

**24<sup>TH</sup>&25<sup>TH</sup>NATIONAL CHILDREN'S SCIENCE CONGRESS  
2016 & 2017**



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**INFORMATION BROCHURE  
Focal Theme**

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## **Focal Theme: Science, Technology&Innovation for Sustainable Development About National Children's Science Congress**

**National Children's Science Congress (NCSC)** is a unique, massive and prestigious flagship programme of the Government of India, catalyzed and supported by the National Council for Science & Technology Communication (NCSTC), Department of Science and Technology, Government of India to reach out to the nook and corner of India to search for the best science talents with an aim to inculcate a scientific temper and initiate a culture of rational scientific exploration among children to seek scientific solutions for common local problems. There is no such a programme anywhere in the world with such a wide outreach and concentrated effort with a sustained continuation of more than two decades.

It is organized nationally every year from December 27-31. It is a forum for children of 10-17 years age, both from formal school system as well as from out of school. Children from across the country take effort to exhibit their creativity and innovativeness and more particularly their ability to solve a societal problem experienced locally through mini research projects using simple methods of science. The children present their studies from school to district, to state and then at national level.

All over the country about a million children take part in this unique event every year, from which about 650 projects come to national level. At the national level, all the children with a wide variety of cultures, language background from both rural and urban areas present their projects and are appreciated for their inquisitiveness and scientific approach and application of method of science. From this, about 20 outstanding projects are selected, which then get a chance to take part in the mega science fair of India, Initiative for Research and Innovation in Science (IRIS). Also, all the group members of these outstanding projects get the opportunity to work under fellowship programme, with the scientists of institute of international repute like IIT, IISER, etc. They are also awarded a small amount of one-time cash prize. In addition, two best projects from every state - one from junior group and the other from senior group- take part in Indian Science Congress every year

This program was initiated in 1993, with the following objectives-

- To provide a forum to the young scientists to pursue their natural curiosity and to quench their thirst for creativity by experimenting on open-ended problems;
- To make one feel that science is all around and him/her, can gain knowledge as well as solve many problems also be relating the learning process to the physical and social environment of the neighbourhood;
- To encourage children throughout the country to visualize the future of the nation and help building generations of sensitive, responsible citizens;
- To stimulate scientific temperament and learning the scientific methodology for observation, collection of data, experiment analysis arriving at conclusions and presenting the findings.

## **Introduction to the Focal Theme**

In usual parlance, development stands for the situation where everyone gets food, shelter, clothing along with sound state of health and mind, gets opportunities for livelihood, having adequate energy to use, has good education, transportation and communication in a better environmental situation where cleaner air, water and soil exists.

In the Report of the World Commission on Environment and Development: Our Common Future, in March, 20, 1987 at Oslo, Gro Harlem Brundtland defined Sustainable Development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs, which not only raises the question of fulfilling the need for present, but also to cater to the need for the future. So, it pleads for rational and wiser uses of our natural resources, redesigning our different economic operations like production, transport and communication systems through optimum use of available resources and reducing its wastage. At the same time, it also demands for equal opportunities for everyone at both present and future focusing economic sustenance. In fact, the entire principle of sustainable development depends not only on environmental, economic and social balances, but also on their inter-linkages. In this context exploration and inquiry using approaches of Science and Technology can help one to understand the dynamics of our planet and different components of its environment, ecosystems and resources those will help for their optimum use without any degradation. Rather, this makes one able to achieve economic sustenance and cater intra and inter generational equality and equity in society. Besides, in every aspect of the exploration and inquiry, innovative thinking and approaches help one to find out solution(s) to address different problems and/or harnessing hidden opportunities. In this perspective “Science, Technology and Innovation (STI) for Sustainable Development” has been decided as the focal theme for 24<sup>th</sup> and 25<sup>th</sup> National Children’s Science Congress, with an expectation that the Child Scientist will be introduced to inquiry based learning approaches in project mode exploring something from “known to unknown or ‘from unknown to known’. They will thereby come up with different new knowledge and knowledge-based probable solution(s) of some identified local-specific problem.

For convenience, the focal theme has been sub-divided into the following seven sub-themes.

1. Natural Resource Management
2. Food and Agriculture
3. Energy
4. Health, Hygiene & Nutrition.
5. Lifestyles and Livelihoods
6. Disaster Management
7. Traditional Knowledge Systems.

## **Sub Theme 1: STI for Natural Resource Management**

Natural resources represent all the material present in nature most of which are used since the dawn of the human civilization. These resources are extracted from terrestrial and aquatic systems. can be biotic and abiotic. The abiotic components are rocks, mineral and soil and biotic components which includes the flora and fauna. Geo-environmental, socio-cultural and economic conditions play an important role in their availability, stock, use or misuse. Today our demands for development put pressures on natural resources beyond the nature's capacity to restore and replenish. Development is required and needed for our economic and social wellbeing, and hence extraction of resources is inevitable. However, we must aim for a planned development and sustainable use of our resources so that we have enough of these for generations to come.

It is to be noted that with the increase of world's population, the human pressure on natural resources increases. For example, in our country we had a population density of 77 person $\text{km}^{-2}$  in 1901, which went up to 117 in 1951, 216 in 1981 and 382 in 2011. Similarly arable land (hectares per person) in India has declined from 0.3 hectares in 2009 to 0.13 ha in 2011. We had a forest cover of 70% in 1947 which has reduced to 21.23% in 2013. Growth of population increases the demand and consumption, which ultimately exerts impact on non-renewable and renewable resources, causing various environmental, economic, social and political crises. Therefore, the scaffold of sustainable development demands environmentally, economically and socially rational practices which will cater to environmental, economic and social sustainability through principles of Reduce, Reuse and Recycle; where sustainability represents sufficiency, safety, security, self-reliance in present as well as future context. To achieve this goal there is a need for innovative S&T interventions to frame suitable management practices, covering initiatives related to planning, futuristic decision making processes, quick response mechanisms, crisis management, inventory management for alternative solutions, monitoring and impact assessment, corrective measures, etc.

The sub-theme will cover studies on different aspects of natural resource extraction, processing, value addition, or any other activity that leads to optimization of natural resource uses for various purposes. It shall also cover activities related to identification of new natural resources or new/ better uses of already available natural resources for betterment of environment and human welfare. In addition to this, one can go for review /impact assessment of existing technologies for natural resources and suggest strategies to address the negative impacts through appropriate correction in technology or developing alternative technologies. The work related to natural resource mapping and management planning, like watershed/micro-watershed planning, land use and land cover mapping, land use planning, Water, sand and soil quality analysis and mapping, water quality management and, tools and techniques for water treatment or water harvesting and management, mapping of biodiversity of village, ward, school, sacred groves, village forests, gardens, population studies of a species and developing conservation and

management planning with help from experts and authorities are some of the suggested activities. It is expected that projects are carried out with a focus beyond documentation and **making inventory**, and lay more stress on quantification and analysis to review the present status, significance, present and potential threats and trends, and identify innovations for in sustainability.

### **Sub Theme 2: Food and Agriculture**

Food is the source of energy for all living organisms on the earth. Sustainability of food, its production and conservation mechanisms are very important while considering development of any country. Prevailing eco-systems help in developing the food chain and food-web as well, which is getting disrupted due to population explosion, together with urbanization and rapid industrialization. In fact, food and agriculture goes hand to hand. Agriculture in India is the major and prime food producing sector, which has a substantial contribution to the gross domestic product (GDP) of the country. Despite technological development in India in the last few decades, agriculture still is impacted because of the vagaries of monsoons and climate change.

As far as human being is concerned, sources of our food are from plants and animals. In true sense, agriculture comprises of crop and animal husbandry, pisciculture, silvi-culture, and many more. Success of all these practices primarily depends upon agro-ecological situations including quality of land, soil, water, seed, climatic variables and management practices. All these factors determine the crop production per unit area per year. However, demand for food has increased manifold in last couple of decades, which has led to development and invention of not only different agro-technologies for production, like fertilizer, pesticides, hybrid seeds, irrigation technologies to name a few, but also of different technologies for post harvest processing and preservation. Despite all such technological inventions, production per unit of cultivated area failed to provide quality food for all. Conversely, some of these technologies led to degradation of environment, land, soil, surface and sub-surface (ground) water that led to health and environmental hazards. Such overall degradation coupled with deforestation and urbanization, occasional occurrence of drought and flood together with shifting of monsoon, increase of ambient temperature due to climate change etc. have drastically impeded the production system of both terrestrial and aquatic crops. As a consequence, not only the per capita availability of food has substantially decreased, but also has resulted nutritional deficiency and related diseases to such an extent that threatens sustainable development. Hence, it is essential to become rational in exploiting the natural resources so that the food-webs do not get disturbed at the cost of destroying the resources for our future generations.

In this backdrop, under this subtheme, children can take up small research projects on quality, production, storage, shelf life, availability, distribution of food for all living beings. In addition to these, projects can also be undertaken on soil quality, production practices, crop performance and yield, soil and water conservation, novel use of agricultural wastes as well as health and environmental hazards related to food and agriculture and also on

tools and machineries used with the main focus on application of innovative, S&T based approached aimed as sustainable modes of production systems.

### **Sub Theme 3: Energy**

Economic development of any region or a country largely depends on how its energy requirements are satisfied. Every production process has certain amount of energy requirement. Hence, availability of quality energy is crucial for overall scientific and technological progress. Per capita energy consumption is one of the key deciding factors of the level of well-being of any society or country as per modern norms.

Energy is central to sustainability and affects all aspects of development - social, economic, and environmental - including livelihoods, access to water, agricultural productivity, health, population levels, education and gender-related issues. Energy is mainly used in domestic, agriculture, industry, transport and communication sectors and they are interlinked.

Efficiency of the technology in use and its purpose to produce services are important which determine the situation of energy sufficiency. In this perspective, to achieve energy sufficiency and efficiency each one is interlinked through proper value setting, management principles and technological efficiency with policy measures. Technologies that promote sustainable energy include renewable energy sources, such as hydroelectricity, solar energy, wind energy, wave power, geothermal energy, tidal power etc., and also technologies designed to improve energy efficiency. Energy efficiency and renewable energy are said to be the twin pillars of sustainable energy.

Energy sufficiency – energy for all - complements two well established fields of energy research: works on energy efficiency which focus on the optimization of input-output relations by creating more effective appliances, whereas research on energy consistence concentrates on renewable resources. Both concepts however would fail, as soon as the number and quality of appliances increase. Therefore, strategies of sustainability require research on sufficiency, which – aiming at the absolute reduction of energy use – questions everyday consumption routines

Taking consideration of our required initiatives in this era of global climate change challenges, efficient energy use and replacement of carbon based fuel with non-carbon based fuel are the key areas by which we can reduce our carbon footprint to a large extent and undertake some pragmatic measures for mitigation of and adaptation to climate change. The energy connects of Sustainable development can be dealt at five levels: Production, Processing, Transmission, Consumption and Disposal. Growth of different sectors like agriculture, industry etc is highly dependent on energy consumption. Many non-futuristic and unsustainable approaches of energy generation lead to the problems of global warming, developmental inequality, conflicts, and health and ecosystem damage.

If the development process has to be sustainable, it is necessary to increase the efficiency of

energy utilities and processes, conserve energy and explore renewable sources of energy. From such perspectives, efficient and equitable energy access and supply systems can create an ideal situation for energy sufficiency and provide energy security to all. Energy is the driver of growth. But sustainable growth implies that our energy management and energy conservation measures are eco-friendly and accompanied by minimum pollution and other negative impacts, in particular minimum carbon emission.

In this Sub Theme, children can think about various projects like testing the efficiency of production, distribution or consumption of energy in various locations, institutions, existing devices and so on. Sustained availability of energy resources can be evaluated and futuristic predictions can be attempted through thematic or mathematic modeling. Assessment of pollution and other environmental effects can be done with a view towards sustainability.

#### **Sub Theme 4: Health, Hygiene & Nutrition**

The “strong synergies between health and nutrition” (World Bank 2013) are well-documented; good health is not possible without good nutrition. Malnutrition remains one of the main determinants of the global burden of disease, with 45% of child mortality attributable to under-nutrition. Today, more than 1 billion people are chronically undernourished and food insecure. Undernourishment compromises immune systems, which leads to a higher incidence of illness and disease that in turn contribute to lower productivity and life expectancies.

Poor nutrition undermines economic growth. According to UNICEF<sup>1</sup>, 195 million children younger than 5, are chronically malnourished. Chronic under-nourishment in children creates a vicious cycle of compromised physical and cognitive development that reduces their economic productivity when they become adults, mirroring people in poverty that, in turn, leads to chronic undernourishment and poor health in the next generation.

A massive disease burden is associated with deficient hygiene, sanitation, and water supply and is largely preventable with proven, cost-effective interventions. The total benefits of these interventions are greater than the health benefits alone and can be valued at more than the costs of the interventions.

Hygiene, sanitation, and water supply are development priorities, yet the ambition of international policy on drinking water and sanitation is inadequate. Hygiene, sanitation, and water supply continue to have health implications in the developed world. The active involvement of health professionals in hygiene, sanitation, and water supply is crucial to accelerating and consolidating progress for health.

Health being at the core of this sub-theme, impact of nutrition (malnutrition, deficiency of vital elements, balanced diet), hygiene (at personal **and** community levels, as well as at

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<sup>1</sup>(UNICEF, *Tracking Progress on Child and Maternal Nutrition*, 2009)

home, school or workplace), and sanitation (cleanliness in and around us, cleanliness of water) on the health of an individual or community at large could be the focal area for a project.

### **Sub Theme 5: Lifestyles and Livelihoods**

In the last few decades, several man-made unsustainable activities and interventions have accelerated the problems related to shelter, environment, food, health, society, culture and working pattern. These problem-areas are also associated, linked and guided mainly with lifestyles and livelihoods. Appropriate lifestyles and livelihoods can help us to move towards a more healthy, livable and sustainable environment at the household, community and society level. Hence the sub theme of lifestyle and livelihood assumes significance.

The idea of this sub theme is to promote the concept of conscious and cautious involvement of science, technology and innovation to evolve sustainable lifestyles & livelihoods. The sub theme looks at several concepts related to the effect of occupational, cultural and environmental changes and their relations with lifestyles and livelihoods. This subtheme shall in addition to its focus on the negative impacts also look at the positive impacts on lifestyle and livelihood and identify these as opportunities for a sustainable future.

Lifestyles refer to the way we live our lives, what we do, with whom, where, how and what we used to do earlier. Lifestyles define our identity. We express our social position, political preferences and psychological aspirations to others through our lifestyles.

Livelihood comprises of the capabilities, assets and activities required for a means of living. Livelihood is defined as a means of supporting one's existence, especially financially or vocationally.

Lifestyles and livelihood are mainly driven by certain crucial factors such as Desires, Needs, Influencers and Motivators. These factors link and define an individual's patterns of living, consumption, migration, travel, health and work. The changes in the patterns of livelihood and lifestyle further define the perceptions or actions of humans towards skills, sensitivity, habits, behavior, economy and culture.

Lifestyle and livelihood is about life and living at individual, group, community and society levels in the context of one's cultural and environmental norms and sensitivity. It covers all our choices and actions - whether at home or at work - on energy use, transport, food, waste, communication and occupation.

The subtheme on lifestyles and livelihood will cover the following aspects:

1. *Waste*: It refers to sensitivity and action related to waste generation, handling, disposal and its management at the household, community, society and occupational



level. Lifestyles and livelihood are considered to be main source of waste, being impediment of sustainable livelihood.

2. *Food*: Accessing, consuming and disposing food for the living beings for subsistence as well as luxury constitute the core aspect of human existence. It related to all aspects of organic and inorganic food products including growing, preparing, storing, handling, consuming, disposing, and its management.
3. *Habits related to Lifestyle & Livelihood*: Habits relates to inherited as well as acquired expression and action of individuals arising out of his or her awareness, sensitivity, attitude, perspective and ability concerning life, livelihood and living.
4. *Lifestyle and livelihood impacting culture and community*
5. *Lifestyle & Livelihood diseases*
6. *Carbon footprints and impacts of handprints*
7. *Sensitivity towards Environment concerning lifestyle and livelihood*
8. *Occupations, economy and Environment*

*Science, technology and Innovation for Sustainable Lifestyles and Livelihoods* could be a product, process, system, ideas which a child can identify or suggest related to sustainability to lifestyle and livelihood and its impacts on Society, Environment and Economics.

Lifestyle and livelihood being a subject linked with everyone's life, the children could work in the direction of studying, mapping, comparing and analyzing, changes in the patterns of lifestyles and livelihood by the changes in environment and socio-economic factors.

Children could take up projects like studying lifestyle related waste generation, its handling and management, mapping of changes in community lifestyle and livelihood of a village in comparison to an urban area, study on food and energy consumption pattern in different areas, measuring carbon footprint in your own area and its comparison with the impact of handprint, analytical study on the positive and negative effect of communication technologies and social media on community and culture, mapping of case studies of sustainable livelihood systems, study and analysis on occupational mobility and migration etc.. Several similar projects can be taken up by the students in relation to lifestyle and livelihood.

### **Sub Theme 6: Disaster Management**

Since past two decades the losses due to disasters are increasing in terms of life and property across the globe<sup>2</sup>. Besides the disasters *per se*, there are some other factors which have been adding to the magnanimity, gravity and severity of disasters like increasing population, unplanned urbanization and rapid degradation of environment which is being reflected in terms of climate change , global warming and depletion in ozone layers etc. In

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<sup>2</sup>[EM-DAT International Disaster Database, Center for Research on Epidemiology of Disasters, University of Louvain.](#)

fact there is a clear link between degraded environment and disaster<sup>3</sup> as it always produced adverse environmental consequences which many times further aggravate the detrimental impact of disasters. Unfortunately the global efforts in managing the disasters are not always matched with the frequency and the magnitude of disasters because of response approach to disaster mitigation.

India, by its geography and its climatic condition along with its high degree of socio-economic vulnerability is one of the most disaster prone countries in the world. In last few years Indian subcontinent witnessed extreme weather phenomena in the form of unprecedented cold and heat waves, floods, droughts etc. which then lead to secondary problems related disease epidemics, crop failures and associated stress to farmers, and thus to the economy as a whole. The vulnerability of Indian subcontinent could be well understood in terms of the number of deaths and loss of property including livestock by earthquake, super cyclones and Tsunami in the recent past.

The Disaster Management Act of India, 2005 has defined the disaster as “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area”. Disasters are classified differently using different criteria. on the basis of their origin as natural or manmade or on the basis of severity as major or minor disasters.

Whatever may be the origin or cause, it always impacts a group of people or people of a region beside de-accelerating the overall developmental process. Fortunately over the past 15 years, there has been a paradigm shift in managing the disaster at the global level which pleads a productive and preventive approach and integrate disaster management with ongoing development activities i.e. sustainable development.

In the backdrop of the above, the sub-theme Disaster Management has been given a prominent place under the main theme. Under this subtheme the groups of child scientists are expected to undertake small research studies about their immediate and nearby surroundings for finding potential disaster prone sites, vulnerable groups, person with special needs and the mapping of existing resources for developing action oriented plan to manage and mitigate the consequences of disasters. As part of the project, child scientists can make use of existing knowledge of Science and Technology and use innovative approach/strategies and new management methodologies in devising and implementing action oriented strategies/plan/processes within the overall paradigm of sustainable development.

## **Sub Theme 7: Traditional Knowledge Systems (TKS)**

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<sup>3</sup>Abramovitz, J. 2001 Unnatural disasters. *Worldwatch Paper 158*.

Traditional knowledge refers to the knowledge, innovations and practices of indigenous and local communities around the world<sup>4</sup>. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds.

Sometimes it is referred to as an oral tradition because, it is practiced, sung, danced, painted, carved, chanted and performed down through millennia. Traditional knowledge is mainly of a practical nature which have real life applications developed over time, particularly in such fields as agriculture, fisheries, health, horticulture, forestry and environmental management in general.

Traditional knowledge is valuable not only to those who depend on it in their daily lives, but to modern industry and agriculture as well including plant-based medicines, health products and cosmetics etc. Other valuable products include agricultural and non-wood forest products as well as handicraft. Traditional knowledge can make a significant contribution to sustainable development. Most indigenous and local communities are situated in areas where the vast majority of the world's genetic resources are found. Many of them have cultivated and used biological diversity in a sustainable way for thousands of years. Some of their practices have been proven to enhance and promote biodiversity at the local level and aid in maintaining healthy ecosystems. However, the contribution of indigenous and local communities to the conservation and sustainable use of biological diversity goes far beyond their role as natural resource managers. Their skills and techniques provide valuable information to the global community and a useful model for biodiversity policies. Furthermore, as on-site communities with extensive knowledge of local environments, indigenous and local communities are most directly involved with conservation and sustainable use.

Traditional knowledge issues cross-cut across many domains in relation to global environmental issues, from biodiversity conservation and natural resource management, to use of genetic resources and to climate change observations, mitigation and adaptation. Work on indigenous knowledge provides support to understanding the role of customary livelihoods within sustainable development and the links between environmental management, science and well-being.

In relation to the sub theme, one can go for documentation of traditional knowledge on natural resource management, tools and techniques used for production and processing, construction, use of natural resources, etc. Along with the documentation, there is a need for validation of the collected information, through appropriate assessment methods to

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<sup>4</sup>Secretariat of the Convention on Biological Diversity (CBD Secretariat) 2013

identify the scientific basis of the practices. One can also look into the aspect of improvisation of such practices as per contemporary requirements and also go for developing appropriate technology or management practices based on traditional practices.

Appropriate acknowledgement of the intellectual rights of the practitioners and linking them with appropriate authority and processes to achieve their intellectual property rights can be a major component of follow up in such kind of projects, like biodiversity related practices can be documented in Peoples' Biodiversity Registers developed by Block level Biodiversity management Committees , District Biodiversity Committees or State Biodiversity Board as per the guidance of National Biodiversity Act unique to geographical location. Specific traditional agricultural or handloom and handicraft products can be linked to GI (Geographical Indicator) registration through state level patent information centre.