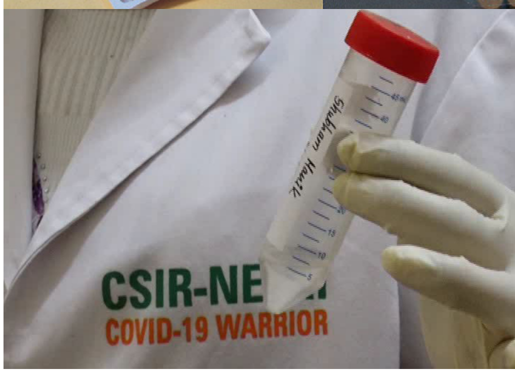
80 YEARS OF IMPACT

Council of Scientific & Industrial Research

India's S&T Partner Since Independence



CSIR India
Fight Against COVID-19

THE Council of Scientific and Industrial Research (CSIR), established on 26 September 1942, completes its 80th year of existence in 2022. Whether it is the first-ever baby food in the world from buffalo milk or the first Indian parallel processing computer, the first complete genome sequencing of an Indian or the first indigenous two-seater trainer aircraft, the first in India to introduce DNA Fingerprinting or the first to establish anywhere in the world the ‘Traditional Knowledge Digital Library’, CSIR has always been at the helm of Indian science.

Established with the primary objective of advancement of scientific knowledge and sustained industrial development of the country, the CSIR today is a well-knit and action-oriented network of 37 laboratories spread throughout the country with activities ranging from molecular biology to mining, medicinal plants to mechanical engineering, mathematical modelling to metrology, chemicals to coal, aerospace to oceanography, genomics to drug design and so on.

Not only have CSIR scientists given to India new and cost-effective drugs for diseases like malaria, tuberculosis, asthma and HIV, and come up with ingenious low-cost water filters and high oil-yielding varieties of crops to boost farmers’ incomes, CSIR has also contributed to developing a strong scientific base for the country by creating a pool of trained S&T manpower through fellowships and support to research.

Most recently, during the most difficult and critical time when the COVID-19 pandemic hit India last year, CSIR laboratories sequenced the genome of the deadly virus and also developed a novel COVID-19 diagnostic kit. In fact, CSIR laboratories churned out nearly one hundred COVID-19 technologies in a short span of six months and transferred over 60 technologies to many industries.

Beginning this issue, we are introducing a new series “CSIR – 80 Years of Impact”, bringing to our readers stories of CSIR’s contribution to the country’s progress at every juncture of its momentous journey. These stories have been adapted from the CSIR Blog (https://www.csir.res.in/csirblog-success-stories).

Traditional Knowledge Digital Library

Documenting & Preserving India's Traditional Knowledge

INDIA'S valuable S&T heritage spans diverse domains such as medicine, food, cosmetics, agriculture, mathematics, astronomy, architecture, astrology, chemical and physical sciences, among many more. Traditional knowledge, an important S&T heritage, has been passed on from generation to generation for over thousands of years. This ancient heritage is global knowledge that belongs to humanity and no single individual or entity can claim ownership and prevent others from using this traditional knowledge. While some of this traditional knowledge is known, integral and common in Indian homes, others are waiting to be read, validated and utilised.

In the mid-1990s, patents were granted on turmeric's wound healing properties, basmati rice lines and grains, and the fungicidal activity of neem, among others. The properties and uses of turmeric and neem are common knowledge in India and so patents being granted on India's traditional knowledge was unbelievable. These 'inventions' were by no way either novel or inventive. By way of intellectual property rights granted to applicants from other countries, India stood to lose its rights on its own traditional knowledge and practices.

So, why and how did this happen? How was India to act on these misappropriations of its traditional knowledge? What were the gaps and how was India proposing to block this?

The answers lay in how a patent, an intellectual property right, is managed. For patents to be granted, an invention should meet the criteria of novelty, inventive step and industrial applicability/utility. Patent applications are examined for these aspects from literature – patent and non-patent – already known in the public domain. Based on the prior-art information, the novelty and inventive steps are established. Intellectual property rights by way of patents are granted when prior-art does not exist, and this confers legal title to the grantee and the exclusive right to make use of the said invention for specific application in the granted region for a specific time period.

So, why did Indian traditional knowledge, which is common knowledge in India, not come up as prior-art when the patent applications on turmeric, neem and basmati rice were being entertained? Indian traditional knowledge including that in classical texts is not part of the prior-art literature that is referenced by patent examiners when assessing patent applications for the grant. The additional complexity was that the Indian traditional knowledge is often in Indian languages which are not understandable and accessible to these examiners from patent offices worldwide.

When faced with grave situations, we often think the unthinkable and roll out solutions that effectively alleviate the challenges. The Visionaries, Dr Raghunath A. Mashelkar, the then DG, CSIR and Mrs. Shailaja Chandra, the then Secretary, Ministry of Health and Family Welfare, Government of India took up the challenge to spearhead efforts to tackle the challenges of misappropriation of Indian traditional knowledge. And thus was born the Traditional Knowledge Digital Library (TKDL). TKDL took birth to address a grave situation — the misappropriation of Indian traditional knowledge.

An inter-disciplinary inter-ministerial task force was constituted under the Chairmanship of CSIR and with experts from the Department of ISM&H (now Ministry of AYUSH), Department of Industrial Policy &

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Biodiversity: CSIR's TKDL prevents granting of wrong patents in 219 cases

https://www.biovoicenews.com/biodiversity-csirs-tkdl-prevents-granting-of-wrong-patents-in-219-cases/

By : BioVoice News Desk - April 11, 2017

New Delhi: As per the information received from Council for Scientific & Industrial Research (CSIR), till date Traditional Knowledge Digital Library (TKDL) has been successful in preventing the grant of wrong patents in 219 cases. For further facilitating the prevention of grant of wrong patents at International Patent Offices (IPOs), International Access Agreements on TKDL have been concluded with United States Patent & Trademark Office, European Patent Office, Canada Patent Office, Germany Patent Office, Japan Patent Office, United Kingdom Patent Office, Australia Patent Office, Malaysia Patent Office, Chile Patent Office and Indian Patent Office.

The Ministry of AYUSH had established TKDL in collaboration with CSIR. The TKDL consist of more than 3.30 lakh medicinal formulations of Ayurveda, Unani, Siddha and Yoga which are available in the public domain, in five international languages namely English, Japanese, French, German and

Promotion (DIPP, now Department for Promotion of Industry and Internal Trade), Central Council of Research in Ayurveda & Siddha (CCRAS), Banaras Hindu University (BHU), National Informatics Centre (NIC), Controller General of Patents Design & Trade Marks (CGPDTM), among others.

The task force recommended that the Indian traditional knowledge be transcribed in languages understandable to the patent examiners, and in a digital form that is accessible to patent offices across the world. The World Intellectual Property Organization (WIPO), the European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO) played an important facilitative role.

The Traditional Knowledge Digital Library, the first of its kind globally – an unprecedented intervention – was thus jointly established by the Council of Scientific and Industrial Research (CSIR) and the Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddha, Sowa Rigpa and Homoeopathy (AYUSH) in 2001.

The TKDL was set up as a prior-art database of Indian traditional knowledge, which can be referenced by patent examiners while assessing the patentability of inventions claimed in patent applications. The TKDL provides information about Indian traditional knowledge transcribed in five languages, namely, English, Japanese, French, German and Spanish, with the help of information technology tools and an innovative classification system – Traditional Knowledge Resource Classification (TKRC), yet again a first of its kind.

The TKDL was envisioned to help overcome the language and format barriers by linking the western world to India's traditional knowledge. The TKDL provides the required legitimacy to the Indian traditional knowledge and confers protection to India's traditional knowledge systems from those claiming intellectual property rights.

Today, the TKDL contains information of about four lakh formulations transcribed from the classical texts of the Indian systems of medicine, namely, Ayurveda, Siddha, Unani and Sowa Rigpa, and also yogasanas. As per the extant approvals of the Government of India, the database access through specific non-disclosure access agreements is provided to thirteen patent offices globally that include European Patent Office, United States Patent & Trademark Office, Japan Patent Office, United Kingdom Patent Office, Canadian Intellectual Property Office, German Patent Office, Intellectual Property Australia, Indian Patent Office, Chile Patent Office, Malaysian Patent Office, Peru Patent Office, Russian Patent Office, and Spanish Patent and Trademark Office.

The CSIR-TKDL Unit by pro-active monitoring of patent applications also files third party observations and pre-grant oppositions on those applications with relevance to Indian traditional knowledge. So far, outcomes in the form of patent revokement, amendment or withdrawal have been achieved in 239 such applications.

Moving forward, CSIR aspires to create a valuable repository of Indian traditional knowledge systems through the TKDL. The TKDL continues to draw synergy from the complementarity of similar efforts by other organisations in the field such as the National Biodiversity Authority, Honey Bee Network, Asian Agri History Foundation, Centre for Indian Knowledge Systems (CIKS), Centre for Development of Advanced Computing and others.

The value proposition is also to position Indian traditional knowledge systems as a source of R&D and innovation. CSIR strongly believes that the inclusion of our Indian traditional knowledge systems as one of the driving forces will facilitate the required strategic transformations and lead us on the path of creating a New India, and for it to be a global S&T leader.

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Adapted from the CSIR Blog (https://www.csir.res.in/csirblog-success-stories)

Renewing and Restoring Sewage using RENEU

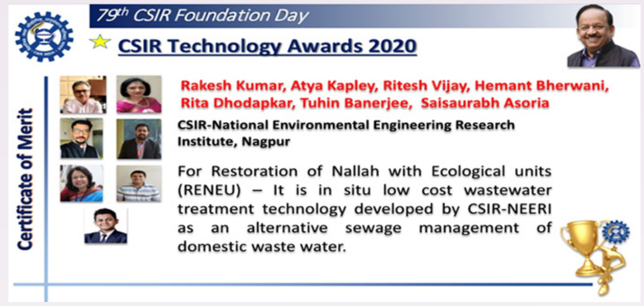
Nallahs, the blackish and smelly drains, frothing and slithering through human settlements have an unwelcome but inevitable presence. Wide or narrow, shallow or deep, *nallahs* are man-made necessities that channelise domestic or industrial wastewater. And because it is a drain, more waste is dumped into it along the way making it even further polluted.

Aesthetic spoiler and the stink aside, drains can be hazardous breeding grounds for mosquitoes, and they can also be toxic — the contaminants in the drain-water leech into the soil. Many drains find their way into freshwater bodies like lakes and rivers, thus polluting them too. There are sewage management systems, but these do not address even 30% of the domestic wastewater generated in our country.

In 2014, the Government of India launched the *Swacch Bharat Abhiyan*. There have been many initiatives under this especially important clean-India mission. One of them was to look at scientific solutions to manage the sewage. A cost-effective, ecologically sustainable, long-lasting, easy to use, maintenance-free and efficient technology that meets pollution control norms on water quality was needed. Restoring polluting *nallahs* into clean water channels was not the most straightforward task.

The Council of Scientific and Industrial Research's National Environmental Engineering Research Institute (CSIR-NEERI) took up the challenge and designed and developed RENEU (Restoration of Nallah with Ecological Units) — a combination of engineering and biological tools to renew the *nallahs*.

To prevent the percolation of the wastewater into the soil, along the way, a water-proof base using brick and mortar is constructed for the sewage to flow. Provisions are made for placing RENEU's ecological units in different segments of the sewage canal. The first is a physical segment that has simple but important filtration gates. The gates act as sieves to filter the floating matter. From the filtration zone, the sewage water enters the sedimentation zone. In the sedimentation zone, the grit and other suspended solids settle down. The effluent which is now devoid of solid matter moves from the physical segment to the biological segment.



The biological segment begins with the anoxic zone — a zone in the *nallah* with low oxygen. Here heterotrophic bacteria — the microbes that feast on organic matter — munch away the nitrogenous, phosphorous, and carbonaceous content in the water. Clearly, the aim is to have cleaner water at the other end. But we are not there yet.

There are still other organic chemicals in the sewage which pass through bio-curtains and bio-mats where different microbes degrade more organic content present in the sewage. The more adamant organic and inorganic content that continue to remain in the sewage are broken down in the florafts treatment units. At this zone, the *nallah* begins to look beautiful with floating plants, with the plants breakdown more organic and inorganic chemicals underneath.

The effluent is now in its final leg in the chemical segment. Here the water is treated with chemicals to kill any disease-causing microbes. Though still not potable, the water is fit for irrigation, horticulture or can be safely discharged into water bodies. The originally blackish and smelly sewage, after its passage through the different RENEU stations, is odour-free and sparkling.

RENEU was successfully implemented at Jhunsi in Prayagraj, in readiness for the Kumbh Mela of 2019, as part of the National Mission to keep the Ganges clean for pilgrims during the holy festival.

A *nallah* renewed with RENEU

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Adapted from the CSIR Blog (https://www.csir.res.in/csirblog-success-stories)