सीएसआईआर-केन्द्रीय नमक व समुद्री रसायन अनुसंधान संस्थान

CSIR-Central Salt & Marine Chemicals Research Institute

जनमानस तक पहुँचने वाले नवाचार

Innovations that reach the people

Council of Scientific & Industrial Research

The Council of Scientific & Industrial Research (CSIR)(www.csir.res.in) is known for its cutting edge research & development knowledgebase in diverse science and technology areas from diagnosis to drugs, hygiene to health, energy to environment, health drinks to drinking water, in-house to industry, arterial to aeroplanes and from industrial waste to wealth. Having a pan-India presence, CSIR has a dynamic network of 38 national laboratories, 39 outreach centres, 3 innovation complexes and 5 units. CSIR's R&D expertise and experience is embodied in about 3484 scientists supported by 7487 other personnel including technical and administrative staff.

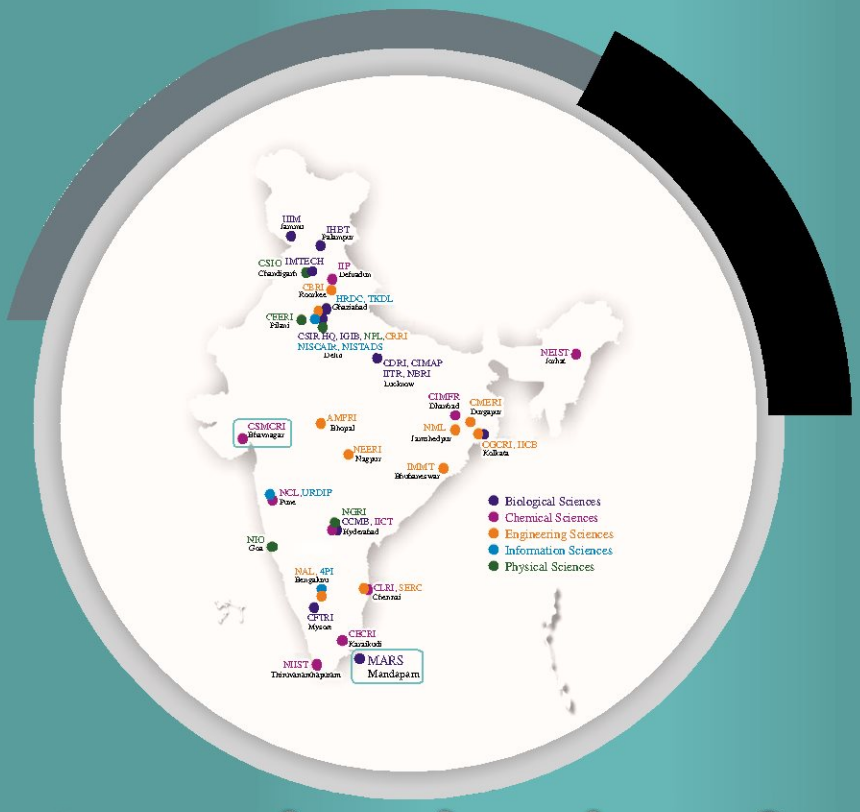
CSIR is eligible for Corporate Social Responsibility [CSR] funding support from corporates under Section 13, Schedule VII of Companies Act, 2013 after the amendment dated 11th October 2019 vide gazette notification number G.S.R 776(E).

- CSIR is a registered Society under Societies Registration Act, 1860.
- The President of the Society is the Prime Minister of India and the Vice President is the Minister of Science & Technology. The Society comprises several eminent persons from different walks of life.
- CSIR is registered u/s 12A of the Income Tax Act, 1961 and has been approved under Section 10(23C) (IV) of Income Tax Act 1961 for assessment year 2010-11 onwards as a charitable institution.

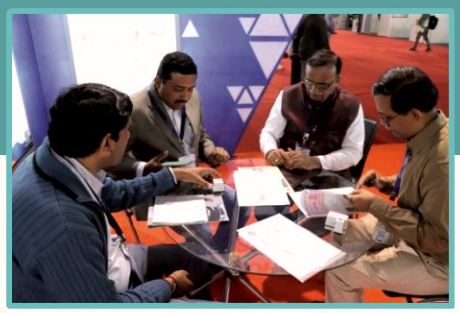
CSIR- Central Salt & Marine Chemicals Research Institute (CSIR-CSMCRI), Bhavnagar

CSIR-CSMCRI is the only institute in Gujarat state that works under the aegis of CSIR, New Delhi. Founded by the then Prime Minister Pt. Jawaharlal Nehru on April 10, 1954 this institute is a leading national research laboratory working in the service of society and industries in partnership with the global sponsors and associates. The institute has done exemplary work for the effective use of seawater for salt and marine chemicals, marine maroalgae and microalgae, coastal wasteland for halophytes, seawater and brackish water desalination and in harnessing solar thermal energy. The institute has proved its potential in the field of Biological Sciences, Chemical Conversions, Process Engineering, Environmental Monitoring and Separation Sciences to meet the concentrated needs of the industries and institutions of these fields.

The institute has contributed significantly towards developing cost-effective technologies/processes in the field of salt, marine chemicals like potash, magnesia, specialty materials and chemicals, seaweed based phycocolloids, bio-stimulants & bio-fertilizers, and recovery of valuable products from industrial wastes. This institute has made significant contributions to the national mission of skilling, women empowerment, *Swachh, Swasth* and *Saksham Bharat* by promoting/developing globally competitive indigenous technologies. Institute's presence in various societal mission is recognized by all diverse sections of the society. All major technological inventions are well protected with IPR. According to Scimago ranking in last few years, this institute stands as one of the top 10 Indian institutions and globally in top 550 institutions. This institute is committed to excel in technological innovations and promote translational research to address the unmet challenges of this country.



सीएसआईआर नेटवर्क मानचित्र



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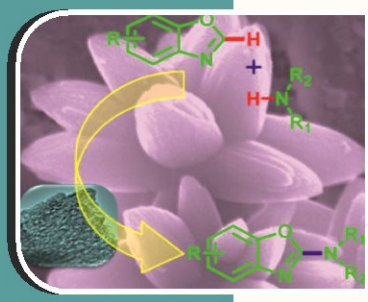
Key Research Areas of CSIR-CSMCRI

Salt & Marine Chemicals

- Recovery & management of salt & marine chemicals from sea, sub-soil and lake brines
- Survey, design, lay out and processes for improving quality & yield of solar salt
- Salt for speciality applications: pharma grade salt, spherical salt etc.
- Management of saline wastes (solids and liquids): separation of pure salts
- Training programmes for salt manufacturers and related industries



Inorganic Materials and Catalysis

- Green and sustainable catalysis for fine, perfumery and chiral compounds
- Active pharmaceutical ingredients [APIs] and key starting materials [KSMs]
- Carbon dioxide & biomass conversion to value added products
- Metal extraction (lithium, cobalt, gold etc.) from industrial wastes
- Specialty materials: silica, inorganic pigments & zeolites

Plant Omics

- Developing plant/crop disease tolerance by the application of seaweed sap
- Halophyte cultivation *i.e. Salicornia brachiata* for saline lands
- Nutrient cycling and microbial community structure analysis
- Understanding the tolerance in halophytes for salinity, drought and heavy metal
- To develop stress tolerance in crop plants

Membrane Science and Separation Technology

- Thin Film Composite (TFC) membranes/modules for water desalination: Brackish Water & Sea Water Reverse Osmosis (BWRO & SWRO)
- Large scale membrane manufacturing facility, state-of-the-art membrane and module characterization/testing facility
- Mobile water purification/desalination system for the service of nation during calamities
- Nano-filter membrane/modules for oil-water separation
- Membrane distillation, membrane bioreactor, antifouling membranes, membrane electrolysis, recycling of membrane modules
- Hollow-fibre, flat sheet ultra-filtration, ion exchange and bipolar membranes for water treatment
- Polymer electrolyte membranes for energy conversion and storage devices

Applied Phycology and Biotechnology

- Seaweed and microalgal biology, sustainable cultivation and bio-prospection
- Genomic, proteomic and metabolomic investigations in marine habitat plants
- Quality seedling production for commercially important seaweeds
- Biotechnological means for quality propagation of economically important plant species
- Seaweed derived plant bio-stimulant formulation and animal feed formulation
- Stress biology and development of smart agriculture

Analytical & Environmental Science and Centralized Instrument Facility

- Renders analytical services and intellectual inputs to the users from various industries, institutes, R&D laboratories and universities. Institute offers analytical services with subsidized charges to academic institutes, universities, small scale industries and start-up companies
- Development of instrument based analytical methods and amendment of existing analytical methods for superior performance
- Functional molecules/materials for sensing of environmentally and biologically important ions and molecules
- Recovery of commercially and strategically important metal ions from natural sources
- Electro catalysis in Hydrogen Evolution Reaction (HER), Oxygen Evolution Reaction (OER) and carbon dioxide reduction reactions
- Computational and crystallographic studies to design new materials for different applications
- Environmental Impact Assessment (EIA) studies; activities to improve the environment quality, mangrove afforestation, protecting marine national park in Gulf of Kutch etc.

Natural Products and Green Chemistry

- Processes for the production of seaweed-based products (agar/agarose, kappa-carrageenan, alginic acid and derivatives, plant bio-stimulant formulations, biodegradable packaging material, vegetable capsule shells, bioactive gels) directly from seaweed biomass
- Development of processes for the production of microbial pigments and bio surfactants
- Development of high-yielding microbial strains for industrially important Active Pharmaceutical Ingredient (APIs)/drug molecules
- Process development for industrially important organic bromides and effluent free dyes

Process Design and Engineering

- Process development and scale-up
- Pilot plant development, process knowhow, demonstration and technology transfer
- Energy application and management, in particular solar
- Technology for recovery of potash and other value-added by-products from distillery spent wash and sea bittern
- Technology for halogen scavenger grade and pharmaceutical synthetic hydrotalcite
- Technology for recovery of pure salts (sodium and potassium chloride/carbonate/sulphate) from waste generated in textile, dyes and pigment industries
- Multiple micronutrient fortification of salt with iron & iodine (double fortified salt)

Skilled Human Resource Development and Service of Society

- CSIR's Skill India initiatives on algae & seaweed cultivation, soil testing, solar salt harvesting, etc.
- Enrolment in PhD & Post-Doctoral programmes
- Summer trainings, internships and science awareness for school children *(Jigyasa)*

Areas for Financial Support & CSIR-CSMCRI's Technologies for deployment under Corporate Social Responsibility (CSR)

Products & Services

- **Drinking Water:** Design, development, fabrication, testing, installation, commissioning and maintenance of brackish water & seawater desalination RO plants up to 0.1 MLD capacity
- **Salt & Marine Chemicals:** Superior quality salt with negligible impurities through cost-effective technologies in situ for marginal salt farm workers. The developed and patented processes to remove Ca, Mg, sulphate iodide and insoluble from common salt directly in solar salt fields, a boon for chlor-alkali & solar salt manufacturers
- **Fine Chemicals:** Improved catalytic process for 2-phenyl ethanol. This IP protected process provides better energy efficiency and renders a cleaner environment using easily scalable and reusable catalysts
- **Seaweed Cultivation & Women Empowerment:** Training, skilling and empowering coastal populace on the cultivation of commercially important seaweeds and their downstream processing for value added products like bio-stimulant, agar, agarose carrageenan etc. – changing the socio-economic landscape of coastal communities
- **Solar Energy:** Community level efficient solar dryers for fish and rubber
- **Health Care:** Double Fortified Salt (DFS) with iron to counter anaemia and with iodine to counter goitre

Spectrum of Product Profile of CSIR-CSMCRI

Optical Liquid Switch for detection of water

- **Clean Environment:** Projects and services that aim to render clean environment, for example...
  - → Management of solid salts waste of industries like textiles, tanneries, etc. & their valorisation
  - → Spent-wash management for molasses-based distillery sector
  - → Zeolite-A – benign and environmentally clean detergent builder
  - → Valorisation of spent liquors/industrial effluents like that of iso-butyl benzene plants, via recovery of salts
  - → Bacterial Detection Kit: A PVDF membrane based simple bacterial detection kit that can identify bacterial presence in any type of water witnessed through simple color change (pH mediated)
- **Training & Outreach:** Education including vocational courses & skill development

CSIR laboratories can receive CSR contributions/grants, for conducting research in science, technology, engineering and medicine aimed at promoting SDGs & an incubator promoting scientific/technology businesses, in the following categories:

Type-1: Support for the creation of infrastructure

Type 2: Support for the creation of a specialized facility of wider utility

Type 3: Support for technology driven projects

Type 4: Support for projects in futuristic technology areas

Type 5: Support for a Centre of Excellence

Type 6: Support for entrepreneurs or start-up's who are building technology businesses (incubation)

Type 7: Research fellowships linked to specified project objectives

Type 8: Awards linked to specified project outcomes

Type 9: Chair Professorships endowed to AcSIR and physically hosted at CSIR laboratories

Membranes
for
Sepration Technology

Potable Water

Diagnostics Devices

Analytical Services Serving
Industry and Academia

Supramolecular Chemistry &
Small Molecules for Diagnostics

High Purity Salt

Fortified Salt
(Iodide & Iron)
& Herbal Salt

Potash from Sea Bittern
& Spent Wash

Industrial Waste to Wealth

Waste Salt Management
(Tannery & Textile)

Green Chemistry, Soft Material
& Nano-science

Green Chemical Processes &
Solar Energy Utilization

Inorganic Materials & Catalysis

Fine & Speciality Chemicals

Seaweed Cultivation
Technology

Down Stream Processing
of Micro/Macro Algae

Stress Biology
& Agronomy

Societal Activities

Improving Livelihood
& Employment Generation

Human Resource,
Skilling & Training

S&T with
Societal Interface

Scientific
Outreach

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SAKSHAM BHARAT
DIGNITY TO SKILL. EMPLOYABILITY FOR LIFE

MAKE IN INDIA

साफ़ पानी स्वस्थ भारत

स्वच्छ भारत
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