



# TAMIL NADU BIOTECHNOLOGY POLICY 2014

Industries Department  
Government of Tamil Nadu



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## 1. INTRODUCTION

1.1. Biotechnology and Information Technology, have been frequently referred to as the technologies of 21<sup>st</sup> century. Tamil Nadu was one of the few States which saw its potential early and formulated a separate Biotechnology Policy a decade ago. The State established its first biotechnology incubation park, the TIDCO Centre for Life Sciences (TICEL) Biotechnology Park I in Chennai with technical collaboration from Cornell University, USA which became operational in November, 2004 and remains fully occupied to-day; the state-of-the art TICEL II with a built-up area of 6 lakh square feet, with Bio-safety Levels 2 & 3 (BSL 2/ BSL 3), is set for completion very shortly. A Biotechnology Core Instrumentation Facility is being established at TICEL II, with the state-of-the-art equipment for microbiology, molecular biology, fermentation, downstream processing, purification and analytical & animal cell culture facilities.

1.2. The Vision 2023 Tamil Nadu unveiled by Honourable Chief Minister in March 2012 mentions Biotechnology sector as one of the Sunrise sectors and emphasises the need to create networks of scientific and research institutions focusing on areas such as biotechnology, high yielding varieties, tissue culture, etc. The Vision 2023 document further envisages the development of eleven important and special signature projects that will create a huge positive impact and provide significant spin-off benefits, one of which is the development of world class institutions of research and knowledge in the Biotechnology sector. Efforts are on to get a National Biotechnology Centre of Excellence established in Chennai. The Golden Jubilee Biotech Park, exclusively for women, is another pioneering effort of the State Government.

1.3 Though the growth of the biotechnology sector in Tamil Nadu has been quite impressive, it can be even better, especially given the abundant opportunities available and the favourable factors Tamil Nadu is endowed with. Hence, this revised Policy: to take a re-look at the journey undertaken so far, and to chart the future course of action to re-invigorate the sector.

## 2. OBJECTIVES OF THE NEW BIOTECHNOLOGY POLICY

The new Policy is designed to facilitate new biotech companies to come to Tamil Nadu by creating an enabling environment. The broad objectives of the new Biotech policy are:

- to take up a detailed inventory of the bio-resources in the State;
- to attract R&D institutions and Manufacturing firms to Tamil Nadu by:
  - developing high quality infrastructure with the required support services for manufacturing units by setting up specialized Biotech Parks in various parts of the State;
  - providing special incentives to the biotech industry and related sectors;
  - developing competent human resources at different levels in the field of biotechnology;
  - facilitating the flow of venture capital funds and bank credit to biotech companies;
  - addressing issues such as Intellectual Property Rights, Bio-safety, Bio-surveillance and Bio-ethics;
  - encourage and facilitate introduction of biotechnology at the grass-root level to strengthen the economy of the State;
  - promote the field of Bio-informatics leveraging the State's strength in Information Technology;
  - promote human resources in Biotechnology by introducing new courses and encourage private sector to establish institutions and
  - promote infrastructure for this by creation of a Biotechnology Zone with TIDCO as the nodal agency.

## 3. THE NATURE OF BIOTECHNOLOGY

Biotechnology is characterised by a number of unique conditions. First, it is a **cross-cutting** technology. A technique developed for and applied in human health can be used in agriculture and vice versa. Therefore, substantial benefit can be derived from this 'cross-fertilisation' feature of biotechnology. Secondly, the biotechnology industry is **research-intensive**. Thirdly, the development and

application of biotechnology requires a convergence of skills from a variety of disciplines: biochemistry, genetics, information technology, engineering and several other specialisations. It is thus a **multi-disciplinary** field. Hence, the industrial application of biotechnology requires the acquisition of strong **scientific and engineering capabilities**, and the deployment of new knowledge in production processes.

#### 4. APPLICATIONS OF BIOTECHNOLOGY

Biotechnology has applications in four major areas: (i) health care (medical), (ii) crop production and agriculture, (iii) non food (industrial) uses of crops and other products (e.g., bio-degradable plastics, vegetable oil, bio-fuels, textiles, paper) and (iv) environmental uses.

#### 5. BIOTECHNOLOGY INDUSTRY IN INDIA AND TAMIL NADU AT A GLANCE

5.1 Biotechnology industry in India has been registering phenomenal growth in the recent past. India is ranked among the top 12 biotechnology destinations in the world and the Indian biotechnology sector is the second largest in Asia after China. The latest *Biospectrum- ABLE<sup>1</sup> Biotechnology Industry Survey 2013* estimates that during the fiscal year 2012-13, the Indian biotechnology sector grew at 15.1% to register a turn-over of Rs.23,524 crore; in 2007-08, the turn-over was Rs.10,272 crore. Tamil Nadu is projected to achieve a revenue of Rs. 5,000 crore (approx. US\$ 1 billion) by 2016. Thus, biotechnology offers an enormous opportunity with a vast potential for growth. The shares of the various segments of the Biotechnology industry in India during 2012-13 were as follows<sup>2</sup>:

<b>Biopharma:</b> Vaccines, therapeutics and diagnostics	63.43%
<b>Bioservices:</b> clinical trial, contract research and manufacturing	18.40%
<b>Bioagri:</b> Hybrid seeds and transgenic crops, Biopesticides and Biofertilizers	13.64%
<b>Bioindustrials:</b> enzymes used in detergents, textiles, food, leather, paper and pharmaceuticals	3.28%
<b>Bioinformatics:</b> creation and maintenance of extensive electronic databases on various biological systems	1.25%

1,2 Association of Biotechnology Led Enterprises, June 2013.



5.2. The Indian biotechnology industry is set to grow to Rs.49,747 crore by 2015<sup>3</sup>. India has a sizable presence in the global pharmaceutical market. It is the fourth-largest global producer, by volume, of drugs, and it is also the biggest global supplier of traditional vaccines. In 2005, under the World Trade Organization's Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreement, India's patent laws were brought in line with international trading rules. TRIPs has provided the impetus for India's innovation to get a jump start and showcase to the world its capabilities in producing the next major drug. The agriculture biotechnology sector is also vibrant in India and many biotech companies look seriously at the agriculture sector in India and Tamil Nadu.

## 6. TAMIL NADU - THE POTENTIAL FOR BIOTECH INDUSTRIES

6.1 Tamil Nadu, with its abundant intellectual and human resources, is fast emerging as an innovation and knowledge-driven economy, and is ideally positioned to reap the benefits the Biotechnology sector has thrown open.

6.2 Pharma giants like Pfizer and Chemical giants like Dow Chemicals, Orchid Chemicals and Shasun Chemicals all have their R& D facilities in Chennai. Orchid chemicals have set up one of the World's largest sterile anti-biotic manufacturing facilities near Chennai with an R&D Facility. In the healthcare domain, Chennai boasts of an impressive array of world-class corporate hospitals and Chennai has emerged as one of the most preferred destinations for medical tourists from across the globe.

6.3 Chennai is also famous for its high-class educational institutions: the Indian Institute of Technology (IIT), Anna University and many well-known Engineering Colleges. The Madras University, the Madurai Kamaraj University, the Bharathidhasan University, the Bharathiyar University and many private Universities offer very accomplished Biotechnology courses. Realizing the importance of education and research in animal and fisheries sciences, the Veterinary College was

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<sup>3</sup> Report by the Confederation of Indian Industries and YES BANK

established as far back as 1876, the first of its kind in India, which has blossomed into the Tamil Nadu Veterinary and Animal Sciences University, again a first in its category. The Tamil Nadu Agricultural University, established in 1971, which had its humble origin as an Agricultural School in 1868, is presently the largest Agricultural University in India: with 36 agro technology research stations, it is a resource centre for many such institutions in various parts of India.

6.4 Tamil Nadu leads in other knowledge based sectors like the Information Technology.

## 7. MAJOR OPPORTUNITIES AND THE THRUST AREAS OF THE BIOTECHNOLOGY SECTOR IN TAMIL NADU

7.1 If the threats and weaknesses facing the biotechnology sector are addressed, the following areas of the sector are expected to offer enormous growth opportunities:

7.2 **Vaccines and recombinant therapeutics:** The next few years will witness the launch of newer therapies, prominent among these would be the monoclonal antibodies products, stem cell therapies, growth factors and others.

7.3 **Bioactive Therapeutic Proteins:** Production of proteins and antibodies and fabrication of diagnostic protein chips would be a promising area for investment.

7.4 **Stem cell research, cell engineering and cell-based therapeutics** could be another area where the State can excel. Up to 25% growth is expected in this field.

7.5 **Agriculture sector:** Tamil Nadu has the potential to become a major State in adopting high technology plant breeding and seed production methodologies. There is an increasing use of molecular markers in crop breeding and a growing realization that some of these new technologies could lead to future growth in the productivity and quality of crops such as rice, wheat, eggplant (brinjal), tomato and

lady's finger. Therefore, hybrid seeds represent new business opportunities based on yield improvement. The development of a production base in bio-pesticides and bio-fertilisers would facilitate the State's entry into the growing organic or natural foods market.

**7.6 Animal Biotechnology:** The livestock and poultry wealth in the State is ever on the increase, as a large number of germplasms are being introduced in the State. The scope for developing diagnostics and vaccines and nutraceuticals exclusively for livestock and poultry applying biotechnological tools is immense.

**7.7 Contract Research:** The cutting edge of the biotechnology sector is the development of new products. Indian pharmaceutical companies possess competitive skills in chemical synthesis and process engineering, which they can leverage to develop new chemical entities, and with the application of bio-informatics tools, tap into the high-potential bio-generics segment.

**7.8 Clinical Trials and outsourcing:** Due to the rising costs of R&D abroad, many global companies are looking for contract research in India especially US and European companies. As already mentioned, Tamil Nadu has got an impressive network of corporate hospitals which is an ideal platform for clinical trials because of the diverse gene pools covering a large number of diseases. Cost-effectiveness, competition and the increased confidence on capabilities and skill sets have propelled many global pharmaceutical players to expand their own clinical research investment in India. Contract research supported by IT skills has led to promising outsourcing business in various other segments including clinical trial data management, statistical analysis, and electronic data capture.

**7.9 Bioinformatics:** This field offers significant opportunities in critical areas such as data mining, mapping and DNA sequencing, besides functional genomics, proteomics and molecule design simulation. The IT skills of Tamil Nadu are a complementary strength.

7.10 Besides the above, the following thrust areas offer tremendous scope for potential investment in the Biotechnology sector:

- Medicinal and Aromatic plants
- Animal Biotechnology
- Aquaculture and Marine Biotechnology
- Seri biotechnology
- Human Genetics and Genome Analysis
- Environmental Biotechnology
- Microbial and Industrial Biotechnology
- Healthcare
- Bio-Fuels
- Software Support

## 8. THE STATE'S INTERVENTIONS

The State Government's initiatives to foster biotechnology will be as follows:

### INSTITUTIONAL

#### 8.1 Creation of the Department of Biotechnology

A separate Department of Biotechnology will be created by the State government to foster the growth of biotechnology in Tamil Nadu.

#### 8.2 The State Biotechnology Board

8.2.1. A State Biotechnology Board will be established to give proper orientation to the biotechnology sector in the State. The Board will have representatives from the public, the research community, the business sector and the Government. To support this Board, a permanent cell comprising qualified experts will be created in the Tamil Nadu Industrial Development Corporation (TIDCO).

8.2.2. This Board will periodically review the policy measures and infrastructure needs of Biotech Industry. The role of the Board will include:

- identifying and defining the focus areas to match the strengths of the State;
- establishing and strengthening world class infrastructure for research and manufacturing;
- establishing speciality parks to boost key areas; and
- identifying funding avenues to promote new companies.

## 9. RESEARCH AND DEVELOPMENT

### 9.1 Creation of Biotechnology Centre of Excellence (BCE)

The State Government will support the creation of Biotechnology Centre of Excellence at Tamil Nadu Agricultural University, to provide research and technology facilities in biotechnology focus areas. The Biotechnology Centre of Excellence will be a full-fledged research institute in itself, with a state-of-the-art laboratory and employing a number of senior scientists with their teams of professional and technical staff, who will focus on research products leading to new products. The Biotechnology Centre of Excellence will leverage the expertise already available in the academic institutions and act as common facility areas where capital equipment and specialised expertise will be shared by the academia and the industry. The Biotechnology Centre of Excellence will be responsible for preserving and distributing biological materials and information. The Centre will also accommodate a biotechnology incubator, on the models of the IIT Research Park in Chennai. The Centre will undertake a systematic study of the biodiversity available in Tamil Nadu with respect to their commercial potential and develop a repository of such knowledge and the genomes.

### 9.2. BioTech Research Institutions

The State Government will pursue with the Government of India to establish a National Centre of Excellence for Biotechnology & Life Sciences at Chennai. The

State Government will collaborate with the Government of India to attract future research institutions for the State from the Council of Scientific and Industrial Research (CSIR) and the Department of Biotechnology (DBT).

### **9.3. Other facilities for Biotechnology Research**

The State Government will facilitate the setting up of resources such as large animal facilities, transgenic animal facilities, advanced protein characterization facilities, chemical and molecular screening libraries, bio-safety level 3 facilities for infectious-disease research, and trade-related testing and accreditation facilities.

### **9.4. Bio-IT Park**

The State Government will promote a Bio-IT Park on the Public-Private Partnership (PPP) mode. The Bio-IT Park will be a cluster of science and technical academic institutions, research centres and Information Technology and Life Sciences industries, all of which will collaborate in addressing the IT related needs of the global biotech industry. The Governments at the Central and State levels, Research and academic institutions and industry (IT, BT, Pharma etc.) will be the major stakeholders of the Park and the Government will play the role of the facilitator. The Research Institutes will play the dual role of being a common infrastructure facility and the facilitator of research through collaborations and technical tie-ups with the companies in the Park.

### **9.5. Medical Biotechnology Industrial Clusters**

The State Government will promote Medical Biotechnology Industrial Clusters by amalgamating biotech talents from different universities, medical centres and institutions.

### **9.6. Biotechnology Research Fund**

A Biotechnology Research Fund will be created with a corpus of Rs. 100 crore to begin with, which will be used to encourage research in the thrust areas already identified and specifically

- the development of easy to use, low-cost diagnostics for the detection and management of infectious and non-communicable diseases;
- the development of affordable and safe vaccines;
- the development of specific Tamil Nadu-developed drugs for diabetics, hypertension, cancer, malaria, TB, etc.;
- a genome project (gene profile) on Tamil Nadu population: the mapping and identification of genes underlying disease structure, elucidation of the molecular basis of diseases common to this region and the development of technology to develop medicines and diagnostic tests;
- the creation of a resource database that will identify all the components required for the commercialisation of biopharmaceuticals. This database could be managed and accessed through a bio-industry portal.

## 10. HUMAN RESOURCE DEVELOPMENT

10.1. Tamil Nadu has emerged as the second largest IT exporter primarily due to abundant availability of skilled manpower. On similar lines, Tamil Nadu has the potential to be a leader in BioTech and allied Life sciences industries.

10.2. The State has 553 Engineering colleges with an enrolment of 1,82,000 graduates, more than 500 polytechnics with an enrolment of 1,20,000 technicians and more than 1,600 Industrial Training Institutes producing about 180,000 skilled workers. Anna University has established a Centre for BioTechnology. A number of other Universities including deemed universities and Engineering colleges currently offer courses in Biotechnology, Bio-Informatics, Bio-medical engineering, Bioprocess engineering, Genetic engineering, etc. However, there is a need to augment the supply.

### 10.3 Curriculum development

10.3.1. The Government will facilitate starting multi-disciplinary courses in the fields of basic molecular biology, bio-informatics, information technology, engineering, statistics, genetic epidemiology, business management, product development and legal issues, in academic institutions.

10.3.2. The State will support integrated degree programmes with industry-relevant curricula and with emphasis on application of basic understanding of the biological system leading to Ph. D.

10.3.3. Hands-on training in biotechnology will be imparted in schools and colleges. Towards this end, the State Government will encourage small scale industries to manufacture reagents and teaching kits.

10.3.4. Industry-oriented PG diploma courses in Biotechnology subjects like clinical trials and bio-reactor operations will be offered in the colleges.

10.3.5. The State Government will support the development of various fermentation processes for the production of Nutraceuticals<sup>4</sup> and encourage large investment projects in Nutraceuticals production.

### 10.4 Augmentation of skilled manpower

To augment the skilled manpower availability, the State Government will

- introduce diploma and certificate courses (for 10+2 higher secondary. CBSE, ISC students) in agricultural biotechnology, animal husbandry, etc.;
- undertake a review and amend course curricula in consultation with the industry and research establishments to meet industry needs;
- encourage industry-university tie-ups to enable professionals to undertake PhD programmes, through sharing of costs;

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<sup>4</sup> A “Nutraceutical” is a food or food product that reportedly provides health and medical benefits, including the prevention and treatment of diseases.



- include components of biotechnology in the life sciences syllabi at the undergraduate and the postgraduate levels;
- encourage the private sector to establish advanced Finishing Schools in BioTech and allied fields;
- introduce Training subsidy to encourage employment of fresh graduates by the BioTech industry.

## 11. INFRASTRUCTURE FOR MANUFACTURING

### 11.1 Biotechnology Enterprise Zone

The State Government, with TIDCO as the nodal agency, will establish the Tamil Nadu Biotechnology Enterprise Zone. The Zone will house a Core Biotech Park and a Marine Biotech Park. Besides the O&M services, the zone will also house specialised services like:

- Consulting Services
- Regulatory facilitation
- Single Window Facilitation Cell and
- IPR Cell.

### 11.2 Special Investment Zones for Biotech industry

The State Government will facilitate the creation of Special Investment Zones for Biotech manufacturing and R&D activities near Chennai.

### 11.3 Biotech Parks

11.3.1. The State will also encourage the development of Biotech Parks which will provide land and plug-and-play infrastructure for biotechnology industries.

Such Biotech Parks will be encouraged near Chennai and also in the tier-2 cities like Coimbatore, Madurai, Tiruchirapalli, Salem and Thoothukudi. More public-private partnerships will be encouraged to set up projects in the model of TICEL phase II type self-contained buildings, that can offer shell spaces for small and medium enterprises.

11.3.2. To encourage the Private sector to establish such Biotech Parks, the State Government will:

- offer 100% Stamp duty concession on built-up space offered to industries in such Biotech parks. Such Biotech parks should have common infrastructure like labs, testing Facilities, etc., to qualify for this.
- provide additional FSI on par with the IT industry, with a condition that at least 75% of built-up space should be used by Biotech industries including Pharma, Contract research organisations in Biotechnology, Bio-Informatics, etc.
- facilitate and provide external infrastructure like access roads, power, communication, water supply, dump sites for waste disposal, etc. in deserving cases.
- exempt Biotech Parks having a height of not exceeding 30 metres in Chennai, Coimbatore, Tiruchirappalli, Madurai and Tirunelveli from the requirement of MSB declaration. Such parks should however follow other statutory regulations.
- provide fast track approvals: Guidance Bureau will be mandated to provide single window clearance and facilitation for Biotech projects and Biotech Parks.
- exempt such projects from standard ventilation requirements, considering that Biotech projects require clean-rooms operating environment.

## 11.4 Bio-Incubators

Bio-Incubators facilitate licensing of new technologies to biotech companies to start new ventures, and to get early stage value enhancement with minimum financial inputs. They help in the lab to land transfer of the technologies through partnership between R&D institutes and industry. The State Government will offer subsidy to Universities and Engineering colleges to establish such Bio-Incubators at 50% of the total cost of development, capped at Rs. 5 crore for each Bio-Incubator centre.

## 12. BIOTECHNOLOGY VENTURE CAPITAL

The State Government will constitute a Biotechnology Venture Capital Fund of Rs. 500 crore on PPP mode, in collaboration with leading venture capital and private equity firms who have specialized in this field through joint ventures with TIDCO. Such joint-venture Capital Fund will help in identifying and nurturing talent and in establishing networks for effective marketing of the products of the start-ups.

## 13. POWER

- Uninterrupted power supply will be provided to Biotech Parks. Such parks will be exempted from any power cuts and peak load restrictions.
- VAT on Captive power including gensets purchased for installation in Biotech Parks will be exempted / refunded.
- Biotech projects coming under manufacturing category will be charged on par with industries. Biotech projects coming under research and development category will be charged under tariff HT IIA.
- Electricity Tax exemption will be according to eligible investment and direct employment given as per the provisions of Tamil Nadu Industrial Policy 2014.

## 14. THE ANNUAL BIOTECHNOLOGY CONVENTION

At present, the Government of Tamil Nadu hosts a major annual event “Connect” that attracts a lot of IT firms from all over the world. On similar lines, the Government of Tamil Nadu will organize an annual Biotechnology Convention in collaboration with the Department of Biotechnology, Govt. of India and Industry bodies.

## 15. FISCAL INCENTIVES

- Fiscal incentives like capital subsidy and Environment Protection Infrastructure subsidy will be as per the Tamil Nadu Industrial Policy 2014.
- Investment Promotion Soft Loan / Subsidy based on VAT accruals will be given depending on size of eligible investment, direct employment and location, as done for manufacturing industries.
- For R&D institutions and Contract Research Organisations (where there will be no VAT accruals), a Special Capital subsidy of 15% of eligible investment subject to a cap of Rs. Five crore will be given.
- Eligible investment will include up to a maximum of 30% of eligible fixed assets in the form of intangible assets like IPR-related expenses incurred, Technology fees paid, etc.
- A training subsidy: Rs.7,500 per Trainee per month up to 12 months will be provided in deserving cases for taking fresh graduates on regular employment, provided the employer pays an equal or more amount to the trainee.
- Patent Registration subsidy will be provided, restricted to 50% of Patent registration expenses subject to a cap of Rs.2 lakhs per patent.

## 16. SINGLE WINDOW FACILITATION

Single Window Clearance will be provided for all biotechnology R&D and manufacturing projects with a minimum investment of Rs. 10 crore through the Guidance Bureau, the notified agency for Single Window Clearance in the State.

## 17. NANOTECHNOLOGY

### 17.1. Introduction

Nanotechnology deals with understanding and control of matter at dimension of roughly 100 nm and below. At this scale, the physical, chemical and biological properties of materials differ from the properties of individual atoms and molecules or bulk matter, which enable novel applications. Like Biotechnology, it has a cross-sectoral application and an interdisciplinary orientation.

### 17.2. Nanotechnology R&D

Currently, Nanotechnology research and development is directed towards understanding and creating improved materials, devices and systems that exploit these properties as they are discovered and characterized. There are many applications of nanotechnology such as in the area of medicine, chemistry and environment, energy, agriculture, information and communication, heavy industry and consumer goods. Nanotechnology can enable cost-effective solar and fuel cells with higher efficiency. Nano-materials could also facilitate energy saving through nano-materials aided efficient lighting (LEDs), nano-catalysts that improve combustion processes and also better insulation materials. Overall, nanotechnology interventions could enable the successful development of renewable energy solutions and reduce our dependence on fossil fuels. Nanotechnology is stated to enhance agricultural productivity through genetic improvement and make crops more resistant to heat and water logging. Water treatment and remediation is another critical area where nanotechnology applications might aid developing countries. Some of the

interventions include water purification, detection of contaminants and waste water treatment.

### 17.3. Commercialization of Nanotechnology

At the commercial level, nanotechnology applications have so far found wide use in three major industry sectors, viz., materials and manufacturing (coatings and composites for products like automobiles and buildings), electronics (displays and batteries) and health care and life sciences (pharmaceutical applications).

### 17.4. Nanotechnology in India

17.4.1. Nanotechnology in India so far has been a government-led initiative. Industry participation has started only very recently. Nanotechnology R&D is largely being conducted at government-funded universities and research institutes, except in a few cases.

17.4.2. The initiatives of the Government of India include the Nanoscience and Technology Initiative (NSTI) from 2001–06, the Nanoscience and Technology Mission (NSTM) in 2007 and the setting up of 19 ‘Centers of Excellence (CoE) for Nanoscience and Technology’.

17.4.3. Like Biotechnology, the development of nanotechnology requires:

- (a) skills of both scientific and non-scientific kind, including regulatory bodies,
- (b) a greater degree of linkages between various actors from academia, industry, policy makers for successful market deployment of such technologies,
- (c) a different R&D strategy as well as reorientation of science and technology activities in universities, research institutes, funding agencies and industry with a conducive institutional setting facilitating interactive learning,

- (d) devising adaptive and responsive governance structures that can suitably regulate applications of nanotechnology in society, and
- (e) a policy environment to create the conditions required for both knowledge generation and its effective utilization.

### 17.5. Risks associated with Nanotechnology

However, there are also quite a few risks associated with Nanotechnology. The complexity of the technology, the breadth of nano-materials and its applications, coupled with the possibility of its wide dissemination in the globalised world renders the technology unpredictable in many senses. The risks include environmental, health, occupational and socio economic risks. Therefore it is crucial to examine and estimate the risk for regulating the production, use, consumption and disposal of these materials.

### 17.6 The Way-ahead

Nanotechnology, right now, is in a nascent stage of development in India. Given the potential and the revolutionary benefits associated with Nanotechnology, it is necessary to harness the technology for the overall development of the State. The Vision 2023 Tamil Nadu unveiled by Hon'ble Chief Minister in March 2012 envisions Tamil Nadu emerging as a knowledge and innovation hub in the country; the large pool of technical manpower available in the State can be harnessed to specializations in advanced fields like Nanotechnology. The State's Solar Policy and the need for industries to find better technologies for waste treatment provide great scope for further developments through Nanotechnology. However, the concerns about the possible adverse impact of the technology on health, environment and personal safety should be addressed dispassionately. Towards this end, the State Government will constitute a **Nanotechnology Advisory Committee** comprising experts in the field to advise the State government on the road-map for the sector in Tamil Nadu.

A Centre of Excellence for Nanotechnology will be established at Anna University, Chennai to undertake research and development and related activities in the field to take the State to the next level in this special area of technology as outlined in the Vision 2023 Tamil Nadu document. TIDCO Centre for Life Sciences (TICEL) under TIDCO will be the nodal agency for implementing this venture.

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