CSIR 2001
VISION & STRATEGY

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1. THE MOTIVATION

In the last five years, there has been a sea-change in the economic, political and technological environment the world over. Age-old attitudes and mindsets are being discarded everywhere. India has been no exception; its economy has been unshackled and the forces of competition have been unleashed. A new vision of India as a major player in the global setting has been articulated. The wave of change sweeping the country and the world has thrown up myriad of opportunities and at the same time posed daunting challenges for all sections of Indian society.

For India, more than ever before, it is essential to bring together the world of science and the realm of technology in the socio-economic sphere. CSIR has the potential, the ability and the will to initiate and be in the forefront of such an exciting endeavour, as it has great strengths in its manpower and infrastructure and it covers a wide spectrum of R&D knowledgespace. The purpose of this 'White Paper' is to draw up an explicit agenda for realising these aspirations of CSIR and to chart out a distinct and detailed road map of attaining the true potential of CSIR, visualised not in relation to what it used to do in the past but in relation to what others, the world over, are likely to do in the future.

2. MISSION STATEMENT

The interactive coupling between technology, economy, environment, society and politics has never been more intimate and intertwined than it is today. Mastery and management of technology is a fundamental determinant of the wealth creating capacity of a nation and also of its political position and prestige in the comity of nations. Technology has an immense capacity to improve the public services and the quality of life of the people. Thus scientific research and development activities in CSIR have to be directed towards technological development and application that maximise the overall benefits for India. CSIR's Mission statement thus is :

To provide scientific industrial research and development that maximises the economic, environmental and societal benefit for the people of India.

Industry has a wider connotation than mere manufacturing. Industry encompasses any human activity that transforms the inputs to outputs of value to society. Thus industry would encompass even agriculture, leave alone services. The underlying emphasis is that R&D to be pursued by CSIR provides traceable and tangible benefits to the economic, environmental or societal welfare systems.

3. TECHNOLOGY FOCUS

Recognising that technological advancement holds the key to India's economic and social renaissance the focus of technology development efforts in CSIR would be on those activities that yield appropriate advantage for the nation. This would be sought to be achieved by directing its R&D activities that lead to technology development for economic growth and for human welfare.

❑ Technology for Economic Growth

It is now recognised that better diffusion of technological knowledge and closer partnership between research community, industry, financial institutions and government are needed to improve India's competitive position. Indeed , CSIR needs to partner Indian industry to support its effort to compete successfully in the global setting and prepare for and adapt to the unprecedented global changes. It is essential that the interaction and relation between CSIR and industry be a symbiotic partnership, where the core competencies of both will reinforce each other.

India is blessed with vast natural resources, rich biodiversity and abundant manpower which need to be gainfully utilised. Exploitation of these endowments requires technological intervention. Thus CSIR's endeavour for promoting economic growth would be twofold to:

- **partner Indian industry enabling it to emerge as a significant global player; and**
- **assist the nation in deriving enhanced and sustainable value from endogenous resources.**

❑ Technology for Human Welfare

Recognising that scientific and technological inputs could significantly contribute to improve the quality of life and public services, CSIR would endeavour to:

provide S&T based solutions to mitigate the vulnerability and improve the quality of life, especially, for the weaker and disadvantaged sections of the society.

4. CSIR VISION: 2001

CSIR, with its complement of 10,000 highly qualified scientific and technical personnel, is amongst the largest R&D organisations in the world for scientific and industrial research. Over the years CSIR has contributed to many vital scientific, industrial, strategic and human resource development endeavours. In recent times it has responded to the changing national and international economic, trade and IPR regimes through appropriate organisational and management adjustments. As a result, around 30% of CSIR's turnover is derived from contract R&D and services, it files and owns more number of Indian patents than any other organisation and its initial forays in the international knowledge marketspace have met with a remarkable success, with some of world's leading multinationals seeking strategic alliances with CSIR. This has now emboldened CSIR to set for itself higher sights and goals tempered with the sanguine realisation of the increased international competition, plummeting technology development times and its own desire to become substanitally self-financing. The belief that the prevailing environment in the country and within the CSIR is conducive, more than ever before, to engineering the transformation of CSIR, has influenced the enunciation of an ambitious vision of what CSIR can be in the year 2001.

❑ **CSIR in 2001 would be:**

- **a model organisation for scientific industrial research and a path-setter in the shifting paradigm of self-financing R&D;**
- **a global R&D platform providing competitive R&D and high quality science based technical services world over; and**
- **a vital source of S&T for national societal missions which combine technology with a human face.**

This is a grand, yet by no means an unrealistic dream. Realising it would need setting quantifiable tasks and targets along the path in time against which CSIR could be benchmarked and judged.

❑ **Goals set for the year 2001 are to:**

- **move towards the path of self financing by generating over Rs.7 billion from external sources, as against Rs.1.35 billion in 1994-95, of which atleast 50% will be from industrial customers (up from 15% in 1994-95);**
- **develop at least ten exclusive and globally competitive technologies in niche areas;**
- **hold a patent bank of 500 foreign patents (up from 50);**
- **realize 10% of operational expenditure from intellectual property licensing (up from < 1%); and**
- **derive annual earnings of $ 40 million from overseas R&D work and services (up from < $ 2 million).**

Admittedly, these goals are not a mere extrapolation of our past accomplishments but a quantum jump in our ambition. In the past CSIR had always lived up to the expectations and aspirations of the nation and now given a clear vision and a motivated workforce-

these tasks and targets, though formidable, should be within the realm of realisation.

5. STRATEGIC ROAD MAP

The strategic road map aims at charting out the directional path and contours of the organisational structures and processes required to realise the vision and achieve the goals set for the year 2001. The road map has been derived after thoughtful consultations and shared common understanding of the extant practices, procedures, processes, structures-formal and informal, and the instruments needed to realise the true potential of CSIR. The road map accordingly dilates on five main aspects of the reform process, namely :

- **re-engineering the organisational structure;**
- **linking research to marketspace;**
- **mobilising and optimising the resources base;**
- **creating an enabling infrastructure ; and**
- **investing in high quality science that will be the harbinger of future technologies.**

These aspects are dealt with individually, in detail in the following paragraphs.

6. RE-ENGINEERING THE ORGANISATIONAL STRUCTURE

Structures determine and decide organisational efficiency, productivity, functionability and also originality. Restructuring is one word that encapsulates the accomplishments and limitations of the past, captures the excitement and concerns of the present and symbolises the promise and vision of the future. The increased external competition and specialisation demands that a globally competitive organisation has a structure that is flexible and capable of responding to situations, opportunities and challenges quickly and effectively. This would necessitate that an optimal balance is struck between decentralisation and devolution of autonomy to the working level and foresight clubbed with strategic planning residing at higher levels of organisational echelons.

CSIR's present organisational structure tends to promote hierarchies, retard individual initiatives and enterprise and empowerment of scientists and lacks instruments for promoting inter- and intra-laboratory coordination . As a result, market responsiveness has not been to the desired level. For CSIR to compete in the global knowledge marketplace, it needs to restructure itself along virtual corporate lines and processes. CSIR's structure for tomorrow cannot spring anew from the drawing board, the antiquated legacies of the past have to be undone. Thus, within the limitations of a publicly funded R&D system, CSIR would evolve an organisational structure of a **virtual corporate entity**. The first step in this endeavour would be to seek and realise the functional and operational autonomy in financial and personnel management enjoined by the society structure of CSIR, if need be through an MoU arrangement with the government.

The Headquarters would be restructured to help catalyse and facilitate the laboratories to move towards self financing and to perform the central corporate functions of policy formulation, foresight, strategic planning and monitoring, budgetary resource allocations, interfacing with government, communicating with stakeholders and the lay public, besides functions enjoined by CSIR bye-laws such as audit, vigilance and parliamentary affairs.

The Advisory Board (AB) and Technology Advisory Boards (TABs) were introduced as new organs in the CSIR structure on the recommendations of SAC-PM with a view that CSIR have the best of expert advice for programme identification, prioritisation and management. Over the years, these advisory constituents have been bestowed with functional responsibilities for programme formulation and resource allocations, career advancement etc. In keeping with the original spirit and intentions of SAC-PM and the high level membership of AB and TABs , these would be more effectively made use of in evolving and influencing CSIR S&T policies and in chartering future directions for CSIR.

At the laboratory level, each laboratory would be considered as a subsidiary corporate entity. The Director would be the CEO of the laboratory and in place of the Management Council (MC) would

have an Executive Board to assist him In the management of the affairs of the laboratory. Performance related accountability, incentives and rewards would be introduced and the laboratories would be accorded autonomy in operations related to and dependent on the extent of their committed output and deliverables - the higher the growth rate committed and achieved the higher will be the level of independence from HQs, and the laboratory rewarded suitably.

The Research Councils (RCs) have been assigned functional responsibility but without any operational powers and accountability. In order to derive the best advantage of the high quality expertise of the RC membership, it will now help the laboratory in deriving its vision and direction and as a S&T sounding board for the ideas and programmes of the laboratories.

7. REORIENTING PROGRAMMES & ACTIVITIES

Trade and tariff barriers amongst nations are disappearing with the result that the innovation chain from concept to commercialisation is crossing national boundaries. There would be no captive or protected markets for R&D and services that CSIR could rely on and competition would become fiercer every year. CSIR, thus has no alternative but to view R&D as a business, a transformation process which adds value to inputs, efficiently and profitably. Each laboratory would thus be encouraged to evolve five year business plan, and not just R&D plans, with external professional inputs and assistance.

CSIR and the laboratories must accept that they are a small component of a large international knowledge supply system and cannot hope to mobilise requisite intellectual or financial resources to excel and capture business over a wide range of R&D activities. It is now recognised that an organisation cannot afford or justify assembling in-house all the skills and facilities to carry out competitive R&D and often the pace of change denies them the opportunity to do so. Economic globalisation is compelling even business rivals and competitors to forge alliances and share their resources to develop new products, achieve economies of scale

and gain access to new skills and technologies. CSIR and its laboratories have thus to plan, prioritise and pursue their R&D programmes and activities to minimise risks and to optimise the returns on investments. It then becomes imperative to use CSIR's own scarce resources to the best purpose by co-operating in a symbiotic and profitable partnership, not only with other laboratories of the CSIR but also leveraging alliances externally with other constituents of the innovation chain nationally and internationally. CSIR's business strategy would thus seek to link and relate its R&D to market place by:

- **studying and analysing technology and market trends and forecasts to identify niche opportunity areas, partners, customers, competitors and markets;**
- **evolving a balanced portfolio of projects: some that are industrially led, cost shared and market driven whilst others that are self propelled and create new processes, products, applications and markets;**
- **shedding and divesting programmes and activities that are non-viable; and**
- **exploring and establishing synergistic alliances, consortia and networks that minimise costs and risks of R&D and optimise on value addition and returns on outputs.**

All of this would necessitate continuous interfacing of knowledge workers with the market place, an activity that could be best done through effective business development and marketing systems.

8. EFFECTIVE MARKETING SYSTEM

CSIR and the laboratories hitherto had been adept at analysing and understanding complex S&T phenomena and generating science based innovations. The ideas of linking their programmes and

activities to the market place and more so of viewing R&D as a business process are rather new to the system. The implementation of the recommendations arising from two recent reports, titled "Creating an Enabling Environment for Commercialisation of CSIR Knowledgebase" and "New Mechanisms for Marketing of CSIR Knowledgebase", have significantly influenced CSIR's thinking and shaped its initiatives to reach out to the market place. The results are already visible; a buoyant business activity and enhancement in external cash flow in CSIR.

Marketing of R&D knowledgebase is different from marketing of physical products and goods or even services. It is best done by persons who are closest to and involved with the generation of the knowledgebase as they are emotionally attached and well versed with diverse nuances and variations of it. Thus **the entrepreneur in a scientist** would be awakened, equipped and motivated to venture out in the knowledge marketspace. The strategy to further enhance the marketing of CSIR knowledgebase would be to:

- **develop, through appropriate training, skills of scientists for diverse aspects of business development and marketing activities ;**
- **involve and associate professionally equipped personnel/ group in each laboratory and/or external (foreign/Indian) organisations/ consultants in business development and marketing activities;**
- **permit select CSIR laboratories to set up separate companies/legal entities for business development and marketing;**
- **create marketing outlets abroad;**
- **twin with R&D institutions and organisations to realise synergy of business opportunities; and**
- **act as technology scout for Indian and foreign organisations to help them to evaluate, select, transfer, upgrade, and add value to R&D and technological inputs.**

All these would require an effective system to provide the requisite legal backing and protection to CSIR's knowledgebase.

9. STIMULATING INTELLECTUAL PROPERTY ORIENTED OUTLOOK

The effectiveness of Intellectual Property Rights (IPR) as a tool for global competitive advantage has gained major impetus and importance since the early eighties. Although CSIR has a strong science base and presently files and owns more number of Indian patents than any other organisation, yet its leveraging and earnings from patents have not been comparable to other industrial R&D organisations elsewhere. The skills and competence to manipulate IPR to gain leveraging influence and competitive advantage is not available in adequate measure either in CSIR or in the country. CSIR has taken early initiatives to mount a major patent literacy mission for its own personnel and to enunciate an IP policy. CSIR's IP policy is:

> ***To maximise the benefits to CSIR from its intellectual capital by stimulating higher levels of innovation through a judicious system of rewards, ensuring timely and effective legal protection for its IP and forging strategic alliances for enhancing the value of its IP.***

The IP policy would inter-alia seek to:

- **stimulate and encourage increased creativity and innovation in CSIR to gain economic advantage;**
- **develop skills amongst the scientists to understand, interpret and analyse the techno-legal and business information contained in patents and other IP documents;**
- **use the information acquired from analysis of IP documents to direct and mount strategic R&D programmes;**
- **establish systems of recording and documentation of experimental results and data that would be accepted and respected by patenting authorities the world over;**

- evolve appropriate systems to capture and assess the intellectual property generated in the CSIR system;
- provide the highest level of professional techno-legal services nationally and internationally for securing and protecting the IP generated;
- manage the portfolio of IP as a business activity;
- manipulate the patent portfolio, defensively and aggressively, to forge strategic alliances/ international S&T collaborations, to gain business advantage and ward off competition; and
- mobilise and influence national thinking on IP related issues and concerns.

he endeavour would thus be to:

- identify and mount applied research projects after thorough analysis and assessment of techno-legal and business information in related IP documents and monitoring global patent position for mid-term project appraisal for which requisite pre-project budget and funds would be allocated;
- encourage the publication of R&D results in scientific papers after careful consideration of the consequences on IP rights. A quick and effective system at each laboratory would be established to scrutinise the scientific papers and media releases on achievements/ developments proposed in terms of the IP information contained therein;

  monitor national & international patents and other IP developments through access to on-line databases, to ensure effective protection for and to ward off infringements and threats to CSIR's IP portfolio and vice-a-versa; and
- analyse and assess techno-legal and business information & market intelligence to identify potential stra-

tegic alliances and to exploit uncovered niche areas of opportunities.

It is envisaged that in 2001 CSIR will, apart from filing 1000 patents per year, hold a valuable portfolio of at least 500 foreign patents, which will enable it to strike strategic alliances with some of the global technological leaders in specific areas and help generate at least 10% of its R&D budget from IP licensing.

10. HUMAN CAPITAL MANAGEMENT

CSIR's productive assets are its people and the impressive network of R&D infrastructure. CSIR's core competency is brain power of its qualified, experienced and skilled manpower. The scientific human capital base of CSIR is vast and in some cases the scientists rank individually amongst the best in the world. The present stock of scientific manpower at the time of recruitment were then amongst the best available in the market place. Investments in keeping the knowledge, expertise and skills of the CSIR scientists updated and contemporary have been inadequate and this has adversely affected their creativity and realisation of the gains for the system. There is thus an immediate need for re-engineering CSIR's human capital stock to enhance its level of performance This would be sought to be realised by :

- **putting in place professional Human Resources Management group in each laboratory;**
- **evolving long term human resources plan for each laboratory;**
- **setting up crash programmes to enhance and update the skills base of the staff through appropriate programmes and placements in India and abroad; and**
- **professionalising R&D management and support functions through appropriate training and induction of professionals.**

CSIR today is unable to attract the best of R&D talent in the marketplace, though there is no dearth of scientists/technologists willing to join CSIR, as the supply side is much larger than the

demand for R&D personnel. Also unlike academic institutions, where there is a continuous influx of new and young talent in the form of research students and in-house R&D units in industry where the mobility due to attractive fiscal package is high, there has been no significant influx of new talent in most CSIR laboratories for over a decade! The inevitable outcome is that the turnover of scientists from the CSIR system has been small and their average age today unduly high for a creative knowledge-based organisation.

Infusion of new ideas and young talent in CSIR is essential for rejuvenation of its knowledgebase. While inducting sizeable number of young staff in the system, CSIR also will endeavour to be **'virtually young'** by:

- **attracting, through provision of appropriate facilities, bright young talent in a transient or floating mode;**
- **recruiting and nurturing young talent through global search;**
- **promoting cross flow of personnel through interchange between CSIR and diverse constituents of innovation chain; and**
- **liberalising sabbatical leave and scientist-entrepreneur schemes to encourage CSIR scientists to venture out and refurbish their knowledge and skillsbase.**

Providing attractive remuneration package, reassuring prospects of career advancement and congenial work environment are prerequisites for optimising the returns out of the present stock of human capital and attracting the best of R&D talents in the market place. CSIR has already initiated schemes to substantially enlarge on the reward and financial remuneration package linked to group performance and output. These efforts would now be further consolidated. Career advancement for S&T personnel in CSIR is now governed by a Merit and Normal Assessment Scheme

(MANAS). While MANAS has introduced greater transparency in career advancement, it has some serious lacunae. Accordingly MANAS would be re-examined to enable an effective system of performance linked career advancement to be instituted. For CSIR to secure competitive advantage in the global setting, the various components of its human capital, scientific, technical, managerial, administrative and financial personnel have to work and act in harmony and unison. Thus good work in any and every sphere, and not only scientific, will be recognised and rewarded suitably. A good worker would also be accorded opportunity, preferentially to upgrade his skills and knowledgebase through CSIR support.

11. THE FINANCE CHALLENGE

As a publicly funded organisation CSIR derives its finances from three major sources:

- **Grant-in-aid from the Government**
- **Fee from customers for R&D and technical services**
- **Interest and receipts from non-R&D activities.**

At present the grant-in-aid contributes around 70% of the overall budget and the endeavour would be to decrease the contribution of grant-in-aid to 50% of the budget by the year 2001. This would necessitate significant increases in the non grant-in-aid resources. Indeed, on the basis of present projections, it would mean a five fold increase in non-grant-in-aid resources by the year 2001! This is all the more challenging as most CSIR laboratories are handicapped in competing globally as they have to work with decades old equipment and infrastructure. In order to service the global market, CSIR laboratories would need to seek GLP and ISO accreditation . All this would necessitate raising vast additional resources over the next five years for refurbishing the equipment and facilities in the laboratories. This calls for originality and ingenuity in mobilising and raising financial resources from very constricted money markets for knowledge organisations. In order to advise, guide and assist in this endeavour a strategic group of

experts would be set-up with a view to advising and assisting CSIR on:

- **tapping hitherto unexplored funding sources and markets;**
- **devising novel routes and mechanisms for raising financial resources; and**
- **accessing funds from foreign sources.**

Utmost dilligence and care would be exercised in incurring expenditure and making investments. The budget allocations to laboratories would be linked to their performance as determined by a set of agreed output performance parameters with time dependent weightages. Also efforts would be made to get "more out of less" by efficient and optimal use and deployment of existing resources by:

- **encouraging and enabling better and fuller use of R&D equipment and infrastructure;**
- **leasing/hiring of underutilised R&D infrastructure and physical assets;**
- **networking & consolidation of units and laboratories; and**
- **strict financial and physical monitoring of projects and performance of laboratories.**

12. ENABLING INFRASTRUCTURE

To compete globally CSIR has to function at the peak of its efficiency and productivity. This requires its R&D infrastructure and R&D management structures and systems to be benchmarked at international levels for quality and timeliness of response to markets and customers, and a motivated workforce. Financial resources were, and continue to be, the major constraints to modernisation of the infrastructure and systems; with the financial initiatives and strategy already mounted recently these would be mitigated to some extent and vigorous efforts are planned to:

- **modernise and upgrade, selectively and in a phased manner, the existing equipment and facilities;**
- **provide funds to laboratories to access business-led information through commercial data bases and intelligence to enable them in devising their R&D strategy and business plan;**
- **establish a computer communication network within each laboratory and its connectivity across all of CSIR and to international networks;**
- **revamp the management information system through computerisation of accounts, project management & monitoring and personnel management;**
- **improve and enlarge the communication channels with customers and stakeholders;**
- **establish transparent and accessible communication and interactive system between staff and management; and**
- **provide more amenities to staff and their families such as housing to more of staff and research scholars by increased construction of houses and leasing of accommodation and community facilities on campus.**

13. ROLE OF BASIC RESEARCH IN CSIR

Science opens up new insights and approaches for technology development, helps leap-frog rather than follow the trodden path and provides the basis and understanding for know-why of technology. CSIR recognises that there is no high technology without high science. CSIR must discerningly use its limited human and financial resources to support basic research in highly selective areas. CSIR needs to outsource a lot of its basic research from the academic institutions through appropriate instruments and mechanisms. Thus basic research in CSIR would be free but focussed to the objective of providing knowledgebase and skills

for generating technology and techniques of the future. CSIR's strategy would thus be to:

- **invest in basic research that supports its "scientific industrial research" programmes;**
- **initiate a 'New Idea Fund' to generate, on a competitive basis, high-risk new research ideas of explosive creativity;**
- **harness the creativity of research fellows and scholars in CSIR for developing science required for new technology development effort;**

  direct CSIR's extra mural research funding to provide the basic research for scientific industrial research in CSIR;

  integrate on a regional basis appropriate academic institutions with CSIR laboratories;
- **twin with academic R&D institutions for symbiotic R&D programmes; and**
- **establish selective schools of science in CSIR that rank amongst the best in the world.**

14. REALISING THE VISION

We recognise that the bold and daring road map drawn up is only an enabling artefact and the mechanisms and instruments suggested are necessary but not sufficient to reach our destination - the realisation of our full potential. There are no short cuts or guide maps to help us navigate through the untraversed path. The spirit of adventure and self confidence supported by diligence and determination are the only sign posts on our exciting journey. We have a long way to go, but our vision is clear and our resolve firm.