- Railways
- Telecommunications
- Border Roads
- Power generation and distribution

Group C: "Innovation" oriented institutions e.g

- CSIR (1942)
- AEC (1948)
- Defence Science Organisation (1949)
- T.R.C (1956)
- ONGC (1956)
- DRDO (1958)
- DOS (1972)
- OSTA (Later DOD, 1976)
- DoEn (1980)

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- Technology Policy is inter-dependently enmeshed with economic, agricultural, environmental, and industrial policies. Indeed Technology Policy cannot be effective without the realisation of this inter-dependence.

- Nor can technology policies be considered in isolation from science policies: the basic research fundamental to scientific progress has often provided the inspirational source for remarkable leaps in technological development.

THEREFORE
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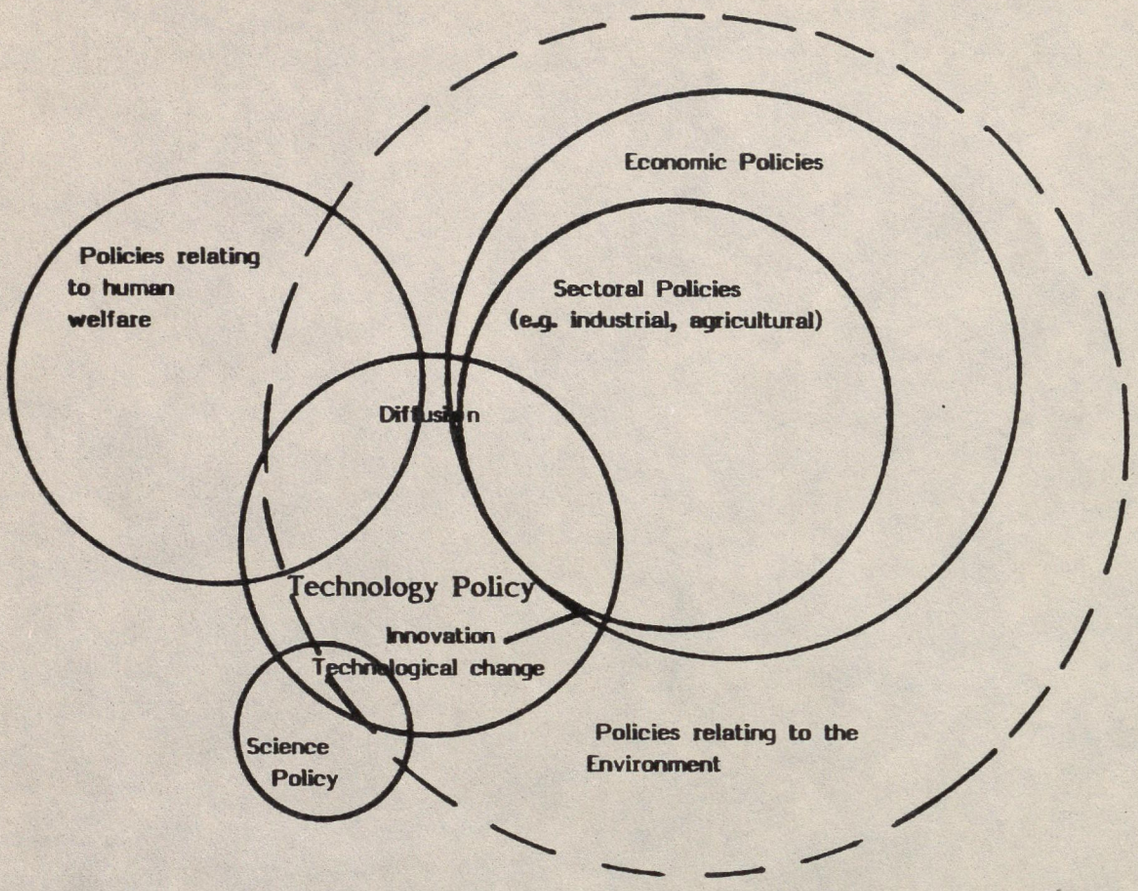
August, 1986

SCIENCE & TECHNOLOGY-IN-POLICY



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- Scientific policy is **not**, primarily, about whether a particular laboratory or facility has out-lived its usefulness, although that may well be a conclusion from a proper scientific assessment.

- The oft-quoted, oft-misinterpreted **Scientific Policy Resolution (SPR)** of 1958 is about **scientific** policies : SPR is not, **primarily**, about policies for science, although the development of science is the foundation on which scientific policies are formulated.

- **SPR** is one of world's earliest official documents that recognised **technology as a "factor of production"**. But SPR did not elaborate on this recognition.

STRATEGY TO HITCH
DOMESTIC TECHNOLOGICAL CAPABILITY
TO THE NATIONAL PURPOSE

- RECOGNISE THAT THE INDIAN SCIENTIFIC COMMUNITY, BY-AND-LARGE, RESPONDS TO PARLIAMENTARY / PUBLIC APPROBATION - NOT TO MONEY "INCENTIVES".

- HARNESS THE ENERGIES AND ASSETS OF INDIAN TECHNOLOGISTS WORKING IN INDIA TO TANGIBLE GOALS OF NATIONAL DEVELOPMENT IN THE RELATIVELY SHORT-RUN.

- IDENTIFY, FUND, NURTURE AND PSYCHOLOGICALLY SUPPORT AN ARRAY OF TECHNOLOGICALLY-DRIVEN NATIONAL GOALS FROM CONCEPTION TO ACHIEVEMENT.

- DESIGN AND FABRICATE INDIAN INSTITUTIONS FOR THE ABOVE STRATEGY.

August, 1986

WHY CANNOT WE BORROW THE DESIGN OF INSTITUTIONS?

- In the absence of operationally significant Grand Ideology, institutional arrangements provide the cement for consensus formation.

- Roots and limits of consensus formation for Science & Technology generation and application in different societies very different. One reason why the impact of the same technology in different societies can be very different. More so in inhomogenous societies such as ours.

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DESPITE SUCH CRUCIAL DIFFERENCES IN HISTORY AND POLITICAL ECONOMY JAPAN AND "MITI" EXAMPLE PERSISTENTLY QUOTED

WHAT CAN THESE TEACH US?

- THE JAPANESE BUILT ON THEIR OWN, PRE-WAR STRENGTHS; VIZ: THEIR COHESIVE BUREAUCRACY; THEIR ZAIBATSU; THEIR BANKING SYSTEM; THEIR HOMOGENEOUS SOCIETY; THEIR WORK ETHIC; AND THE MARKETS AVAILABLE TO THEM.

- MITI IS A PRODUCT OF THIS JAPANESE INSTITUTIONAL HISTORY

- THE EVOLUTION AND ROLE OF MITI REVEALS THE LESSON THAT FOR ALL OF JAPAN's BORROWING FROM ABROAD, THE JAPANESE GENIUS RESTS IN THE IDENTIFICATION AND USE OF THEIR OWN ASSETS, INCLUDING THEIR POLITICAL ASSETS.

- IN SEEKING TO EMULATE JAPAN's ACHIEVEMENTS, WE WOULD BE WELL-ADVISED TO FABRICATE OUR INSTITUTIONS FROM OUR OWN LOCAL MATERIALS, INCLUDING LOCAL POLITICAL MATERIAL.

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THEREFORE

EACH DEPARTMENT, EACH INDUSTRY, EACH SERVICE ORGANISATION HAS TO

- Thoroughly understand the Scientific and Technological basis of their present policies and practices.

- Assess the likely impact of the present, and emerging technologies with the full realisation that such "impacts" are felt, not on abstract entities, **but on people.**

- In this sense, most impact analyses will be environmental impact analyses with two key questions to be answered:

  - Which social groups are paying costs?

  - Which social groups are reaping benefits?

- Recognise that the total impact of the same technology in different policy circumstances can be very different.

- Since tailoring the technology is often difficult, tailor the policy regime so that costs are minimised and benefits maximised.

INDIAN
PRE-REQUISITES OF TECHNOLOGICALLY-DRIVEN GOAL ACHIEVEMENT

- Clearly perceived, "commonly accepted", mission objectives

  "Commonly accepted" means accepted by that segment of the community

  A: In whose members a consensus is necessary to execute all the steps from conception to achievement;

  B: Which will accord approbation to the achievement.

- Clearly articulated, consistently implemented, administrative means for the management of all transactions that are designed specifically for mission achievement.

- Pre-defined and publically announced limits of failure-tolerance.

- Selection, through due process, of "Field Commanders" of Mission Accomplishment Agencies.

  - No rejection of pre-categorised "duds".
  - No selection of pre-categorised "favourites".

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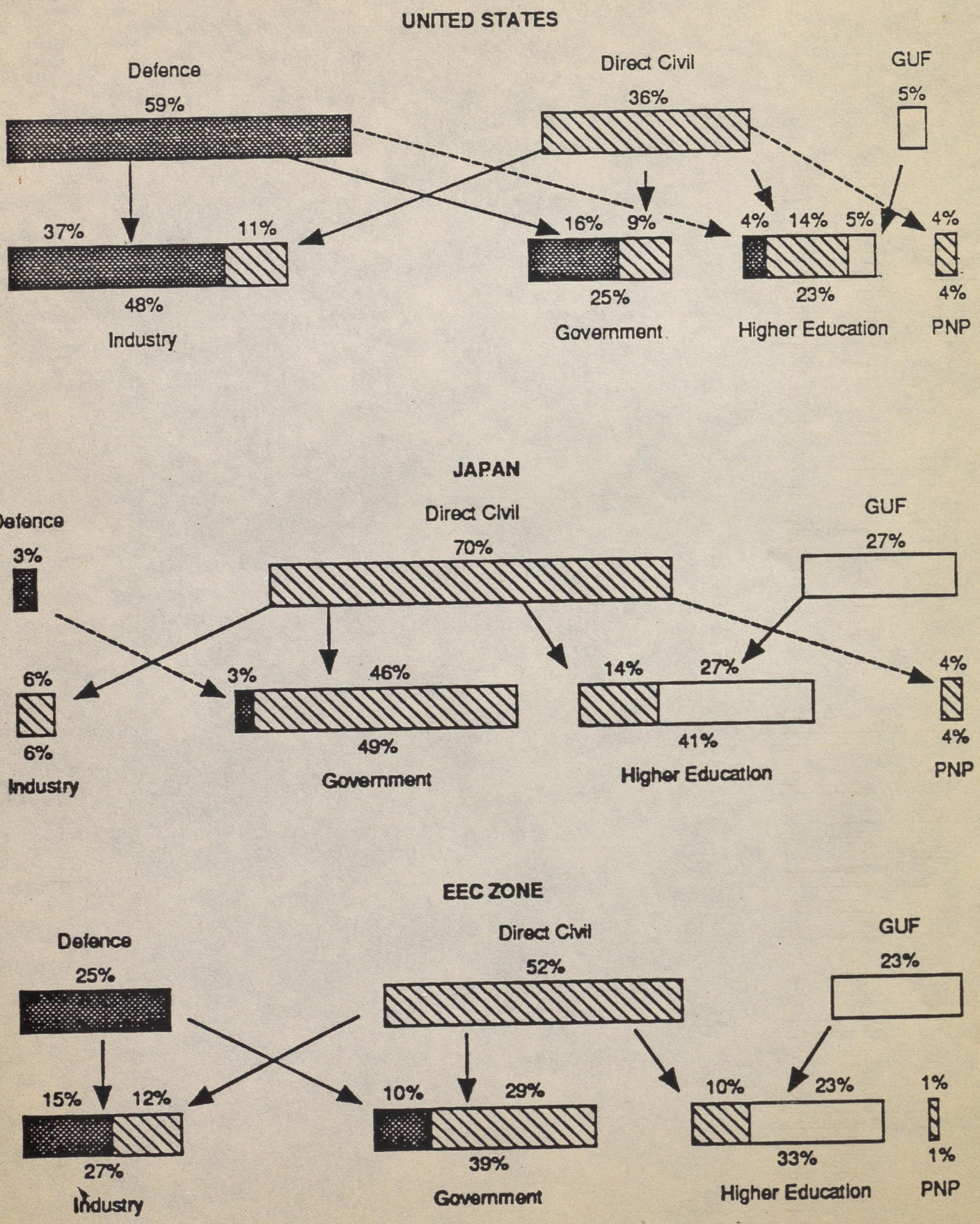
Graph 17

Structure of government-financed R&D in 1985

[OECD SCIENCE AND TECHNOLOGY INDICATORS REPORT NO.3]



Taiwan Stages (Largely Sequential)	India Stages (Largely Simultaneous)
• Factor driven • Investment driven • Innovation driven	• All three • Stage depends on sector of industry that is being driven into growth of output and employment

India Stages

Objective	Economic/Industrial Policy	Drivers
Economic growth with employment generation	• Using low-cost labour	Factor
	• Building infrastructure or • Upgrading or installing known technology for lines of products already in existence	Investment
	• New products, new manufacturing technology or • New business processes	Innovation
Active role in setting global 'rules of engagement'	• Food self-sufficiency • Counter-denial in identified sectors (Atomic Energy; Space; Defence)	• Independent Foreign Policy • Security