S&T POLICIES,

SYSTEMS,INPUTS AND OUTPUTS

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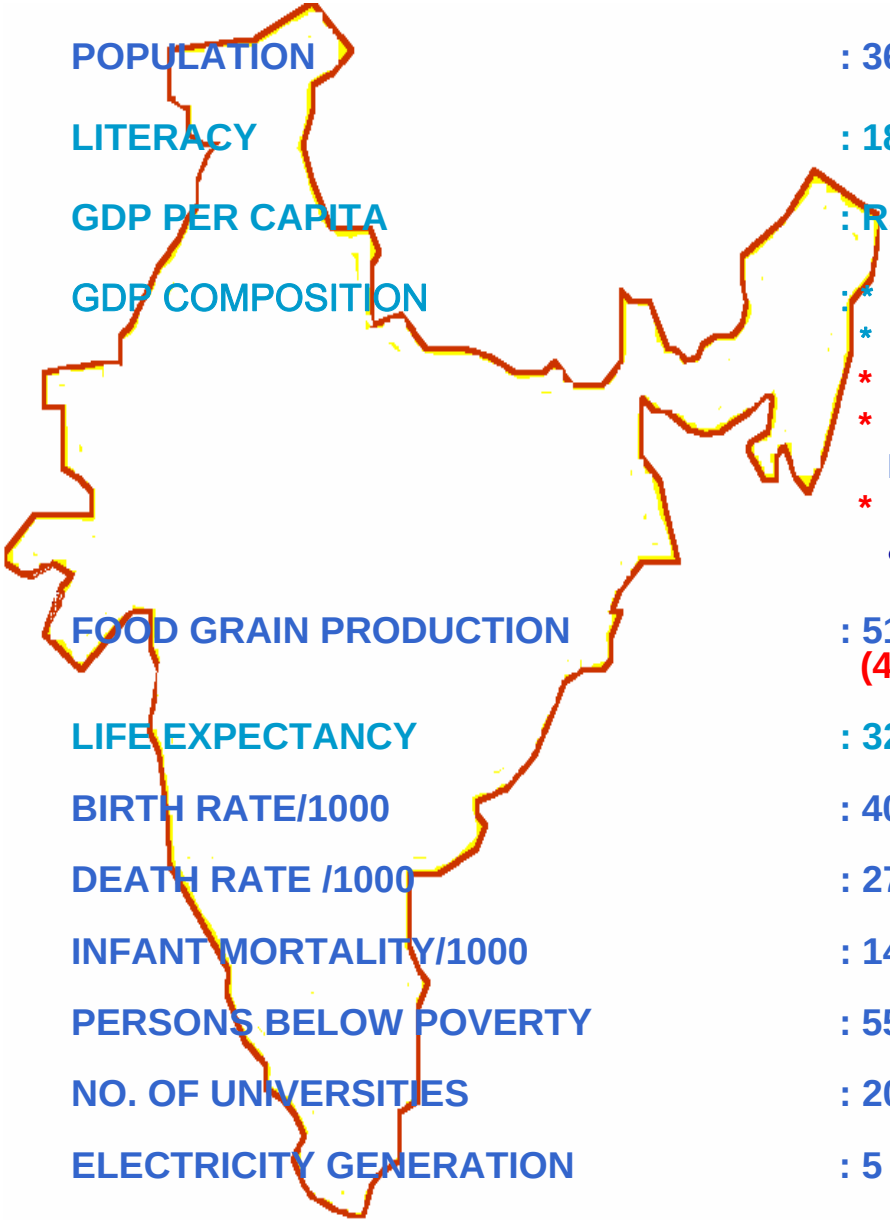
Format of Presentation

- Introduction
- Policies
- S&T System
- Resources for R&D
- Outputs
- Conclusions

INDIA AT A GLANCE – 1947

INDEPENDENCE	: AUGUST 15, 1947
POPULATION	: 360 MILLION
LITERACY	: 18%
GDP PER CAPITA	: Rs. 239
GDP COMPOSITION	: * AGRICULTURE (59%) * MANUFACTURING (13%) * TRADE & TRANSPORT (12%) * BANKING & INSURANCE REAL ESTATES (7%) * PUBLIC ADMINISTRATION, DEFENCE & OTHER SERVICES (9%)
FOOD GRAIN PRODUCTION	: 51 MILLION TONNES (400 GMS / CAPITA / DAY)
LIFE EXPECTANCY	: 32 YEARS
BIRTH RATE/1000	: 40
DEATH RATE /1000	: 27.4
INFANT MORTALITY/1000	: 146
PERSONS BELOW POVERTY	: 55% (1973)
NO. OF UNIVERSITIES	: 20
ELECTRICITY GENERATION	: 5 BILLION UNITS (14 UNITS/ CAPITA)



SO,

THE CHALLENGE

- **EDUCATION**
- **FOOD**
- **HEALTH**
- **INDUSTRIALIZATION**

NEHRU'S VISION FOR S&T

FIRST PRIME MINISTER OF INDIA

JAWAHARLAL NEHRU

'The Progress of Science & its offspring technology is changing the way man thinks of himself and the world……. Science shall put an end to superstition, rituals and dogma.'

HOW WE BEGAN ?

- SEPARATE MINISTRY OF SCIENTIFIC RESEARCH AND NATURAL RESOURCES (1947) UNDER PRIME MINISTER

- INDUSTRIES DEVELOPMENT & REGULATION ACT (1951)

SCIENTIFIC RESEARCH AGENCIES

(Government Funded)

- **COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH (CSIR)**
- **INDIAN COUNCIL OF AGRICULTURE RESEARCH (ICAR)**
- **INDIAN COUNCIL OF MEDICAL RESEARCH (ICMR)**

SUBSEQUENT DEVELOPMENTS

POLICIES

- SCIENTIFIC POLICY RESOLUTION (1958)
- TECHNOLOGY POLICY STATEMENT (1983)
- NEW EDUCATION POLICY (1986)
- NEW INDUSTRY POLICY (1991)
- NEW S&T POLICY (2003)

SCIENTIFIC POLICY RESOULUTION (1958)

– THE FIRST MAJOR STEP

IT RECOGNISED THAT –

- **NATIONAL PROSPERITY LIES IN "TECHNOLOGY, RAW MATERIAL & CAPITAL" – *TECHNOLOGY MOST IMPORTANT***
- **WEALTH OF A NATION DEPENDS ON INDUSTRIALISATION**
- **S&T CAN MAKE UP FOR DEFICIENCIES IN RAW MATERIAL.**

TECHNOLOGY POLICY STATEMENT (1983)

- PROMOTION OF INDIGENOUS TECHNOLOGY
- DEVELOPMENT OF TECHNOLOGY
- COMMERCIALISATION OF TECHNOLOGY
- IMPORT OF TECHNOLOGY WHEREVER REQUIRED
- PROMOTION OF INVENTION AND REWARDS TO SCIENTISTS
- IDENTIFIED AREAS FOR SPECIAL FOCUS:
  - AGRICULTURE
  - OILSEEDS
  - DRINKING WATER
  - LOW COST HOUSING
  - NON-CONVENTIONAL SOURCES OF ENERGY
  - ENVIRONMENT
  - ENERGY

NEW S&T POLICY- 2003

- Focus on Networking of S&T institutions
- Usage of knowledge from within and outside
- Disaster Management
- Generation of IPR and its commercial utilisation
- Making S&T as an attractive career

SCIENTIFIC MINISTRIES

- SCIENCE AND TECHNOLOGY
- SCIENTIFIC & INDUSTRIAL RESEARCH
- BIOTECHNOLOGY
- EARTH SCIENCES
- INFORMATION TECHNOLOGY
- NEW AND RENEWABLE ENERGY SOURCES
- ENVIRONMENT AND FORESTS
- ATOMIC ENERGY
- SPACE
- DEFENCE RESEARCH
- DEPARTMENT OF HEALTH RESEARCH (*Oct 2007*)

INCENTIVES

INCOME TAX

- 100% DEDUCTION OF R&D EXP. BOTH CAP. & REVENUE
- 125% DEDUCTION FOR SPONSORED RESEARCH
- 125% DEDUCTION FOR THE DONATIONS FOR RESEARCH
- 150% DEDUCTION FOR CERTAIN PRIORITY AREAS – ELECTRONICS, DRUGS, TELECOM, BIOTECH. CHEMICALS
- HIGHER DEPRECIATION FOR INDIGENOUS TECHNOLOGY

TAX HOLIDAY

5 YEARS FOR R&D COMPANIES

CUSTOM DUTY

- 100% DUTY EXEMPTION FOR PUB. R&D NON-PROFIT INSTITUTIONS
- 100% FOR SPONSORED JOINT R&D WITH GOVERNMENT

EXCISE DUTY

- EXEMPTED ON INDIGENOUS EQUIPMENTS, SPARES, CONSUMABLES PURCHASED BY NON-PROFIT INSTITUTIONS
- EXEMPTED FOR 3 YEARS FOR INDIGENOUS TECH. PRODUCTS

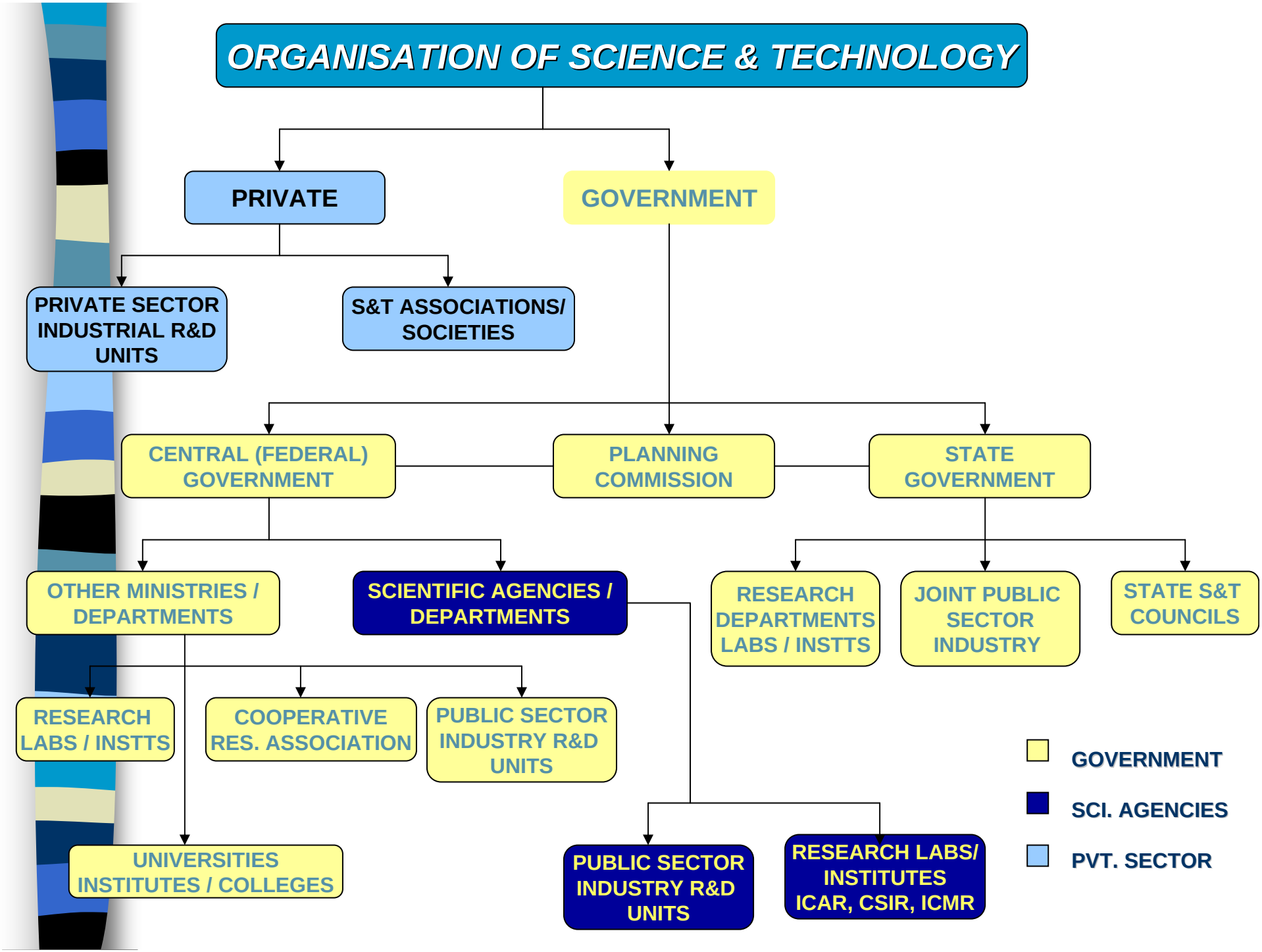
PRICE CONTROL

- DRUGS BASED ON INDIGENOUS TECH. ARE EXEMPTED FROM PRICE CONTROL

PROFESSIONAL BODIES

(Government Funded)

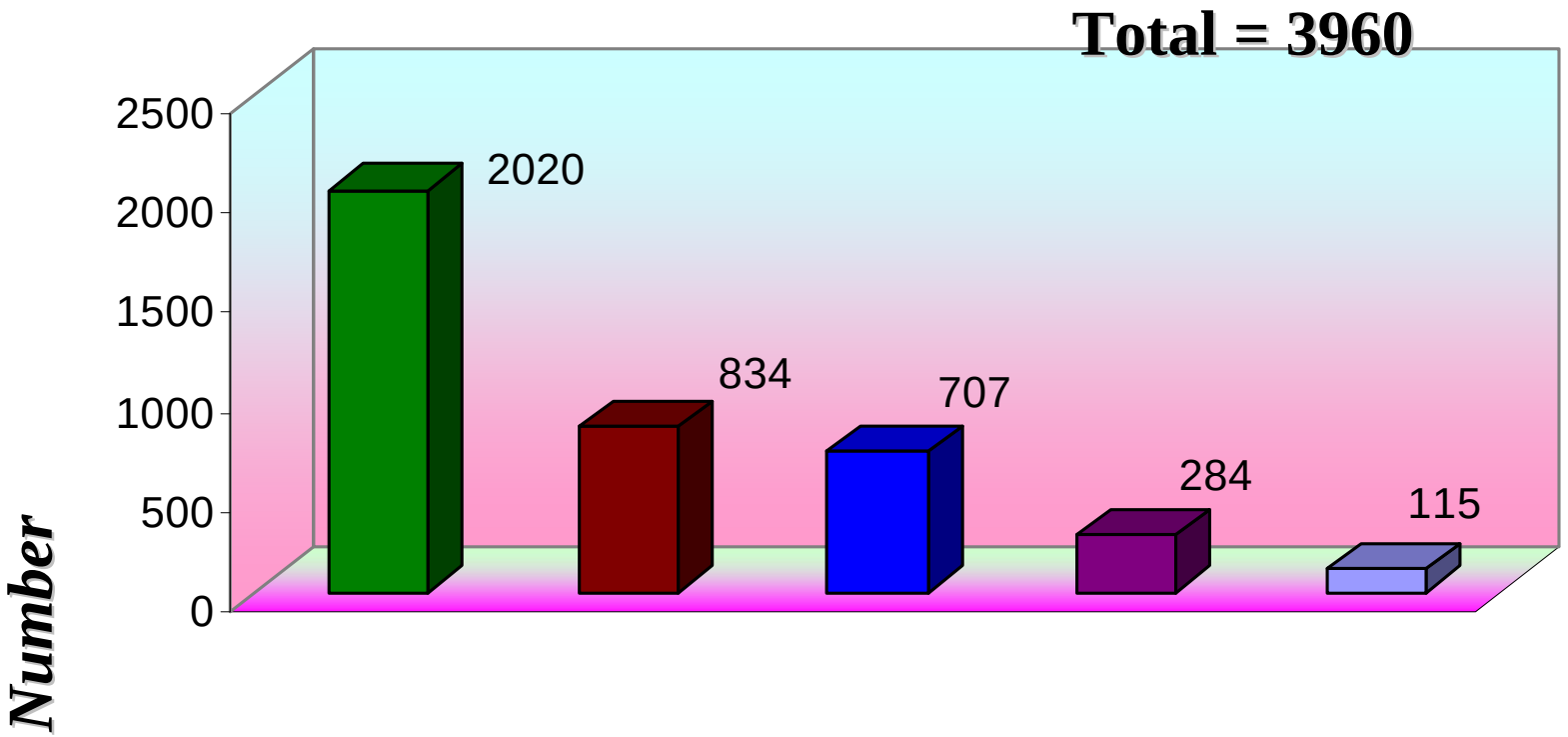
- **INDIAN ACADEMY OF SCIENCES**
- **NATIONAL ACADEMY OF SCIENCES**
- **INDIAN NATIONAL SCIENCE ACADEMY**
- **INDIAN NATIONAL ACADEMY OF ENGINEERING**
- **INDIAN SCIENCE CONGRESS ASSOCIATION**


ORGANISATION OF SCIENCE & TECHNOLOGY
PRIVATE
GOVERNMENT
PRIVATE SECTOR INDUSTRIAL R&D UNITS
S&T ASSOCIATIONS/ SOCIETIES
CENTRAL (FEDERAL) GOVERNMENT
PLANNING COMMISSION
STATE GOVERNMENT
OTHER MINISTRIES / DEPARTMENTS
SCIENTIFIC AGENCIES / DEPARTMENTS
RESEARCH DEPARTMENTS LABS / INSTTS
JOINT PUBLIC SECTOR INDUSTRY
STATE S&T COUNCILS
RESEARCH LABS / INSTTS
COOPERATIVE RES. ASSOCIATION
PUBLIC SECTOR INDUSTRY R&D UNITS
UNIVERSITIES INSTITUTES / COLLEGES
PUBLIC SECTOR INDUSTRY R&D UNITS
RESEARCH LABS/ INSTITUTES ICAR, CSIR, ICMR
GOVERNMENT
SCI. AGENCIES
PVT. SECTOR

DIMENSIONS OF S&T SYSTEM

284	Universities
16855	Colleges
3960	R&D Institutions/Labs
11	Scientific Ministries
5	Scientific Academies

R&D INSTITUTIONS BY SECTOR - 2006



GOVERNMENT COORDINATION

- **APEX LEVEL**

CABINET COMMITTEE ON S&T CHAIRED BY PRIME MINISTER AND MEMBERS FROM VARIOUS MINISTRIES AT MINISTER'S LEVEL

RIGHT FROM BEGINNING AFTER INDEPENDENCE

SUCH A STRUCTURE HAS BEEN IN FORCE

- **1948 – ADVISORY COMMITTEE FOR COORDINATING SCIENTIFIC RESEARCH**

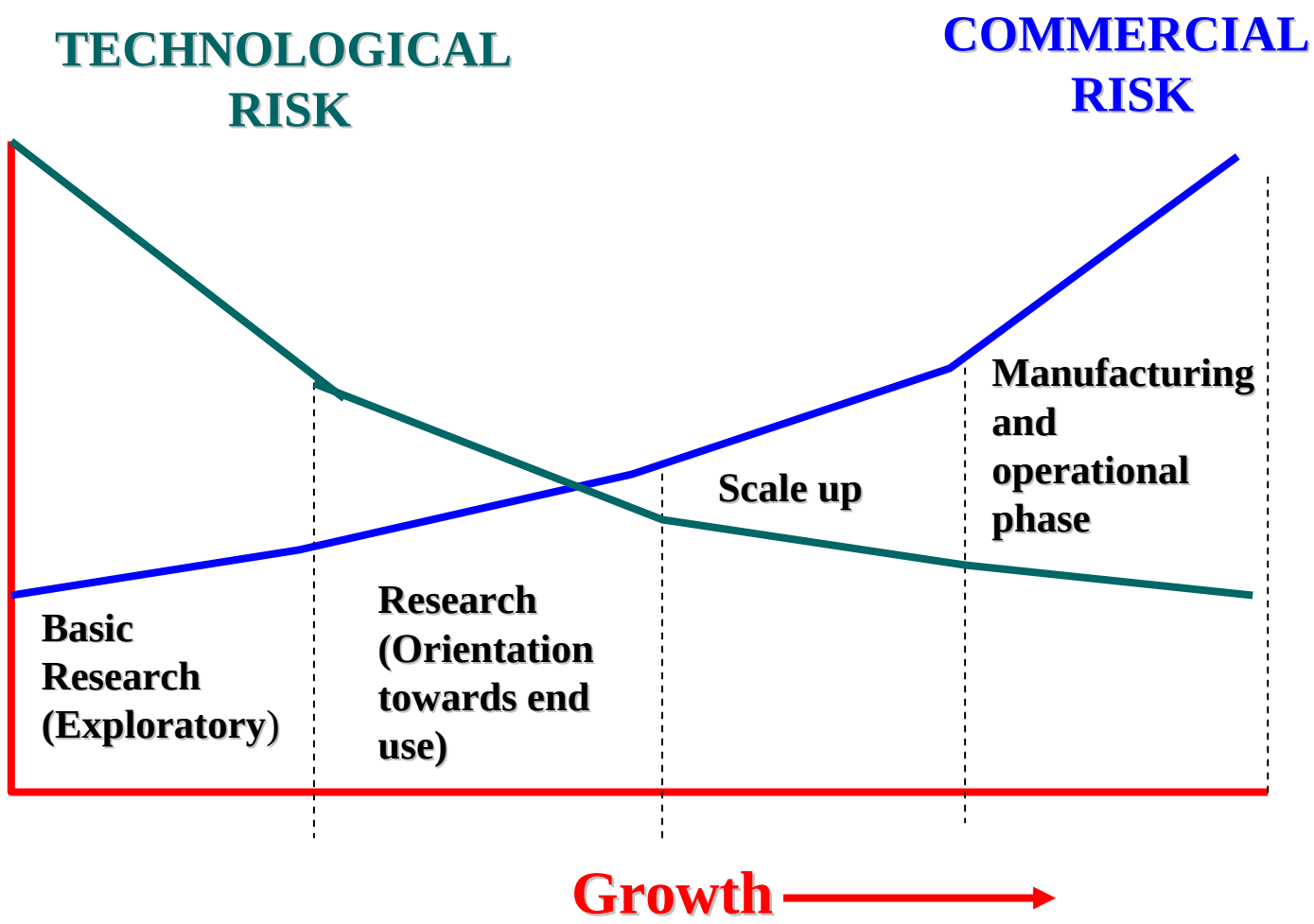
GOVERNMENT COORDINATION

SCIENTIFIC ADVISORY COMMITTEE TO THE PRIME MINISTER

- CHAIRED BY AN EMINENT SCIENTIST

IT DRAWS MEMBERS FROM SCIENTIFIC COMMUNITY , INDUSTRY AND COMMUNITY OF SOCIAL SCIENTIST .

TECHNOLOGY DEVELOPMENT CHAIN

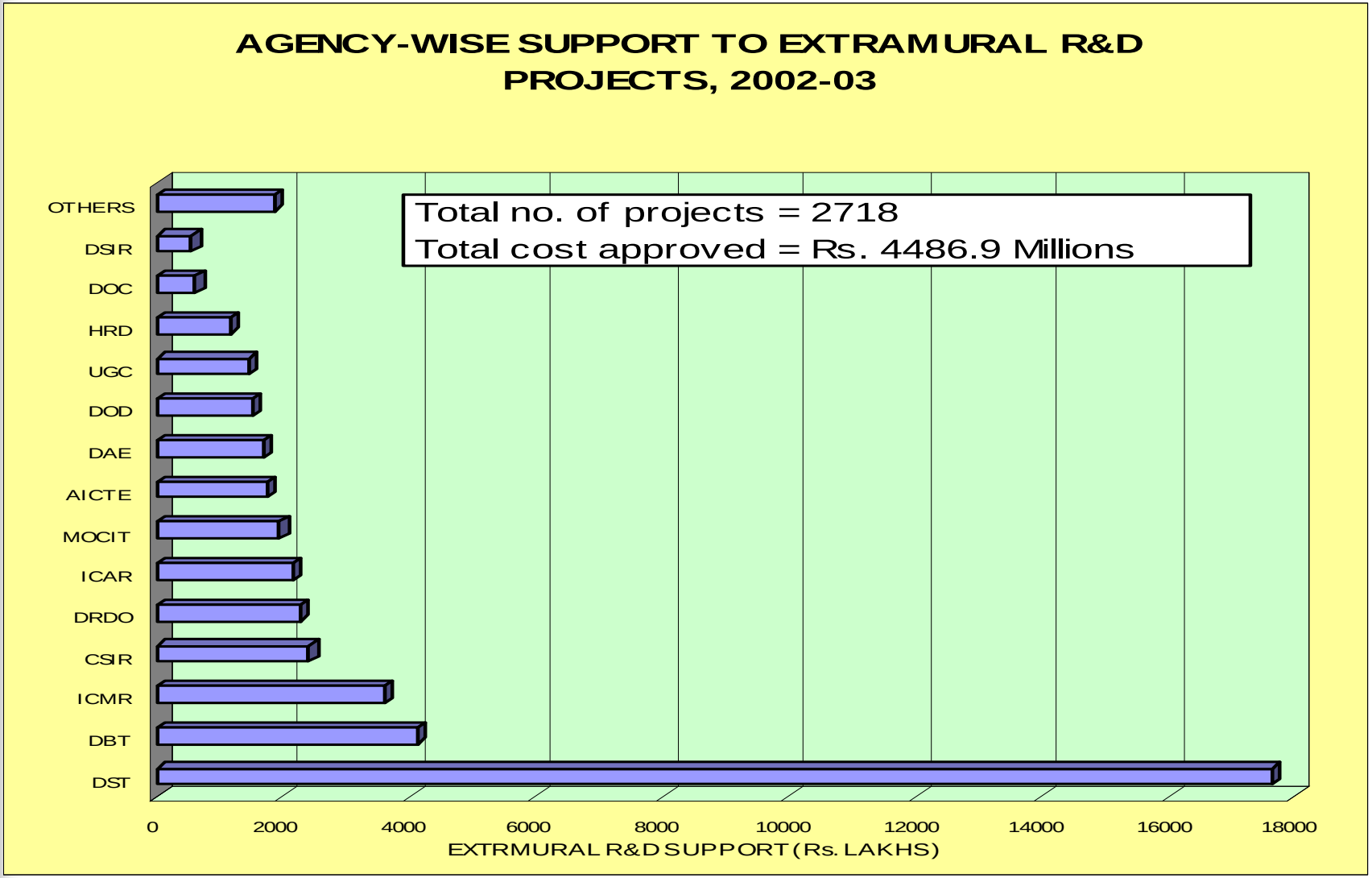


MINISTRY OF SCIENCE AND TECHNOLOGY

MECHANISMS

- *SCIENCE ENGINEERING RESEARCH COUNCIL (SERC) – GRANT-IN-AID*
- NATIONAL RESEARCH AND DEVELOPMENT CORPORATION (NRDC)
- TECHNOLOGY DEVELOPMENT BOARD (TDB)
- TECHNOLOGY INFORMATION FORECASTING ASSESSMENT COUNCIL (TIFAC)
- NATIONAL SCIENCE AND TECHNOLOGY ENTREPRENEURSHIP DEVELOPMENT BOARD (NSTEDB)
- NATURAL RESOURCES DATA BASE MANAGEMENT SYSTEM (NRDMS)
- PATENT FACILITATING CENTRE (PFC)
- S&T COUNCILS AT PROVINCE LEVEL

Extramural R&D

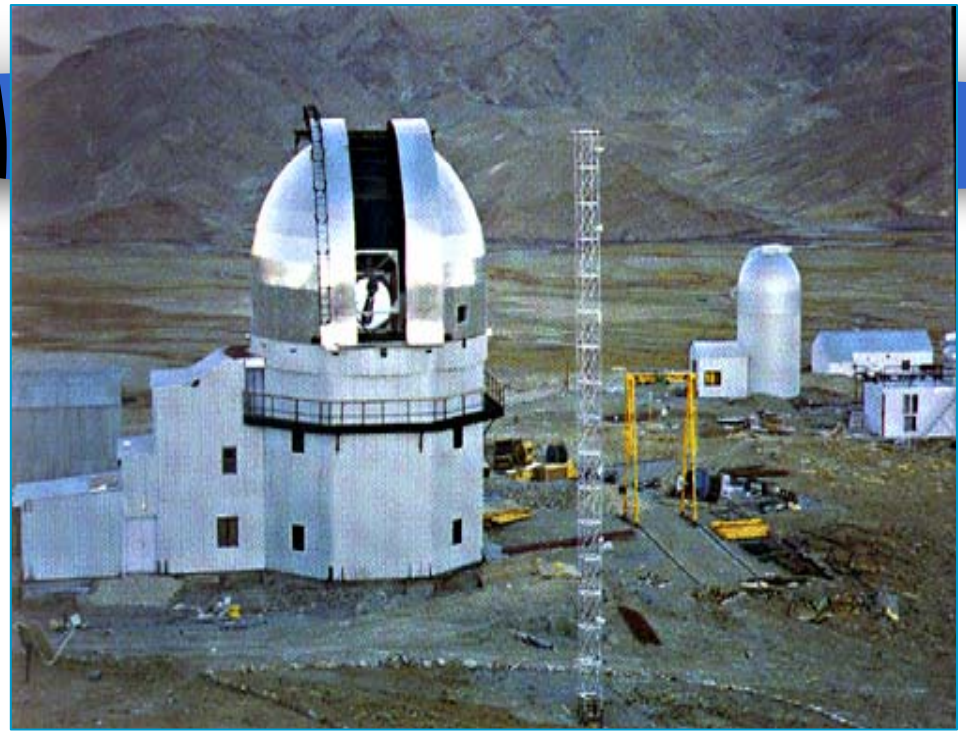


Subject-wise Distribution of R&D Projects,2002-03

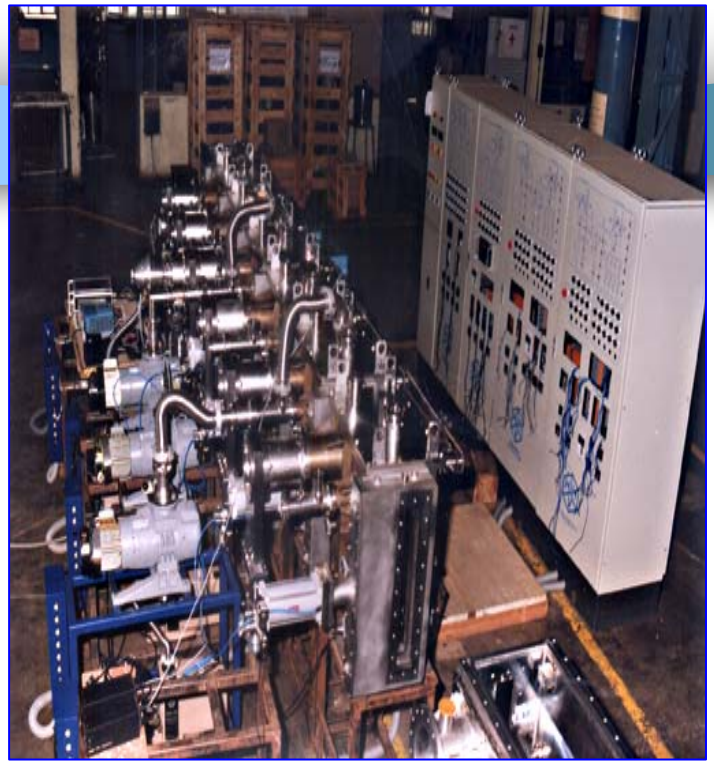
Subject	Number	Cost (Rs. Mn)
Engineering & Technology	765	1710
Medical Sciences	397	632
Biological Sciences	389	585
Chemical Sciences	371	518
Agriculture	260	394
Physical Sciences	250	297
Earth Sciences	241	328
Mathematics	45	19
Total	**2718**	**4477**

Some Examples of R&D Promotion

Prototype for fabrication of a-Si modules at IACS-Kolkata



Telescope at Hanle supported under SERC



SPECIAL PROGRAMMES

- Drugs and Pharmaceuticals Programme
- Nanotechnology
- Biotechnology
- S&T Management & Information System
- Technopreneur Promotion Prog.
- Patent facilitation center for university
- International S&T Co-operation

Drug & Pharmaceutical Research

Key Features

-Drug research is very time consuming - 12 to 15 years to bring out a new drug.

-It is investment intensive **-** nearly US $ 900 million to US $ 1.0 billion .

-It is highly risky- 10,000 : 1

SCOPE OF FINANCIAL SUPPORT

- **GRANT-IN-AID TO INSTITUTIONS FOR JOINT R&D PROJECTS**
- **GRANT-IN-AID TO INSTITUTIONS FOR NATIONAL FACILITY**
- **SOFT LOAN TO INDUSTRIES FOR R&D PROJECTS**

Drugs & Pharmaceutical Research Programme

Composition :

Each 10 gm contains extract of:

Seetaphal (*Annona squamosa*)	660 mg
Arka (*Calotropis gigantea*)	466 mg
Excipients	QS

Indications :

- **Prevention and treatment against ticks, flies, lice and mange in pets.**
- **Fungal skin infections in pets.**
- **Dermatomycosis and patchy alopecia of fungal origin.**

Directions for use :

Apply Alquit dusting powder liberally, directly on the body coat especially areas affected with ectoparasites avoiding eyes and ears. Dust / scrub off the dusting powder after 2 to 4 hrs contact time.

Precautions :

- **Store in a cool, dry place, away from heat & fire.**
- **Avoid contact with eyes and ears.**
- **Restrain the animal from licking.**
- **Keep away from children.**

Date
Batch
Mfg. L

Best within 36 months from the date of manufacture. T product being natural has a tendency to lose its colour storage. However, the efficacy remains intact.

"Developed in technical collaboration with DST and CIRG"

Alquit™

Dusting Powder

Herbal Ectoparasiticidal for pets

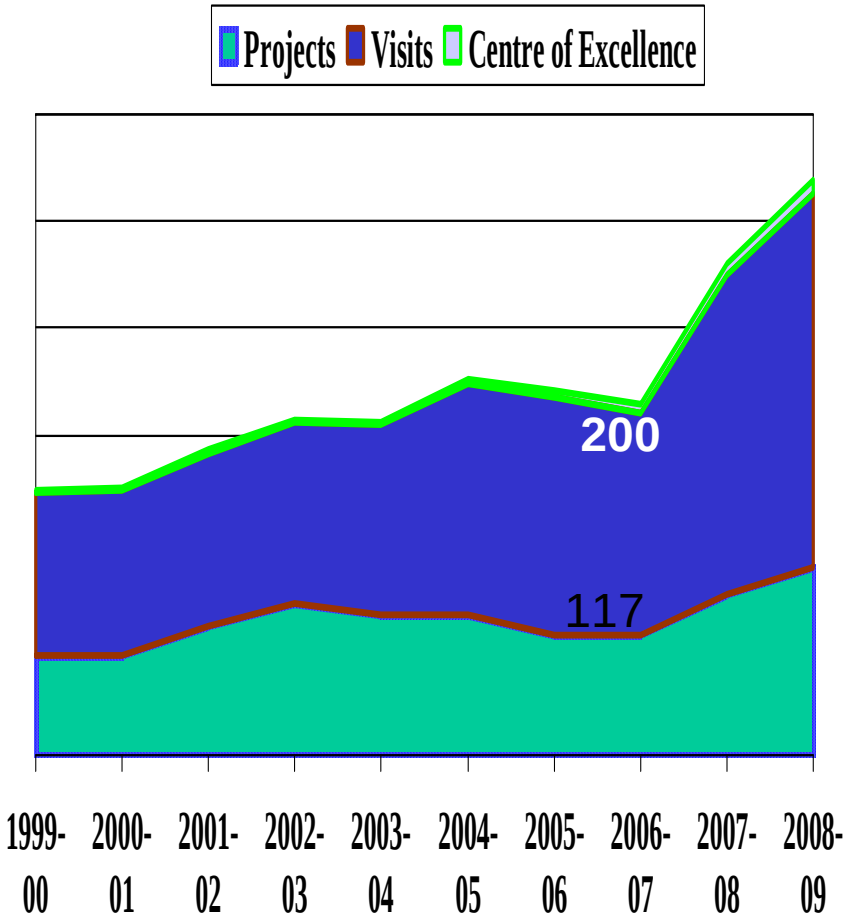
Ayurvedic Veterinary Medicine

A new herbal formulation for animal health care system has been developed and commercialized

No.5B, Veerasandra Indl. Area,19th KM Stone, Hosur Road, Bangalore - 560 100

International S&T Cooperation

- A mandated activity of DST
- India has signed cooperation agreements with as many as 70 countries so far
- Prior to 2003-04, investments into the International cooperation related activities have been limited to less than Rs 5.5 crores per year (total of 26 crores for 5 years).
- Resources were spread thin and wide.
- Cooperation with countries like former USSR and present Russia has, led to good lessons.



STOCK OF SCIENCE & TECHNOLOGY PERSONNEL

(figures in '000)

FIELD	1950	1960	1970	1980	1990	2001
ENGINEERING & TECHNOLOGY	53.1	137.2	429.8	550.8	1189	2556.1
SCIENCE	76	213.3	559.2	967.8	2103.9	4829.9
AGRICULTURE	7.9	23.9	60.7	96.5	196.2	285.3
MEDICINE	51	75.6	124.8	167.6	319.9	415.9
TOTAL	188.0	450.0	1174.5	1782.7	3809.0	8087.2

NATIONAL R&D EXPENDITURE

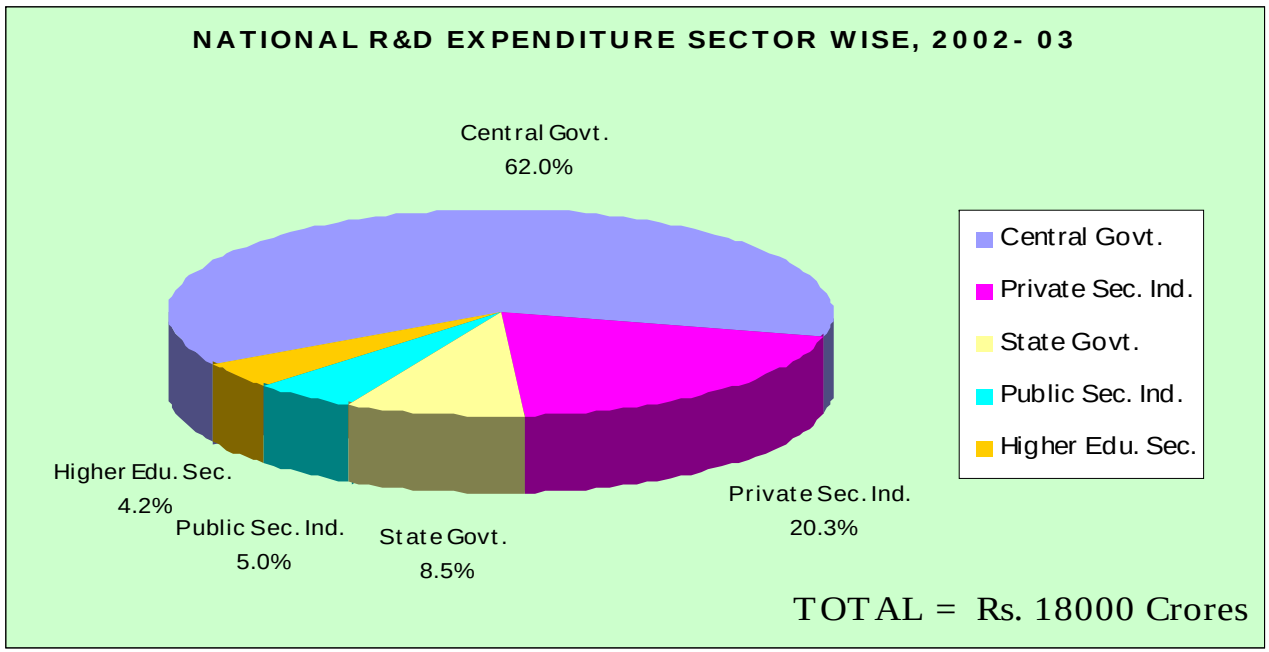
(Rs. In Million)

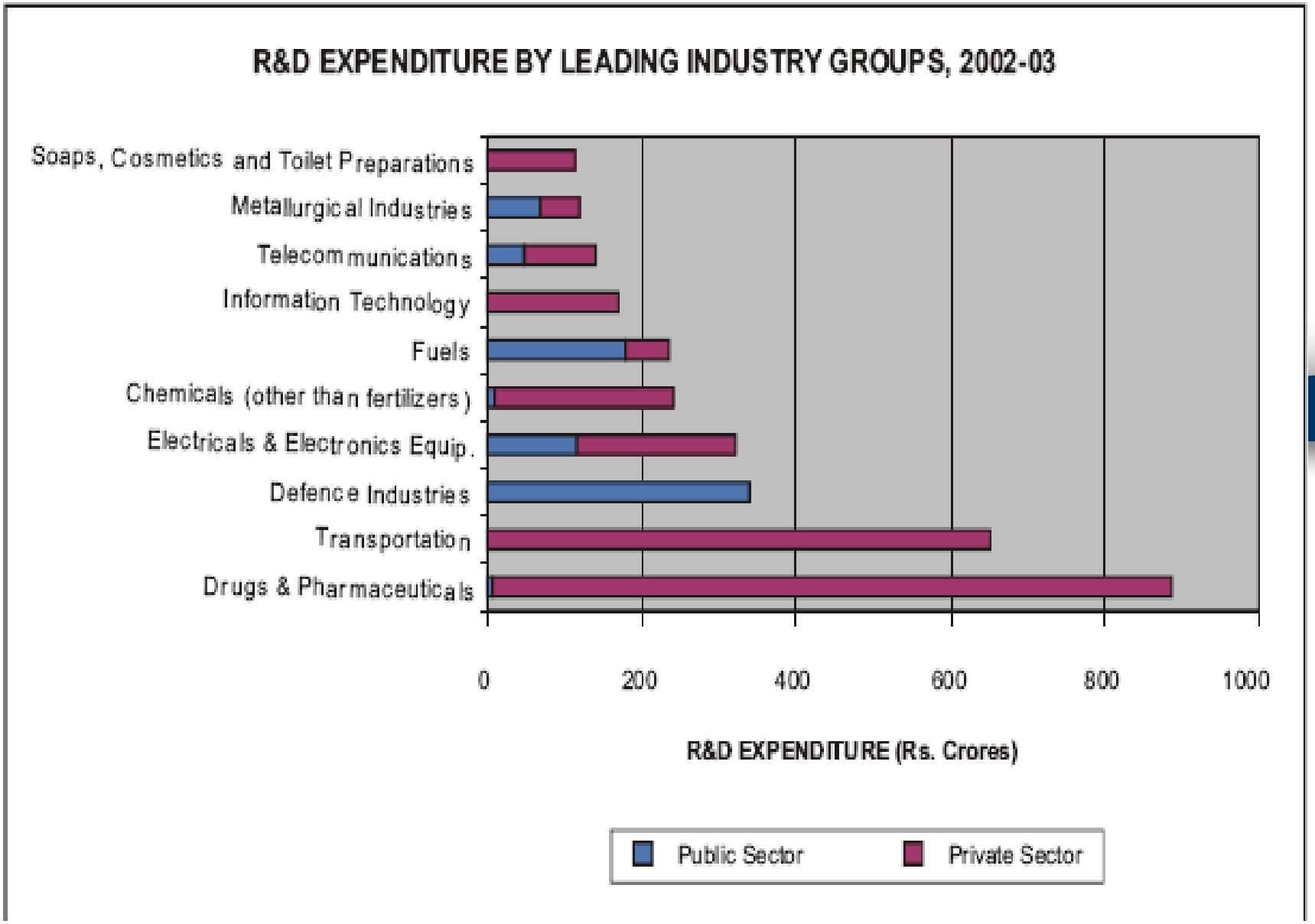
YEAR	AMOUNT	% OF GNP
1950-51	46.8	0.05
1958-59	229.3	0.16
1970-71	1396.4	0.33
1980-81	7605.2	0.58
1990-91	39741.7	0.79
1995-96	74838.8	0.71
1998-99	129507.6	0.81
2002-2003	180001.6	0.80

NATIONAL R&D EXPENDITURE BY SECTOR

(%age)

YEAR	GOVT. SECTOR	PRIVATE SECTOR	TOTAL
1950-51	100.0	--	100
1970-71	88.8	11.2	100
1980-81	84.0	15.9	100
1990-91	86.2	13.8	100
1995-96	78.3	21.7	100
1998-99	78.0	22.0	100




R&D EXPENDITURE BY LEADING INDUSTRY GROUPS, 2002-03
Soaps, Cosmetics and Toilet Preparations
Metallurgical Industries
Telecommunications
Information Technology
Fuels
Chemicals (other than fertilizers)
Electricals & Electronics Equip.
Defence Industries
Transportation
Drugs & Pharmaceuticals
0
200
400
600
800
1000
R&D EXPENDITURE (Rs. Crores)
Public Sector
Private Sector

RESEARCH PAPERS PUBLISHED
SCI DATA

(Number)

Year	No. of Papers	World %age
1994	11319	1.661
1995	11084	1.566
1996	11177	1.531
1997	11067	1.484
1998	12128	1.574
1999	12521	1.595
2000	12127	1.558
2001	13425	1.646
2002	14028	1.788
2003	15699	1.769
2004	16001	1.993

RESEARCH PAPERS PUBLISHED FROM INDIA

SUBJECT AREA	2003
AGRICULTURE	13637
BIOLOGICAL SCIENCES	10765
CHEMICAL SCIENCES	17502
EARTH SCIENCES	794
ENGINEERING	8248
MATHEMATICS	1587
MEDICAL SCIENCES	9094
PHYSICAL SCIENCES	7203
TOTAL	68830

Patents Granted

Year	Indians	Foreigners	Total
1999	557	1324	1881
2000	399	919	1318
2001	654	937	1591
2002	494	885	1379
2003	1078	1391	2469

Patents Filed

Year	Indians	Foreigners	Total
2002	2693	8773	11466
2003	3218	9395	12613

No. of Ph.D's Awarded

Faculty	**Ph.D's**	**%age**
Science	4497	32.7
Engineering & Technology	779	5.7
Medicine	243	1.8
Agriculture	1042	7.6
Vet. Science	153	1.1
Others (Lib,Fine-arts etc..)	7019	51.1
Total	**13733**	**100**

IMPORT OF TECHNOLOGY

1991 : ECONOMY FULLY OPENED UP

- AUTOMATIC APPROVALS TO IMPORT OF TECHNOLOGY
- FOREIGN EQUITY UPTO 100% - AUTOMATIC APPROVAL

PROVIDED

FOREIGN EXCHANGE REQUIREMENTS IS TAKEN CARE OF BY EQUITY PARTICICIPATION

FOREIGN COLLABORATIONS

(Number)

UPTO 1960	1505
1961-70	3187
1971-80	3055
1981-90	7979
1991-2000	18709
1991	891
2000	2098*

FOREIGN EQUITY

(Rs.Billion)

1990	1.5
1991	5.2
1992	38.8
1993	88.6
1994	140.0
1995	326.0
1996	361.0
1997	548.5
1998	306.5
1999	283.5*

*

SWED.	FRANCE	U.S.A.	SWITZ.	JAPAN	U.K.	GERMANY	NETH.	ITALY	OTHERS
3.6	16.8	36.6	2.9	14.6	29.4	11.6	6.3	17.7	144.0

WHERE HAVE WE REACHED ?

Indicators	1947	Present	Multiplier
Population (Million)	361 (1950-51)	1029 (2001)	3
GDP at current prices(Rs. Million)	95490 (1950-51)	25197850 (2003-04)	260
GDP Per Capita at current prices (Rs. Million)	239	25000 (2003-04)	104
Food Grain Production (Million Tonnes)	51 (1950-51)	213 (2003-04)	4
Life Expectancy (in years)	32 (1950-51)	62.6 (2000-01)	2
Literacy (%)	18 (1950-51)	64.8 (2000-01)	3.5
Electricity Generated (Billion KWH)	5 (1950-51)	665 (2004-05)	113

WHERE HAVE WE REACHED ?

Indicators	1947	Present	Multiplier
Universities (Number)	20 (1947)	284 (2003-04)	14
Colleges (number)	542 (1950-51)	16885 (2003-04)	30
Education Expen. (Rs. Million)	1140 (1950-51)	725350 (2002-03)	650
R&D Expenditure (Rs. Million)	47 (1947)	180002 (2002-03)	3800
R&D Exp. as % of GNP	0.05 (1950-51)	0.81 (2002-03)	16

WHERE HAVE WE REACHED ?

Indicators	1947	Present	Multiplier
Exports (Rs. Million)	606 (1950-51)	2933670 (2003-04)	~ 5000
Imports (Rs. Million)	608 (1950-51)	3591080 (1999-00)	~ 6000
IT Ind. -Turnover (US $ Million)	510 (1990-91)	21600 (2003-04)	40
Software Exports (US $ Million)	150 (1990-91)	12900 (2003-04)	~ 80

WHERE HAVE WE REACHED ?

Indicators	1947	Present
Poverty (%)	55 (1973-74)	26
Birth rate/1000 population	40.0 (1950-51)	24.1.0 (2003-04)
Death rate/1000 population	27.0 (1950-51)	7.5 (2003-04)
Infant mortality rate /1000 of live births	146 (1950-51)	58 (2005)

LESSONS LEARNT

- Mere presence of R&D Institutions is not enough. There is some thing beyond.
- Mere framing of Policies is not adequate. Implementation in letter and spirit is essential.
- Pace of growth is more important than mere growth.

WHAT NEXT ?

* BRANDED TECHNOLOGIES OUT OF S&T PROJECTS
* PRIVATE-PUBLIC PARTNERSHIP IS BEING ENCOURAGED
* CREATION and NETWORKING OF STATE OF ART FACILITIES FOR RESEARCH
* PATENT LITERACY

THE DAY WILL DAWN,
HOLD THY FAITH FIRM.


THANK YOU