

22nd NATIONAL CHILDREN'S SCIENCE CONGRESS 2014  
MANIPUR

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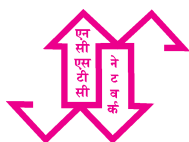
# Activity Guide

UNDERSTANDING WEATHER AND CLIMATE



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**Science Teachers' Forum, Manipur**  
Manipur Public Library Building, B.T. Road, Imphal - 795 001

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# Activity Guide

*Focal Theme*  
**Understanding Weather and Climate**



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## **National Children' Science Congress - 2014**

National Children's Science Congress (NCSC) provides the children of 10 to 17 years, from all over the country, a unique opportunity to discover and recognise their scientific temperament and use their knowledge to make their own ideas come true.

NCSC is held annually from December 27 to 31. After a thorough scrutiny at district and state levels, about 650 children take part in 5 day long deliberations and science activities.

This event of NCSC is not restricted to the school-going children only but is also open to the drop-outs and the non-school going children from the marginalised sections of the society, who can be involved as team members.

### **The major objectives of NCSC are :**

- To provide a forum to the children to pursue their natural curiosity and to quench their thirst for creativity.
- To effect a change in the way science is taught and learnt at schools, by relating the learning process to the physical and social environments around.
- To encourage children throughout the country to visualise future of the nation and help in building a generation of sensitive and responsible citizens.
- To stimulate scientific temperament and learn the scientific methodology for observation, collection of data, experiment, analysis and then arriving at a conclusion.

### **Features of the Congress : The projects are to**

- Be innovative, simple and practical;
- Represent teamwork.
- Be based on exploration of everyday life-situations;
- Involve field based data collection;
- Have field outputs and arrive through scientific methodology;
- Be related directly to community work in the local community;
- Have definite follow-up plans.

### **Who is eligible to participate :**

This is a forum open to young scientists in the age of 10-14 (lower age group) and 14-17 years (upper age group) as on December 31 of the calendar year.

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### **Areas of Research :**

Every year, a focal theme is announced for the CSC. The children are expected to carry out projects related to the focal theme and the identified sub-themes. Activity books are available to help (with the help of scientists), school teachers, co-ordinators, activists of science based voluntary organisations etc. The teacher/guide is facilitated with special orientation on the theme of the CSC every year.

### **Guidelines for Teachers and participants :**

CSC projects are related to learning by problems solving method. The project should fall within the theme and sub-themes defined for the year. Children may not succeed in finding solution to the problem in the specific period but the methodology adopted to find the solution should be scientific. They should design experiments/methods to validate the data collected or obtained.

### **What are Good Projects :**

Projects rated very good have the following elements.

- ✧ Proper understanding and definition of the problem undertaken.
- ✧ Quality and quantity of work, including team work, learning process, subject understanding and efforts to validate the data collected.
- ✧ Relevance of the proposal to the community/school problem and impact of project on schoolmates and neighbourhood community.
- ✧ Originality, innovation and creativity to understand the problem and find the solution i.e. in methodology and experiment designs.

### **Theme :**

Theme for the NCSC 2014 and 2015 is “**Understanding Weather and Climate**” with the following sub-themes.

### **Sub-Themes :**

*I: Weather around You*

*II: Impact of Human Activities on Weather and Climate*

*III: Weather, Climate and Ecosystems*

*IV: Weather, Climate - Society and Culture*

*V: Weather, Climate and Agriculture*

*VI: Weather, Climate and Health*

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## About Children's Science Congress (CSC)

### CSC – the beginning

The seeds of the programme of children's science congress (CSC), in the way of an exercise to carry out small research activities at micro-level were planted in Madhya Pradesh by an NGO called Gwalior Science Center. It was later adopted by National Council for Science and Technology Communication (NCSTC), Department of Science and Technology (DST), Government of India for carrying out national level activities through NCSTC-Network (a network of Non-Government and Government organizations working in the field of science popularization) as national organiser. It was a time when many of the country's crusaders of science communication were experienced with massive science communication exercise of *Bharat Jana Bigyan Jatha* and *Bharat Jana Gyan Bigyan Jatha*. It was felt that the large scale activities for developing scientific awareness among the masses are to be continued as regular activity, so, this programme was launched nationwide in 1993, under the nomenclature of National Children's Science Congress (NCSC), with an expectation that it would generate scientific temperament among the teachers and students, and spread among various stakeholders of the society. The programme of NCSC has been fruitfully conducted for the last 21 years.

### CSC – an overview

Children's Science Congress is targeted to spread the concept of the method of science among the children through their project activities adopting the principle of '**Learning through doing**'. The mandate of participation is that, the children will carry out a project on a particular topic in relation to theme and sub-theme decided for the year. The study is to be carried out in the neighbourhood of the children where they live in. For this, the students form a group with their like-minded friends/classmates and the study is carried out under the supervision of a guide. It is not mandatory that a guide must be a school teacher; any person with fair knowledge of dealing with children and method of science, is considered eligible to guide the children.

The exercises of project activities, as a thumb rule, encourage the children to *explore, think, serve and wonder*. It is capable to imbibe the following temperament/quality/skill of the children:

- *Observation,*
- *Making measurement,*



- *Making comparison and contrasts,*
- *Classification,*
- *Estimation,*
- *Prediction,*
- *Interpretation,*
- *Critical thinking,*
- *Creative thinking,*
- *Drawing conclusion and*
- *Cooperative skill*

Therefore it is ideally expected that any group of children will undertake a project work with a perspective of continuous effort of questioning and experimentation.

Observation and questioning. (What ? Where ? When ? Why ? How ? Whom ?)

Do back-ground work like reading relevant literature and discussing with person having expertise on the issues of concern

Construct hypothesis (assumption)

Carry out survey and experimentation

Analyze results and draw conclusion

Hypothesis is true

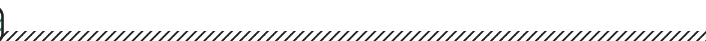
Hypothesis is false or partially true

Report results

Communicate with large masses in the neighbourhood and take some action initiatives

### **Take new initiatives**

The study may be through survey or experimentation or survey followed by experimentation. In the case of survey-based work, identification of respondent, their unit of observation, sample coverage, design of survey in relation to designing of interview schedule or questionnaire is supposed to be the most critical steps. In case of experimentation, setting



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the objective of experimentation, defining different parameters, identification of ideal instruments, framing of procedures/steps and control along with repetitive observation of the experiments are critical. Again in relation to issues of study, such experiment may be either laboratory experiments or field experiments.

It is expected that in course of time, the children's project will bring in lots of new information about problems and prospects of their locality along with innovative ideas to address these issues. Moreover, in the course of project work, the children may develop different new approaches of study along with the development of different instruments for their experiments. Another expectation is that the outcome of different studies will be communicated among the local populace, which in turn, helps in generating scientific temperament among the general mass.

In a nutshell, the CSC projects are simple, innovative, concerned with local issues and not merely confined to the study topic and corresponding model making.

### **Objectives**

The primary objective of the Children's Science Congress is to make a forum available to children of the age-group of 10-17 years, both from formal school system as well as from out of school, to exhibit their creativity and innovativeness and more particularly their ability to solve a societal problem experienced locally using the method of-science.

By implication, the CSC prompts children to think of some significant societal problem, ponder over its causes and subsequently try and solve the same using the scientific process. It encourages a sense of discovery and emboldens the participants to question many aspects of our progress and development and express their findings in vernacular.

### **Relevance of CSC in the light of contemporary educational initiatives**

The basic approach of CSC on the principle of learning through doing on the issues of children's immediate environment significantly carries the spirit and mandate of Education for Sustainable Development (ESD) of UNESCO, National Curriculum Framework (NCF,2005) and Right to Education (RTE,2009).

“A social movement along the lines of Children's Science Congress should be visualised in order to promote discovery learning across the nation, and eventually throughout South Asia.” - National Curriculum Framework 2005 (NCF-2005).



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The modalities and approaches of CSC cater to the five pillars of learning of Education for Sustainable Development vividly, viz. learning to know, learning to do, learning to live together, and learning to be, learning to transform one self and society (Declaration of ESD in the 57th meeting of the United Nations General Assembly in December 2002, which proclaimed the UN Decade of Education for Sustainable Development, 2005- 2014, refer – [www.desd.org](http://www.desd.org) and [www.unesco.org](http://www.unesco.org))

The mandate of CSC which encourage children to observe, explore, experiments and wonder through a project activities. It associated ways of participation and evaluation rightly take care of the guiding principles of the NCF,2005. Therefore, example of Children’s Science Congress is rightly cited in the NCF documents under executive summery section, page ix (<http://www.teindia.nic.in/Files/NCF-2005.pdf>) .

Similarly CSC activities also helps in materializing the approach of learning as framed in the Right of Children of Free and Compulsory Education (RTE) Act, 2005.

More over the CSC activities, since 1993, has catered to many of the approaches and priorities of science education visualized in the National Programme of Sarva Siksha Abhiyan (SSA) (refer SSA framework, [http://ssakarnataka.gov.in/pdfs/aboutus/ssa\\_framework%20.pdf](http://ssakarnataka.gov.in/pdfs/aboutus/ssa_framework%20.pdf)) and Rastriya Madhamik Siskha Abhiyan (RMSA) ( refer - <http://www.educationforallinindia.com/rastriya-madhymic-shiksha-mission-RMSM.pdf>).

### **Eligibility of participants**

- ✧ Two age groups of children cited already (lower/upper).
- ✧ A group of children not exceeding five, can do the project –study under a teacher guide.
- ✧ A child scientist, who had already presented as a Group Leader at the National Level in one age-group, can act as a co-worker in the subsequent year, in the same age group (lower / upper).
- ✧ Parents, whose child would participate in the Children’s Science Congress in the ensuing year, should not hold any portfolio in the organizing committee of the CSC conducted at any level.

### **Modalities of participation**

Formation of a group with like minded friends and selection of group leader Choosing a guide. Selection of topic/issues for study in relation to Focal theme and sub-theme. Framing design of the study, selection of field study area (local area) and preparation work plan



**Carry out the study** (field observation, field study, field or laboratory experiment or both) and collection of primary and secondary data , compilation and validation of data, data analysis , interpretation and framing of results.

Registration for block/district level (by filling up the form)

Writing report and preparation of posters for presentation

Submission of report for block/district level

Presentation at block/district level (from where selection will be there for state level than state to national level on the basis of the merit of the project)

Following are major steps involved for participation in the NCSC.

### **Nature of CSC Project**

The CSC projects are:

- ◆ Innovative, simple and practical;
- ◆ Representing teamwork;
- ◆ Based on exploration of everyday life-situations;
- ◆ Involving Experimentation and/or field based data collection;
- ◆ Having definite outputs, arrived through scientific methodology;
- ◆ Related directly to community work in the local geographical area;
- ◆ Having follow-up plans.

The Project may follow the steps of **SMART** approach

**S** – **Specific** – The subject/issues of study must be specific

**M** – **Measurable** – The issues of study must be measurable in quantitative/qualitative forms so that component of comparability is maintained

**A** – **Appropriate** - The topic must be appropriate to focal theme and subthemes, along with field study area, methodology must be appropriate to nature of the issues considered for the study,

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**R – Realistic – The issues of the study must be realistic along with the methodology adopted for the purpose**

**T – Time bound** – study must be carried out in limited time frame. The project activities may not destabilize normal activity schedule of the Child.

Prototype model or functional models are only encouraged to use in project presentation if issues and methods of study really demands for it.

**Log-Book- Proper work diary has to be maintained while carrying out the project work. The day-to-day activities has to be neatly noted in the form of a log-book, and should be submitted with the project report at the time of submission. All the details, such as Project title, name of the group leader etc should be written clearly on the cover.**

### **Structure of the project report**

The structure of project report of CSC is as follow

- i. Cover page – must incorporate
  - Title of the project
  - Name and address of Group leader and co-workers
  - Name and address of guide
- ii. Form – A ( Registration form)
- iii. Abstract – in 250 words (one copy in English)
- iv. Contents- list of chapter with detail heading and sub-heading, list of table, chart, maps, etc. along with references against page numbers
- v. Introduction- description on background of the study
- vi. Aims and objectives of the study
- vii. Hypothesis
- viii. Need statement
- ix. Work plan
- x. Methodology

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- xi. Observations
  - xii. Data analysis and interpretation
  - xiii. Results
  - xiv. Conclusions
  - xv. Solution to the problem
  - xvi. Future plan
  - xvii. Acknowledgement
  - xviii. References

The word limit for the written report for the lower age group is 2500 and that for the upper age group is 3500. The written report can be substantiated by including limited number of photographs, sketches, illustrations and/or drawings, etc.

### **Oral presentation:**

Oral presentation at the technical sessions of the congress is a very important component of the entire process. Effective communication during briefing the issues of study, its objectives, and methodology adopted for the study, important observation and findings, vital aspects on the way and approach to solve the problem or address problems is a very critical part of the exercise. Because only 8 minutes time is allotted for the purpose. Therefore, one has to plan pragmatically for the purpose. Children can use 4 different posters (which is mandatory) along with visuals through over head projector or LCD projector for the purpose. Poster must be prepared on 55 cm x 70 cm (21.6" x 27.5") drawing sheets (i.e. chart papers).

The posters should contain information on (1) The project title, (2) Names of the group members, (3) Objectives, (4) Map of the area, (5) Methodology, (6) Results, (7) Conclusion, (8) Solution to the problem. Depending upon the nature of the project the poster may or may not have a map and/or results.

### **Different level of Congress**

Children's Science Congress is organised in three levels where the child scientists and their project works are screened under common evaluation criteria. The evaluation of the project is done for its innovativeness, simplicity and practicality. On the basis of the merit the project is selected for the next level. The three levels are as follows:

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- ✧ Block /district level
  - ✧ State level
  - ✧ National level.

The District/Block level Congress is the first level in which projects are screened for presentation at the State level Congress.

- ✧ The selection ratio of Lower age group to Upper age group should be 2:3.

### **Tentative Activity Schedule**

- Selection of subjects and activity for registration of teams : June-August
- Working on the project : About two months
- District level Congress : September - October
- State level Congress : October
- National level Congress : 27-31 December

### **Approaches of Evaluation**

The innovative ideas and scientific methodology are the basis of a good project but one has to prove his communication skills also to make others listen and understand his findings. For doing this, a total cooperation in the group is a must. Accept positive criticism within the group or even from outside and improve the work plan. This will bring award and recognition.

### **Evaluation Criteria**

- i) Originality of idea and concept :
- ii) Relevance of the project to the theme :
- iii) Scientific understanding of the issue :
- iv) Data collection :
- v) Analysis :
- vi) Experimentation/Scientific study/validation :
- vii) Interpretation and Problem solving attempt :



- viii) Team work :
- ix) Background correction (Only for District level) :
- x) Report and Presentation :
- xi) Follow up Action Plan (Only for State and National levels) :
- xii) Improvement from the previous level (Only for State and National levels):
- xiii) Additional page(s) :

**Evaluators**

- i) Evaluators may please note that the participating children are budding scientists with limited access to knowledge centres and so the evaluators should provide them with constructive inputs and positive feed-back.
- ii) Evaluators should appreciate their honest work as a guiding light for future endeavours of the child scientists.
- iii) Evaluators should evaluate the projects on the basis of subject matter and scientific content.
- iv) Evaluators should avoid any sort of distraction to the child scientists. They may make efforts to know what the child scientist know about the subject area.

The word limit for the written report for the lower age group is 2500 and that for the upper age group is 3500. The written report can be substantiated by including limited number of photographs, sketches, illustrations and / or drawings, etc.



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## 22<sup>nd</sup> NATIONAL CHILDREN'S SCIENCE CONGRESS 2014

### Focal theme and Sub-theme

#### Focal theme: "Understanding Weather and Climate"

Weather is the instantaneous state of the atmosphere, or sequence of states of the atmosphere with time, which can be defined as the condition of the atmosphere at any given time and place. Climate, on other hand, is the average as well as variability of weather conditions prevailing in an area over a long period of time. It is known as the Statistics of Weather.

Precipitation, temperature, humidity, atmospheric pressure, and wind are the important elements of weather and climate. It is the result of the interaction of four basic physical elements- the Sun, the Earth's atmosphere, the Earth itself, and natural landforms on the Earth's surface.

The geographical situation of any locality/area/region in relation to its latitudinal and longitudinal position, altitude, distribution of land and water, relative location from water bodies, surface cover (viz. vegetation/snow/rocks etc.) are some of the natural factors that influence the weather and climatic condition of that particular location.

Moreover, weather and climate are among the key factors that determine the nature, condition, and pattern of natural resources (e.g. water, soil, flora, and fauna). State of temperature, humidity, and precipitation in temporal context in a year determine season and climatic condition in long temporal context. These are responsible for determining the forms of water, soil-forming processes and creating support systems for floral growth; which again determine the faunal composition. These natural resource bases along with weather and climate determine our way of life (viz. occupation, housing, food habits, dress style, transportation, etc.). In totality, weather and climate form the base of the economy and culture of that area. In this perspective, any significant change in weather and climatic condition creates serious impact not only on natural resources but also on the biosphere as a whole, including human life.

Scientists have studied global climate change patterns, apparent from mid to late 20<sup>th</sup> century onward, attributed largely to increased levels of atmospheric carbon dioxide produced by uses of fossil fuels and other green house gases. Averaged over all land and ocean surfaces, temperature has increased by **roughly 1.53°F (0.85°C) from 1880 to 2012**, according to the Intergovernmental Panel on Climate Change (the IPCC's *Climate Change 2013: The Physical Science Basis*,

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Summary for Policymakers, Page 5). This climate change is considered as one of the most important global environmental challenges being faced by humanity today, with its implication on natural ecosystem, food production systems, fresh water supply, health and weather related calamities.

India's weather and climatic conditions are naturally controlled by her geographical location (i.e. its latitudinal and longitudinal extents) and the conditions along her boundaries. (Himalayan ranges from northwestern to northeastern corner in the northern side, existence of Indian Ocean and Arabian Sea as well as Bay of Bengal in southwest to southeast). The country also encompasses the Western Ghats, which is one of the 34 Biodiversity hot-spots of the world; extending along the West coast of India from the Vindya Satpura ranges in the North to the Southern tip of the peninsula to a stretch of 1,600 km, receiving an average of nearly 6000 mm of rainfall every year.

The latitudinal and longitudinal extension within the country has greater implication on variation of solar days or sunshine hours from east to west, which is one of the fundamental factors regulating weather and climatic variations in the country. Further, within the country, there are variations in distribution of land and water, altitudinal differences, vegetation type and coverage. All these together have given rise to six different climatic zones and twelve agro-climatic zones.

However, these climatic and agro-climatic zones are facing serious problems of various kinds due to the impact of climatic/ weather changes. For more than a decade, weather and climatic anomalies are taking place in all the agro-climatic regions of the country. Moreover, winds during monsoon mainly control Indian climate; highly influenced by the summer monsoon. But in the last few decades, onset of monsoon over India is changing resulting in variations in the amount and distribution of rainfall.

In this context, there is a need to have proper understanding of weather and climate and its changes, mainly oriented towards different aspects, factors, and attributes of weather and climate along with their implications on the natural ecosystem and on the way of life of living beings. At the same time, focus on climate change aspects, including mitigation and adaptation are also strongly recommended.



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## Sub-themes:

### I: Weather around You

Weather is the immediate physical environmental spur and situation we face in our day-to-day life and it influences our decisions, like what to eat, what to wear, where to live, etc. However, rarely do we make a systematic effort to understand it better. Therefore, systematic approach for understanding weather of a locality/area will be the main concern of this sub-theme, which can help the children to make their decisions more precise and pragmatic, particularly adjusting with the weather conditions.

Such systematic studies can be carried out through methodological approaches of observation, measurement of weather attributes (like temperature, daily sun shine hours, humidity, wind, precipitation, etc along with other elements like presence of gaseous components, suspended solid particles, etc), analysis of collected information and results of measurement followed by forecasting and interpretation of findings and correlating the same with decision making context and processes. In doing so, children can also design and develop their own tools and instruments for measurement and analysis. However, there are many sources where daily weather information are available (like website of Indian Meteorological Department, News Paper, TV /Radio weather bulletin, etc), one can go for comparison of the collected with available information from such sources; time period based trend analysis and its impact in local context, etc.

Instead of simple information collection from secondary sources, analysis of long-term trends or some experimental and field based measurement of components must also be there in such study. Such trend analysis will make children understand the difference between weather and climate.

### Components

The experiments would involve, *inter alia*, observations, measurements of different parameters of interest. The observations would push the child to integrate and synthesise the data into a set of linked proposals(hypotheses). The child would, ideally, at the end of the experiment, come up with a conclusion based on evidence which will be of some consequence. The component/parameter/aspects that could be studied are:

- Temperature [maximum, minimum, average]
- Atmospheric pressure

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- Wind Speed and wind directions
  - Relative Humidity
  - Clouds
  - Quantum, Intensity and Frequency of Rain
  - Lightning, thunder, rainbow
  - Water level [in wells, ponds]
  - Evaporation from surface water
  - Fog, mists and smog and dew
  - Response of Plants and insects to weather
  - Predicting weather from plants and animal behavior
  - Emergence of diseases

### **Project Examples**

Making simple measuring devices and using and validating them

- Calendar - onset of major events such as monsoons
- Making a Rain Gauge ; Human hair hygrometer

#### *Measuring wind speed and direction*

- How to measure speed?
- Why is direction important

#### *Measuring temperatures*

- Maximum, minimum and average temperature
- Shade or open
- What is the “hottest month

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### **Other Suggested Projects**

1. Studies on micro climatic variations in different eco systems in your study area.
2. Analysis of monsoon rainfall of past and present period for your locality.
3. Setting of low cost weather station and analysis of data generated and comparison with weather station data for your area.
4. Studies on wind speed and direction in various sites of your locality in relation to weather data.
5. Establishment of micro meteorological stations with local, low cost, available assets to observe and study the weather of a particular catchment area/locality and compare the data with secondary data from weather stations.
6. Study of landslides – mapping vulnerable points, reasons thereof for, study of exotic and indigenous plant species on landslides and correlating the various factors leading to landslides
7. Study of weather pattern and shifting monsoons and other phenomenon with consultations with elderly people and correlation with historical data as well as measurement current weather parameters.
8. To study the variations of local weather conditions influenced by topographical features.
9. Analysis of rainfall trends (if possible probability of occurrence)
10. Moisture availability in a locality in different seasons

## **II: Impact of Human Activities on Weather and Climate**

Human population has been growing in geometrical proportion in the last two centuries. Growing population and increasing consumption of goods and services per head after the industrial revolution requires in increasing manner environmental resources (life support systems like air, water, and soil and other natural resources) for its survival and sustenance. The pressure on these has also influenced the weather conditions and climate locally and globally. The growth in agriculture, animal husbandry, fisheries, urbanization, transportation, deforestation, and industrialization causes

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changes in land use and bio-geo-chemical cycles. Exploration and utilization of energy sources for the increasing demands of the growing society pump in large quantities of green house gases to the atmosphere causing global warming.

At the first level, children need to understand what greenhouse gases (GHG) are and how they allow the radiated heat of the Sun to come through at high temperature, but do not let the return radiation from earth at lower temperature to pass through easily. Children also should know how the warm blanket around us keeps us comfortable at the current earth's temperature, instead of freezing us to death at an average minus 15 °C. There is also a need to understand the Carbon cycle, the manner in which Carbon Dioxide, the major GHG cycles between the earth and the atmosphere.

At the second level they need to understand that the trend has become clear in recent years that climate – the long term weather pattern – is changing, and changing so rapidly, that life forms on earth including humans face a huge challenge in adapting to this change. (The last time the earth heated up by 2 °C, coming up to the current level from the ice age, it took 18,000 years. It is now set to go up by another 2 °C within a matter of 200 years.)

The third aspect to realise is that this rapid increase is caused entirely by human activity – the activity of digging up millions of years of energy buried deep inside earth in the form of carbonaceous fuels, coal and oil, burning them in increasing quantities each year and sending up carbon dioxide, ever since the industrial revolution. This changing lifestyle has also resulted in other GHGs too going up in increasing quantities.

Children need to be made aware of the results of this human induced climate change such as weather disasters, disease spread, heat stress, drought, water shortage, crop yield decline, sea level rise, large scale migration and such other.

Children are expected to observe and analyze the human activities which contribute to weather and climate changes in their locality and they can review the situation, scientifically logically, design and propose alternatives to improve the human life as well as control reduce the negative impacts of human activities on weather and climate. Children also need to look at the impacts of human induced climate change or weather and climate related disasters like drought, cloudburst, landslide, flood, thunderstorm, cyclone, etc, which in turn could be linked to disease spread, stress due to heat and cold waves, water shortage, crop yield decline, crop loss, weather and climate induced migration, refugee situations etc.

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### **Suggested projects**

1. Loss of forest/wilderness areas in the locality
2. Loss of water bodies with time
3. Changes in cropping pattern in the locality
4. Food wastage and carbon footprint
5. Life style and carbon foot print
6. Afforestation and carbon footprint
7. Use of fuel in industry and impact on weather and climate.
8. Artificial fish culture, fertilizing water and GHG emission
9. Use of biowaste as compost and reduction in carbon footprint
10. Replacement of non biodegradable plates, cups etc with biodegradable to reduce carbon footprint
11. Use of bicycle in place of motorised vehicle and reduction in carbon footprint
12. Energy saving devises to reduce GHG emission
13. Use of natural light in place of artificial light.
14. Monitoring air and water pollution in your locality.
15. Comparison of nature of houses (in terms of materials used, ventilation etc.) their design in terms of heat absorption and other weather parameters.
16. Study the impact of developmental activities on the micro climate/weather of your locality and compare the data with nearby areas not affected by the developmental activity.
17. Study the impact of vehicular pollution on micro climate at tourist destinations with reference to pre tourist seasons, tourist season and post tourist season.
18. To study the carrying capacity of micro water sheds / local entrepreneurs in assisting pilgrims/ tourists on religious routes and study seasonal variations, damages to eco systems, pollution etc.
19. Study the solid waste random disposal /landfill and its effect on nearby water resources and remedial measures.

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20. Study the change in land use and land cover in your areas and its impact on climatic conditions.
  21. Impact of changing weather, climate on the mangrove forests, density, eco system as a whole.
  22. Impact of glass claddings in modern buildings – study of micro climate inside versus ordinary buildings.
  23. Impact of charcoal making (*Prosopis juliflora*) on wild life.
  24. Study the impact of multi storied buildings on the local wind velocity and sunlight intensity, temperature, humidity etc.
  25. Comparative study on soil health in jhum cultivated and normal land

### III: Weather, Climate and Ecosystems

**Biotic** components are the living things that shape an ecosystem. A biotic factor is any living component that affects another organism, including animals that consume the organism in question, and the living food that the organism consumes. Biotic factors include human influence.

**Abiotic** components, are non-living components of an organism's environment, such as temperature, light, moisture, air currents, etc

Weather and climate have various significant elements such as Rain, Temperature, Wind and Humidity that impact the occurrence, abundance, seasonality and behaviour of living organisms as well as quality of air, water and soil. They have direct or indirect effect on the various components of ecosystems. With the variation of temperature, humidity and precipitation the quality of water, soil forming process, floral growth, and faunal composition may undergo change.

India's weather and climatic conditions change from region to region on their geographical locations and conditions; hence the parameters of weather vary from place to place. Due to such variations, the distribution of life forms, soil quality and water quality also vary from place to place.

**Phenology is the study of periodic plant and animal life cycle events and how these are influenced by seasonal and inter-annual variations in climate, as well as habitat factors (such as elevation).**



All weather and climatic parameters affect the ecosystem elements in various ways. In turn, biotic elements influence the development of microclimate of an ecosystem. Phenology of plants, occurrence, populations, and behaviour of various floral and faunal elements change according to weather and climate. Disasters such as floods, droughts, unprecedented rains, inconsistencies in seasonal temperature etc on various ecosystems are the consequences of climate variability at a macro level

Under this sub-theme, we need to understand and observe the changes in weather parameters as well as the changes in biotic and abiotic parameters around us. This will enable us to study the effect of weather/climate on ecosystems. Systematic observations, measurement, and analysis of weather parameters and the biotic and abiotic elements make us understand effect of these parameters on the functioning of ecosystem.

There is a need to study basic elements of weather first, viz. temperature, air pressure, wind, humidity and precipitation before concentrating on their impact assessment or relationship with abiotic and biotic components.

The projects encompassing effect of weather parameters on abundance of flora and fauna and seasonality, movements, breeding, feeding and other behaviour patterns falls under this sub-theme, Behaviour of animals, seasonality of occurrence and flowering of plants, migration of animals, birds, fishes and insects etc are climate dependent.

Similarly, variable weather conditions can affect quality of air, water and soil which in turn affect biotic elements. Some of the changes such as pH, amount of dissolved salts, organic matter in soil and water etc. are measurable. Quality of air in terms of pollutants such as carbon dioxide, methane, NO content is measurable.

Simple experiments can be conducted on the effect of light period, light intensity, atmospheric temperature, humidity and soil moisture on growth of plants. Stomata count as surrogate for the production of Oxygen, Rate of Carbon sequestration in different urban and rural situations etc. also can be done by the children.

### **List of Projects suggested**

Effect of the pattern of weather parameters such as Rain, Temperature, Wind and Humidity on :

1. Abundance of various Insects
2. Changes of Behaviour of insects with respect to weather parameters



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3. Relationship between Dragon fly population changes and rainfall
  4. Relationship of movement of social insects and weather parameters
  5. Behaviour of birds in relation to the weather parameters
  6. Behaviour and movement of spider in relation to the weather parameters
  7. Abundance and breeding of frogs in relation to the weather parameters
  8. Variation in weather and climate Vs presence and absence/abundance of plants such as weeds
  9. Behaviour of domestic animals in relation to the weather parameters
  10. Seasonality of occurrence of plants
  11. Weather pattern and flowering of plants
  12. Soil organisms and weather pattern
  13. Fish migration and weather pattern/tide pattern
  14. Fish catch and weather pattern
  15. Seasonality in fish catch
  16. Seasonality of behaviour of costal animals / tide pattern
  17. Weather parameters and abundance of mushroom
  18. Variable weather conditions can affect quality of air, water and soil. Some of the changes are measurable such as measuring pH amount of dissolved salts in water, organic matter in soil etc.
  19. Quality of air in terms of air pollutants such as Carbon dioxide, methane, NO content in different seasons
  20. Soil pH in different places/ different time.
  21. Water pH in different places/ different time / rain water
  22. Determination of dissolved minerals in different water samples in your locality
  23. Comparing water quality before and after rain
  24. Determination of organic matter present in soil in different periods of time.
  25. Weather and soil erosion



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26. Effect of light period, light intensity, atm., temperature, humidity and soil moisture on growth of plants
  27. Stomatal count as surrogate for the production of Oxygen – comparison of different plants
  28. Calculation of Carbon sequestration in different urban and rural gardens
  29. Relation between Wind pattern and seed production in wind dispersed seeds.
  30. Relation between wind pattern and flowering of anemophilic plants.
  31. Animal behavior as weather indicators – Collection of traditional experience and scientific validation.
  32. Study of group migration of animals/birds/fish/plants and correlating the same with observed weather change / extreme weather events.
  33. Study of Pond/Lake eco systems – temperature, water levels with reference to rain fall, study of life forms during various seasons (fish, frog, fresh water snakes, birds, aquatic plants, quality of water across seasons / varying temperatures / varying turbidity, etc.
  34. Study of sacred groves – seasonal variations of life forms biomass, micro climate studies, interrelationships within the eco system, etc.
  35. Study the impact of temperature variation on floral diversity and behavior of plants in an area.
  36. To study the role of lichens with respect to climate change/weather and biodiversity in a select area.
  37. Study of flora and fauna of a wetland in your locality and study seasonal changes if possible.
  38. Study of aquatic and terrestrial ecosystems in terms of physical, chemical and biological parameters with respect to seasonal changes.
  39. Study of primary productivity in a pond ecosystem.
  40. Study of carbon sequestration in pond/lake eco systems by studying bottom sediments.
  41. Study of carbon sequestration in forest/grasslandsoil.
  42. Study of a tree as an eco system more specifically a habitat – seasonal changes and changing diversity in niche specialization.
  43. Impact of climatic variations of agro-forestry in an area.
  44. Impact of rainfall variability on production of crops of an area.
  45. Study of insect diversity of a grassland eco system (alternatively in wet land / dry land etc.)

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## **IV: Weather, Climate - Society and Culture**

Weather and climate determine the physical environmental condition of an area through their impact on abiotic and biotic elements and that condition in turn influences human way of life in the forms of belief, livelihood, and social, institutional, as well as cultural practices. These together reflect the social and cultural system of a locality, area, region. The social and cultural systems have an adaptation mechanism to local weather and climatic situation through their practices fulfilling basic needs of food, shelter, and clothing through designed livelihood activities, food system, settlement and housing, management of natural resources etc. However, there are many practices associated with social and cultural system, which have negative impact on natural resources and in turn responsible for anomalies of weather and climate, such as human induced climate change. On the other hand there are many examples that human beings face up to extreme weather situations through their social and cultural practices based on Indigenous Knowledge and try to cope up with such weather conditions and disasters.

In broad perspective, this sub-theme will cover issues for systematic studies, like, local food practices, its seasonality and adjustments to weather situation, local calendar system and agricultural cycle and adjustments with weather, flood/drought adjustment approaches of different community/locality, traditional knowledge on weather prediction, cultural practices, modern consumption practices and their impact on ecosystem and further impact on climate patterns etc. Studies taken up would try to establish the science behind these practices and the societal efforts to adopt with climate change as well, are expected

### **Suggested projects**

1. Study the relationship between traditional/indigenous pest management practices and weather condition;
2. Study the practices of traditional land use and land cover management and impact on weather and climate;
3. Assess the impact of traditional water harvesting and management practices in developing sustainability of water resources in climate stress period and developing resilience system;
4. Study the traditional practices of animal rearing and their health management, their relationship with weather condition and seasonality; identify components of adaptation and resilience;

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5. Study cultural priority on selection of food crop for cultivation in the locality and its relationship with local weather and climate induced disaster;
  6. Study on the efficiency of traditional utensil used for cooking and their contribution in reduction of energy and carbon emission;
  7. Comparative study of distribution of rainy days against month in traditional calendar system and English calendar system and find out the reliability aspects for agricultural planning;
  8. Study on fuel wood based cremation practices, assessment of carbon emission and developing alternative system for cremation;
  9. Assessment of energy requirement in traditional cooking and modern way of cooking, identify carbon emission factors and impact on weather and climate;
  10. Study on the alternative food sources of different cultural groups in disaster prone situation (like flood,drought,etc) and assessing its potentiality for building resilience and adaptation to climate change;
  11. Assess the energy consumption and pollution of air, water, noise during festival ( like Diwali, Pongal, Magh Bihu, Durga Puja, etc ) and impact on developing resilience and adaptation to climate change;
  12. Study on the traditional food storage practices among the community and its relation to weather and climate;
  13. Prepare community based culturally adaptable Disaster Management Plan with proper assessment of risk and vulnerability for climate induced disaster of your locality.
  14. Study of seasonal food practices and its availability in terms of weather in your locality
  15. Study of weather related folklore and proverbs of your state/area.
  16. Study of climate change/weather extremes and adaptation practices of the people and their culture in high altitude areas.
  17. Study the merit of traditional houses in terms of weather parameters.
  18. Comparison of crop calendars of present and past and study the impacts on food habits and culture.
  19. Identification, documentation, and validation of indicator plants related to soil moisture status, ground water availability, etc.

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## **V: Weather, Climate and Agriculture**

Agriculture is the backbone of our country. Weather and climatic condition determine all the aspects of agricultural practices, which is very much vivid in all agro- climatic regions of the country. In present day context, agriculture is most vulnerable to weather and climate changes because of its seasonality and narrow range of weather conditions influencing crop and livestock production. Last several decades people across the globe witnessed above normal temperatures and more rapid warming that occurred during the last half of the 20th century. Climate change presents a profound challenge to food security vis-a-vis livelihood and development all around as well.

As an effect of climate change, heavy rainfall events increase resulting in floods, and more intense droughts occur affecting agricultural and allied sectors (cropping cycle, population, and density of pollinators, flowering pattern, agricultural produce including animal production etc). On the contrary, modern agricultural practices (both above and below the ground) also play vital role in spurring climate change through release of green house gases, depletion of soil carbon, desertification, salinization etc. Under this sub-theme, children can observe changes in the weather regulating factors and their impact on agricultural system in their own area and find out some method/ technique to mitigate. Moreover, there are many practices related with seed selection, irrigation, soil management etc., which help in adaptation process.

Children can also carry out study in different aspects of agriculture, right from seed selection, land preparation to harvesting and processing etc. It may be on how weather conditions influence our agricultural practices; impact of changing conditions on agriculture; impact of agricultural practices on local weather conditions, how to overcome the adverse climatic weather condition for agricultural practices. Age old practices in agriculture in different areas and how these are related to local weather conditions can also be studied.

### **Suggested Projects:**

**Project 1: Conservation agriculture for sustainable land use**

**Project 2: Mitigate soil and water loss through runoff with suitable control**

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**Other suggested projects :**

1. How does organic component influence different Soil Properties?
2. Determining maximum loading limit for copper in agricultural land
3. Evaluating filtration capacity of soil
4. Influence of vegetation cover on microclimate
5. Influence of mulch on soil physical properties
6. Study of the influence of tillage on soil physical properties
7. Effect of land use options on erosion, loss of surface soil
8. Influence of tillage on ground water recharge from rice field.
9. Impact of saline water on soil properties like pH etc.
10. Germination of crop in soil with varying salinity level
11. Organic matter addition and crop growth
12. How pollutants affect soil biota
13. Study of climate, weather versus vegetation changes in an area.
14. Study of traditional water harvesting and irrigation techniques and their relevance in changing weather and climatic conditions.
15. Impact of micro climate on various parameters of a crop including yield, total biomass production etc.
16. Effect of late monsoon on cropping pattern in your locality.
17. Change in irrigation pattern due to change in climatic conditions.
18. Study of traditional agricultural practices of past and present practices in terms of changing weather.
19. Study of the impacts of weather and climate change on traditional agricultural practices.
20. Study of effect of heavy rainfall on different crop stages and its effect on production.
21. Study of different agricultural practices in relation to weather and climate (tillage, land preparation, sowing, transplanting, weeding, harvesting and post harvest in relation to local calendar systems.

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22. Study of Jhum cultivation and its impacts on change of weather and climate of your locality.
  23. Analysis of yield and quality of spices due to weather/climate change in hilly regions with special relevance to onset of South west monsoon.
  24. Comparison of seasonal crop calendars and their variation within an agro climatic zone – regional variations and differences and their rationale.

## **VI: Weather, Climate and Health**

Weather and climate influence environmental and social determinants and also affect health of the living beings. Health - as defined by World Health Organization is a state of complete physical, mental, and social well being and not merely absence of disease. Health, whether of human or animal, mainly depends on safe drinking water, nutrition, sanitation or hygiene and the likes.

Likewise, any variation in weather or climatic conditions adversely affects the health of living beings. Outcome of these changes; heat or cold waves, drought or flood, storms etc., takes its toll on the health, manifested by occurrence of diseases, or even sometimes an outbreak of epidemics.

**In the light of the fact that weather and climate have potential impact on the health of human beings and animals, child scientists can undertake studies to understand the causative factors, the concerns arising and the corrective measures to be adopted to lessen the adversity. Ailments like water / air / vector borne diseases (diarrhoea, malaria..), infections (bacterial or viral...) and infestations (parasitic..), zoonosis, reemergence of certain diseases and others which are influenced by the variability of weather and climate are some of the areas for the child scientists to ponder upon and take up project works.**

### **List of suggested Projects**

1. Mapping of weather related diseases in your locality
2. Studies on prevalence of vector-borne diseases (malaria / dengue)
3. Occurrence of communicable diseases due to extreme weather conditions
4. Effect of temperature and humidity changes on incidences of skin diseases
5. Impact of weather on production and/or health of animals

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6. Effect of extreme weather on the health of women and children
  7. Effect of summer, winter and monsoon on incidence of respiratory diseases
  8. Effect of heat on the health of farmers / industrial workers in your area
  9. Studies on weather patterns and income loss of workers with daily wages
  10. Studies on air-borne infections during variable weather conditions
  11. Hospital based studies related to weather and climate and correlating with field level studies.
  12. Mapping of vector borne diseases in your locality with special reference to re emergence of certain diseases, mapping more vulnerable areas and linking them to health, sanitation etc.
  13. Study / documentation of working policy planning of various line departments with respect to onset of monsoon, weather extremes, disease incidence and strategies for coping with epidemics and finding out the efficacy of such plans and suggesting changes/modifications in a scientific manner.
  14. Study of pattern of common diseases in the general population in relation to changing local weather conditions including seasonality, frequency etc.
  15. Study of various skin diseases in the last three years in your locality related to changing weather, climate etc.
  16. Study the quality of air in various environs – crowded, slums, textile industries, fly ash handling areas, bricks and cement industry etc. and study the seasonal variations.
  17. Study the impact of weather and climate on food, fruits, vegetables, fish etc. and their durability during various seasons/weather.
  18. To study the impact of changing weather / climate on industrial areas (thermal plants, stone crushing industry, textile, steel, glass industries etc.) on health and livelihood losses.
  19. To study the impact of humid weather on skin related diseases/infections.
  20. Prevalence of nature of disease in domestic animals as an effect of weather and climate.

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