

**LECTURES  
ON  
ENVIRONMENT AND SCIENCE**  
**Annual Report - 2017**



**ORISSA ENVIRONMENTAL SOCIETY**  
**2017**

**ORISSA ENVIRONMENTAL SOCIETY**  
N.D-4, VIP AREA, IRC VILLAGE, BHUBANESWAR-751015. TEL. NO. (0674) 2557423  
Website: [www.orissaenvironment.com](http://www.orissaenvironment.com); Email: [oesbbsr@gmail.com](mailto:oesbbsr@gmail.com)

**ODISHA DIGYAN 'O' PARIKESH**  
(An Annual Event)

ISBN - 978-81-924480-7-7



**ORISSA ENVIRONMENTAL SOCIETY**

N.D-4, VIP Area, IRC Village, Bhubaneswar-751015, Tel.: 0674-2557423  
Email: [oesbbsr@rediffmail.com](mailto:oesbbsr@rediffmail.com), [oesbbsr@gmail.com](mailto:oesbbsr@gmail.com)  
Website: [orissaenvironment.com](http://orissaenvironment.com)

Printed at AD GRAPHIX

**LECTURES ON  
ENVIRONMENT AND SCIENCE  
ANNUAL REPORT - 2017**



**ORISSA ENVIRONMENTAL SOCIETY**

ND-4, VIP Area, IRCVillage

Bhubaneswar-751015, Odisha, India

Telephone: 0674-2557423

Email: [oesbbsr@rediffmail.com](mailto:oesbbsr@rediffmail.com); [oesbbsr@gmail.com](mailto:oesbbsr@gmail.com)

Website: [orissaenvironment.com](http://orissaenvironment.com)

## **Lectures on Environment and Science Annual Report - 2017**

Compiled by : **Dr Sundara Narayana Patro**  
: **Dr Lala Aswini Kumar Singh and**  
: **Dr Jaya Krushna Panigrahi**

Publisher : **Orissa Environmental Society**  
ND-4, VIP Area, IRC Village,  
Bhubaneswar – 751015  
Phone: 0674-2557423

Printed at : AD GRAPHIX, Bhubaneswar,  
Tel.: 9438028690

Cover Design : Sarat Kumar Swain (Biranchi)

© Publisher

Date of Publication : October 25, 2017

### **Citation Example:**

Dash, M. C. (2017): Environmental Education for Lasting Solutions to Environmental Challenges. Pages 99 - 118. In: Patro, S. N., Singh, Lala A. K. and J. K. Panigrahi (Compilers). Lectures on Environment and Science, Annual Report-2017. Orissa Environmental Society, Bhubaneswar. vi + 158pages.

ISBN:978-81-924480-7-7

*The views and contents of the write-ups are entirely those of the concerned authors.*

## Foreword



Orissa Environmental Society founded in 1982 is actively engaged in promoting mass awareness for conservation of natural resources and environment. Study, research, documentation, publication, lobbying, liaison, persuasion, conference, seminar, workshop, colloquium, public meeting, issue based discussion and consultation, education, awareness programme etc are most of the activities of the Society. The Society

honours its members, distinguished persons and scholars with awards and felicitations. Dignified members and persons are accorded the honour as Patrons, and Fellows.

As on today, the Society has about 700 life members and institutional members who are motivated academics, technocrats, architects, planners, doctors, economists, development managers, bureaucrats, corporate houses, government and non-government institutions, and persons interested in conservation of biodiversity, natural resources and environment.

Among many of the successful programmes of the Society are the activities for Anugul, Similipal, Mahendragiri, and Chilika. Based on a research study by OES on the problems of fluoride pollution due to industrial activities a project for fluoride-free water supply to 11 villages in Anugul district was implemented in 2000-2001 under Orissa Environment Programme (Indo-Norwegian Cooperation). The Central Pollution Control Board has identified Anugul as an environment hot-spot due to industrial pollution. The Society launched an intensive campaign, to move Government of India and Government of Odisha, leading to creation of the eighth biosphere reserve of the country in the Similipal Forest of the Mayurbhanj District (Odisha) in 1994. For the last several years sustained campaign is going on towards protection and conservation of the epic fame Mahendragiri hill complex. Mahendragiri is studded with rare biodiversity and archaeological monuments. Efforts are made to impress upon appropriate authorities for recognition of this hill forest ecosystem as an Entity of Incomparable Value (EIV) and raise the status to a Biosphere Reserve and also to include in the list of Heritage Sites. At the initiative of the Society the Government of

Odisha constituted a Committee to study the feasibility of setting up of a biosphere reserve here. The Committee has submitted its report in its favour. The Society conducted a seminar on Chilika lagoon and brought out the proceedings serving as a base document to plan for its conservation through the Chilika Development Authority.

An important flagship programme of the Society is holding of an annual meet of the scientists (formerly as OBC now OBPC). The Odisha Bigyan Congress (OBC) had its genesis in the year 1997 to endow with an apt platform to the scientific community of the State for deliberating on the advances in science and technology in diverse frontiers. From 2016 a little amendment has been made in the title of the Congress to make it Odisha Bigyan 'O' Paribesh Congress (OBPC) for focusing attention on the environmental challenges confronting the mankind at the present juncture. The Congress brings out the voluminous proceedings in shape of a book.

About eight years back, in 2009 the Society launched the programme of Monthly Seminar on 'Current Issues on Environment and Science'. Every month on the first Sunday the programme is organized regularly. A subject expert on any current issue on environment and science is invited to deliver a talk followed by floor discussion. As and when felt necessary, the summary of the discussions on the topics of local importance and relevance along with the recommendations are communicated to appropriate authorities. Such intellectual discussions of high academic order in lucid language, I am sure, helps to augur and augment future course of action at individual and collective level to serve the common interest of a resilient society.

It is a matter of pride that the valuable monthly seminar lectures are compiled and published along with the annual activities report of the Society for the second year in 2017. I hope the Society will continue to do so in the coming years. The Annual Report published in shape of a book will have the referral value for the scholars, students and persons interested in the subject.

I acknowledge the meticulous and sincere efforts and pains taken by Dr Lala A. K. Singh, other members of OES as well as the guest lecturers but for whom this publication would not have been a reality.

Dr Sundara Narayana Patro  
President, OES

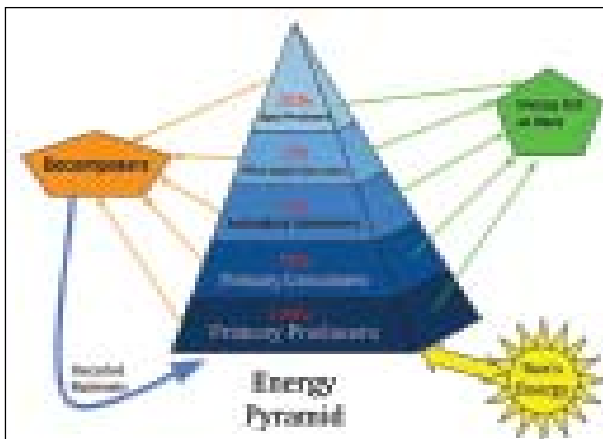
# CONTENTS

## 1. Lectures on Environment and Science

○ Water Resources: Engine for Improvement of Quality of Life and Economic Development	Nanda Kumar Mohapatra	01
○ Industrial Safety	Shailendra Kumar Tamotia	11
○ Inter Linking of Rivers in India: Problems & Prospects	Binayak Rath	17
○ Eco-friendly Industrial Technology - a Case Study NALCO	Chitta Ranjan Mishra	36
○ Environmental Management Practices in Thermal Power Sector of Odisha	Rabi Narayan Prusty	48
○ Responses of Plants to Environmental Stress	Arun Chandra Sahu	50
○ Depression: let's talk: World Health Day Discussion	Rabindra Kumar Das and Seba Mohapatra	58
○ World Earth Day 2017	OES-release	65
○ Herbal Treatment for Common Diseases	Kunja Bihari Satapathy	68
○ Connecting People to Nature: World Environment Day 2017	OES highlight	91
○ Vana Mahotsav	OES pick-ups from online resources	96
○ Environmental Issues of Concern in Factories	Malay Kumar Pradhan	97
○ Environmental Education for Lasting Solutions to Environmental Challenges	Madhab Chandra Dash	99

2. Prasanna Kumar Das Memorial Lectures	119
3. Awards Instituted by OES	119
4. Awards and Felicitations Received by OES Members from other Organisations	121
5. Felicitations to Senior Life Members	123
6. Fellows of OES	123
7. Patrons of OES	124
8. Obituary	126
9. Activities of OES	127
10. 18 <sup>th</sup> Bigyan 'O' Paribesh Congress	133
11. OES Publication List	136
12. Note from Sri Bibhudhendra Pratap Das	138
13. Life Member List (from 2016)	139
14. Executive Committee of OES members Including Office Bearers	146
15. Advisors	149
16. OES Membership Application Form	150
17. OES Fellow- Guidelines	154
18. OES Patron- Guidelines	157

•••



# 1. Lectures on Environment and Science

## Water Resources: Engine for Improvement of Quality of Life and Economic Development

N. K. Mohapatra

(Date of presentation: 23.10.2016)

**Introduction:** Natural resources are those which occur in their original form within the environment undisturbed by humanity. Water, land, forest, mineral deposits are the sources of wealth for any state. Out of these water is pristine, a scarce natural resource and considered to be the life for all.

Life depends on the nexus of water, food and energy. Any civilization in the world has developed around the source of water and got extinct due to destructive forces and or non-availability of fresh water. India having a population of more than 120 crores has developed around 12 major river basins and 46 medium river basins. Water resource is the only variable which is going to decide the quality of life and economic development of the country. Water resource will be the engine for development. India is dependent on monsoon rainfall which has complex uneven distribution over time and space. In addition, there are challenges of frequent floods and droughts in one or the other part of the country. The impact of climate change has also affected the water resources due to extreme events of flood and drought.

Indian rivers are mostly interstate and create ground for competition and conflicts for water. The state which will harness, conserve and optimally use the water resources will prosper. In this paper an attempt has been made to analyse the historical development of our country due to crisis arising in water resources and its related socio-economic impact.

**Odisha in India's Resource Maps:** From the India Climatic Zone map (Fig No.1), it is observed that Odisha lies in the tropical wet and dry climatic conditions. The coastal states of Gujarat, Maharashtra, Karnataka, Tamilnadu and undivided-Andhra Pradesh have more or less similar conditions as of Odisha but have better GDP (Fig.2).

Fig. - 1

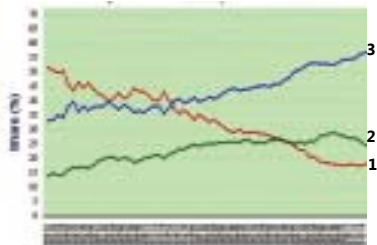


Fig. - 2



**Sectorwise Contribution of GDP of India (1950-2014)**

1. AGRICULTURE    2. INDUSTRY    3. SERVICE



## A Comparison of Resources of Six States

<b>A. RAINFALL</b>		
<b>State</b>	<b>Met Division</b>	<b>Average Annual Rainfall in mm</b>
Gujarat	South	1107
	Saurashtra & Kutch	578
Maharashtra	Madhya	901
	Marathawada	882
	Vidarba	1034
Karnataka	North interior	731
	South interior	1126
Tamil Nadu		998
Andhra Pradesh	Coastal	1094
	Telengana	961
	Rayalsheema	680
<b>Odisha</b>		<b>1489 High</b>

<b>B. LAND RESOURCES</b>		
<b>State</b>	<b>Area in km<sup>2</sup></b>	<b>National %</b>
Gujarat	1,96,024	5.96
Maharashtra	3,07,713	9.36
Karnataka	1,91,791	5.83
Tamil Nadu	1,30,058	3.95
Andhra Pradesh	1,60,025	4.87
<b>Odisha</b>	<b>1,55,707</b>	<b>4.73</b>

<b>C. FOREST RESOURCES</b>	
<b>State</b>	<b>% of forested area</b>
Andhra Pradesh	16.77
Gujarat.	7.48
Karnataka	18.84
Maharashtra.	16.45
Tamil Nadu	18.33
<b>Odisha Highest</b>	<b>32.33</b>
Total ( India )	21.23

<b>D. COAST AND PORTS</b>		
<b>State</b>	<b>Length in km</b>	<b>Ports</b>
Gujarat	1600	41
Maharashtra	720	53
Karnataka	320	10
Tamil Nadu	1076	15
Andhra Pradesh	974	12
<b>Odisha</b>	<b>480</b>	<b>3</b>

### **E. MINERAL RESOURCES**

Odisha Plateau & Chota Nagpur Plateau region are the mineral heart land of India and have 93% iron ore, 84% coal, 70% chromiite, and the largest reserve of bauxite.

### **F. ENERGY RESOURCES**

<b>State</b>	<b>Thermal</b>	<b>Renewable</b>	<b>Total</b>	<b>% of National</b>
Gujarat	23160	6271	29431	11%
Maharashtra	28145	9537	38372	14%
Karnataka	6643	8152	15271	3.5%
Tamil Nadu	11513	10605	23104	8.37%
Andhra Pradesh	9708	3852	13688	4.13 + 3.46 % for Telengana
<b>Odisha</b>	6753	2283	9036	3.28%

Odisha has better resources compared to other states. The irony is it is still underdeveloped. We were historically maritime traders like Gujuratis, warriors like Marathas and Kannadigas, and have similar farmers and craftsmen like Tamilians and Andhraites.

We have 5% of geographical area of the country with 4% population, 480 km long coast line, good fertile land, 11% water resources, 5 million ha of forest cover, high mineral resources, potential for high energy production through hydel, thermal, solar, wind sources, two Ramsar Sites— Chilika brackish water lagoon and Bhitarkanika, and the UNESCO declared Biosphere Reserve with Similipal forests.

As discussed water resources are the catalyst for happiness and economic growth. The Odisha scenario is better as compared to other states. A look at the water resources of Odisha will reveal the facts.

Source: Odisha Water Plan, 2004 & [dowrodisha.gov.in](http://dowrodisha.gov.in)

Basin wise availability of Surface Water (Scenario: 2051)							
Sl. No.	Basin Name	Average Annual flow (in BCM)			75% dependable flow (in BCM)		
		Own	Outside State	Total	Own	Outside State	Total
1	Mahanadi	29.9	29.255	59.155	25.508	23.225	48.732
2	Brahmani	11.391	7.186	18.577	8.849	5.521	14.011
3	Baitarani	7.568	-	7.568	5.434	-	5.434
4	Rushikulya	3.949	-	3.949	2.782	-	2.782
5	Vamsadhara	5.083	-	5.083	3.881	-	3.881
6	Budhabalanga	3.111	-	3.111	2.521	-	2.521
7	Kolab	11.089	-	11.089	8.885	-	8.885
8	Indravati	16.265	-	6.265	4.451	-	4.451
9	Bahuda	0.438	-	0.438	0.213	-	0.213
10	Nagavali	2.853	-	2.853	2.322	-	2.322
11	Subernarekha	1.193	1.115	2.308	1.193	1.115	2.308
	Total	82.841	37.556	120.397	65.679	29.861	95.54

Total availability of Surface Water (Scenario: 2001/2051)						
Total availability	Average Annual flow (in BCM)			75% dependable flow (in BCM)		
	Own	Outside State	Total	Own	Outside State	Total
2001	82.841	37.556	120.397	65.679	29.861	95.54
2051	82.841	25.272	108.113	65.679	20.212	85.891

<b>Storage Capacity of Reservoirs of Odisha in Billion Cum</b>				
Category	Completed Projects		Projects under Construction	
	Number	Capacity	Number	Capacity
Major	7	14.86	4	1.36
Medium	38	1.53	9	0.41
Minor	2340	0.85	-	-
Total	2385	17.24	13	1.77

<b>Per-capita Water Availability</b>		
Year	Average per-capita water availability per year in cum	Remarks
2001	3359	Stressed < 1700 cum Scarced < 1000 cum
2051	2218	
Rushikulya will be scarce & Budhabalang & Bahuda will become close to scarce by 2051		

With a growing population and rising needs of fast development of our state unless we improve WR storage in our state water availability scenario may be critical because of population growth and global climate change conditions.

### **Crisis around Water and Economic Development :**

In pre-independence era, due to crisis of water, there was “The Great Famine – Naa Anka Durbhikhya” in 1865. Handling water resources became the means for transport of grains and need for irrigated agriculture. Mahanadi canals, high level canals, Odisha coast canals were built followed by Rushikulya system. Similar development took place in Andhra Pradesh, UP and other states. All these took birth from the crisis of famine.

After Independence of our country, there was the euphoria to build and make the country self sufficient, but financial resources were meagre and skilled technical manpower was extremely low. However, Hirakud and Bhakra Nangal Dams were constructed for boosting irrigation, energy and flood moderation.

In other economic sectors, construction of steel plants, cement plants and establishment of IITs linked with foreign aid decisions were taken. The country suffered from lack of infrastructure, dependence on fickle monsoon, and unemployment continued.

- The country suffered from food shortage in sixties and depended on the USA for wheat under PL-480 or Food for Peace.
- Green Revolution needed use of better seeds, fertilisers and irrigation. Punjab, Haryana, UP changed India's food scenario. Green Revolution was the result of a crisis.
- Drought conditions in Gujarat and shortage of fodder saw the development of cooperative movement for milk and the success story of Amul. The White Revolution was born from crisis.
- In 1990 India faced economic crisis. Probably with the Indian financial ethics, we are now sailing safely while there is global financial slowdowns. The introduction of GST is a venture to bring reforms.

After the financial reforms of nineties dramatically India's software industry became the superstar. The market also opened up for metal, cement and coal. The banking sector picked up fast. Revolutions in the IT and Telecom sectors created new information highway. The road infrastructure began to improve, and improvement in energy sector showed results.

### **Water Resources Sector could not match with the time**

Development of water resources sector continued to remain low although other infrastructure sectors could benefit from advancements in technological and financial boom. WR Projects which were implemented after 1980 had to pass through stringent Forest Conservation Act. There have been difficulty in building large reservoirs because of issues related to submergence, rehabilitation and resettlement. Environmental Impact Assessment & Environmental Impact Plans are to be prepared and followed. So projects experienced longer gestation period.

The role of Water Resources Professionals has become multi-faceted. Days for WR professionals are no longer limited to creation and maintenance of only irrigation infrastructure. They face the tasks such as management of coastal erosion, drainage congestion, and also work for the Amrut

Yojana, the fluorosis eradication programs, the water grid, preservation of “Ramsar” sites, the biospheres, water quality issues, industrial water supply, creation of water fronts, and revival of inland transport etc. The challenges are lot many. Societal demands will be more and more challenging as water becomes scarce and sensitive issue.

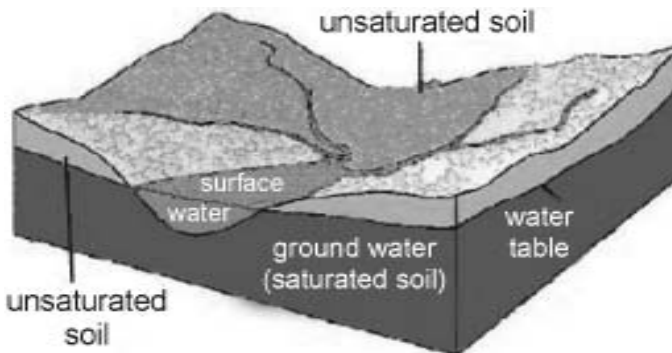
Rivers are to be kept healthy. Governance for regulations has to be there. Efficiency in water usage in agriculture has to be improved. Water saved will be water available. Since water is central for economic development and quality of life it is time for Government/Corporate/NGOs to come out of the silos. Water Resources Department has to take the lead for the all round development, where irrigated agriculture and industries have to coexist and keep the rivers healthy for the future generation as the custodian of the pristine resources.

### **Some of the Thoughts to Share**

- Large scale Water Resource Project construction has become extremely difficult. Management of Water Resources should be centre of action.
- Agricultural development and industrial development have to coexist; hence industries have to join hands for improving water use efficiency in the largest water consuming sector i.e agriculture. Water saved in agriculture will be water available for use in other sectors.
- River health monitoring and management should be key for improving quality of life and sustaining the eco-system.
- For integrated water resources management and considering the tasks for total socioeconomic development of river basins we need to create separate organisations for river valley development say, Tel Development Corporation/ Baitarani River Basin Organisation, etc.
- Interstate water grids can be established by transferring surplus water to deficient areas.
- As the climatic conditions are changing and extreme events of flood and drought are going to be more and more pronounced there has to be a mechanism for assessment of water availability. Advantages have

to be taken from developments in information technology, electronics, and automation and used extensively for integrated water management.

- More and more youth are to be encouraged to have start ups in the largest sector of water and agriculture.
- With industrial advancements the rivers are going to be increasingly polluted. Therefore, strong monitoring and regulatory mechanisms have to be in place.
- The Brahmani basin is a small basin as compared to Mahanadi. Therefore, transfer of water from Brahmani through Rengali Right Canal to Mahanadi Basin should be reviewed. Rengali Right Canal at Athagarh can be fed from Mahanadi during kharif and the water can be stored in Brahmani for domestic and economic use in the industrially developing cities such as Talcher~Angul~Kalinganagar~Dhenkanal.
- Pressurised pipe irrigation and micro-irrigation is to be promoted.
- Solar power schemes and lift irrigation schemes are to be converged.
- Irrigated command areas should be considered as the unit for socio-economic development. It should be professionally managed by engineers, agronomists, economists, environmentalists and sociologists under the broad umbrella of state level integrated plan which aims for economic development of the farming community.





**Er. Nanda Kumar Mohapatra**

Former Chief Engineer, Irrigation

Er. Nanda Kumar Mohapatra, born in Puri in 1955, studied BSc Engg (Civil) in Burla in 1978 and completed ME in Water Resources Development in University of Roorkee and served as an officer trainee. Er Mohapatra joined Government of Odisha in 1980 and served in various capacities at places like Balimela, Potteru and Upper Indravati Project. His prime area of interest is in Water Sector Reform. As Chief Construction Manager he planned, designed and managed construction of 29 hospitals and 3 Ekalavya Model Schools. As Director and Chief Engineer of Odisha Water Planning Organisation Er Mohapatra gave shape to Water Allocation, Water Services and Tariff Policies. Due to his leadership the flagship Mega Lift Irrigation Project of the state is under execution in 17 districts of the State. On various assignments he visited USA, Australia, Philippines, Indonesia, Kualalampur, Vietnam and Thailand. After retirement Er Mohapatra served as Advisor to the Govt for two years and presently he renders consultancy services.



# Industrial Safety

(Date of presentation: 23.10.2016)

**S. K. Tamotia**

The latest incident of fire in SUM Hospital on 17.10.2016 and consequent death of 24 patients and injury to more than 40 has provoked me to begin my talk with some of the insightful quotations regarding safety.

1. *Your body is a big part of your capital: don't invest it in the "Bank of Careless Habits."*
2. *Safety is not a gadget but a state of mind.*
3. *Safety doesn't happen by accident.*

We know and we are aware about all these philosophies and when accident occurs, everything is forgotten. The history of Indian industries bear a lot of testimonies of unfortunate memories of industrial accidents and the most unforgettable one is the Bhopal gas tragedy that occurred in the night of 2-3 December 1984. It has virtually shaken the nation. The scale of it was numbing— more than 3,500 people died and 500,000 were injured in the immediate aftermath of the leak of methyl isocyanides gas from Union Carbide India Ltd's pesticide factory. Generations have been left maimed.

Before that the Chasnala Mine Disaster occurred on the evening of 27 December 1975, and killed 372 miners in Dhanbad. An explosion rocked the Chasnala Colliery in Dhanbad and the explosion was most likely caused by sparks from equipment igniting a pocket of flammable methane gas. Clouds of coal dust rose by the explosion and accompanied shock wave.



Chasnala Colliery in Dhanbad

One more industrial accident is the Jaipur oil depot fire which broke out on 29 October 2009 at 7:30 PM at the Indian Oil Corporation oil depot's giant tank holding 8,000 kilolitres of oil, in Sitapura Industrial Area on the outskirts of Jaipur, Rajasthan, killing 12 people and injuring over 200. The blaze continued to rage out of control for over a week and during the period half a million people were required to be evacuated from that area. The incident occurred when petrol was being transferred from the Indian Oil Corporation's oil depot to a pipeline. There were at least 40 IOC employees at the terminal, situated close to the Jaipur International Airport when it caught fire with an explosion.

The 2009 Korba chimney collapse is another sad story that occurred in the town of Korba in the state of Chhatisgarh on 23 September 2009. It was under construction by BALCO when the chimney collapsed on top of more than 100 workers who were taking shelter from a thunderstorm. At least 45 deaths were recorded in this shocking event.

Next let us think about the Mayapuri radiological accident on 14 April 2010. The total number of lives lost in the explosion is estimated at more than 800, although some estimates put the figure around 1,300. Besides there was a huge loss of public property and the losses are irrecoverable till today.



Mayapuri Radiological Accident

Accidents that occurs at workplace can be categorized as:-

1. Workplace fatal and non-fatal
2. Physical injuries due to accidents
3. Suffering from occupational diseases due to toxic exposures at the workplace
4. Detrimental health effects caused by environmental exposures

A recent issue of Indian Labour Statistics published by the Ministry of Labour's (MoL) reports an average annual incidence of 1,400 fatal and one lakh non-fatal accidents in non- domestic workplaces. The same document also provides fatal and non-fatal injury rates for the workforce for which accidents are reported. Based on these rates, fatal accidents can be estimated to range between 50,000 and 75,000 and non-fatal accidents 5 to 7.5 million per year for the entire workforce in India. If mortalities due to all causes were considered for Indian workers in the age group 15-60 years, workplace fatalities contribute premature deaths in this population to the extent of 5 per cent.

***It is a basic human right to return home safely from work.***

Major socio-economic developments are also changing the scale and pattern of accidents and its associated risks. Transportation, for instance, is expanding tremendously, involving much larger volumes of people and goods to much longer distances. Technological advancements no doubt have reduced the probability of accidents but when it happens the scale of damages is catastrophic.

At an individual level, the personal costs of an accident, emotional and financial, can be high. The pain and mental distress can cause a major life change. From a corporate perspective, accidents disrupt production, thus increasing costs and sometimes undermining the organisation's reputation. The net effect of occupational accidents is a significant national economic loss. Depending on the country, costs vary from 1-3% of gross national product. These costs ultimately fall on all citizens, both taxpayers and consumers. The question is: 'Are we really willing to continue to pay this high price?'

Accident rates at work have remained persistently high over the last decade. The positive news is that detailed long and short-term analyses have shed valuable light on the causes of the accidents and the risks



involved, indicating powerful preventive measures. A number of conferences and symposia are being explored and journals and magazines are dedicated on this theme for preventing accidents at work and minimizing health hazards on account of poor environment management.

Out of my long standing experiences as the CEO of industries and institutions I want to place before you, some of my insights and understanding on formulating strategies for minimizing industrial accidents.

### ***Creating an organisation's vision for zero accident:***

This means changing the mindset of all the stakeholders of the industries including the employees that accidents are preventable and organizations should thrive for zero accident vision to bring radical changes in the safety parameters of the industries.

### ***Establishing Performance-related safety initiatives:***

This may include preparing a detailed action plan for implementation of new management practices for:-

- Better working environment,
- Installing environment friendly infrastructure,
- Creating sustainable awareness towards safety and environment through developmental activities; and
- Overall encouraging the departments and divisions with zero accident i.e. zero man hour loss from accidents with adequate reward and incentive programs.

### ***Developing leadership to practice safety as a core value of the organization:***

I feel leaders need to see always “beyond safety” as an added value. They have to place human capital and their safety precisely at the focal

point of their operational energy. Enhancing safety performances by visibly committed to it has to be the prime responsibility of the leader. This will not only foster trust between management and team members to establish the core value, but also will involve employees for formulation of safety strategies.

***Adopting recent technological advancements for managing safety:***

Various technological advancements like video surveillance systems, access control solutions, advanced fire safety solutions, addressable mass notification systems, mobile security management etc. can make significant value addition in the safety management system of the organization.

I am sure, the future will bring out a lot of new ideas and insights that will go a long way in changing the safety management systems and processes in order to make the working environment safer, healthier, productive and more enjoyable.



Everyday thousands of people die as a result of work place accidents



**Dr. Shailendra Kumar Tamotia**

Dean cum Director General and Vice Chairman,  
Centre for Communication and Management,  
Bharatiya Vidya Bhavan, Bhubaneswar.

Flat No- D 801, Block-D, Gymkhana Palm Heights, Near SUM  
Hospital, Shampur, PO- Ghatikia, Bhubaneswar- 751003,  
E-mail: sk\_tamotia@yahoo.co.in,  
Mob: 9937011356, Tel: 0674-2386789/2386999

Born on 25.09.1939 Dr Shailendra Kumar Tamotia is an Engineer by profession who started his career in 1962 from Bhilai, but in the span of next 50 years he stood taller as a person with many ‘firsts’, many ‘Fellowships’, many ‘honours’ and many ‘awards’ with appreciations in 1990s by Chief Minister of Odisha for his contribution to the Industrial Growth of Odisha, and the Prime Minister of India for his leadership in managing NALCO. Dr Tamotia is recognized among the country’s top project managers with impressive track record in steel industries and then in aluminium industry in India. Personally he led the planning and commissioning of several mega projects in the country including commissioning of the Kudremukh project.

From June 2006 Dr Tamotia is the Hon. Dean cum Director General & Vice Chairman of The Centre for Communication & Management at Bharatiya Vidya Bhavan. He was Principal Advisor to Magnesium International in Australia in 2005-2006, Vice Chairman- VISA International Limited, and earlier to that he was either President or Chairman or the Chief Executive in INDAL, Aditya Aluminium, HINDALCO, NALCO, Kudremukh Iron Ore Co. Ltd, and Hindustan Steel Works Construction Ltd. One of his softer aspect is promotion of Art & Cultural heritage in the State of Odisha. Dr Tamotia has published many research papers, edited a number of books on aluminium technology and various area of management. He is a member in several Advisory Boards of Research Committees like the former RRL, Bhubaneswar, NML Jamshedpur, JNAARDC Nagpur, and Institute of Advance Technology and Environmental Studies. He is a member in research Review Committee of CSIR at NML Jamshedpur for utilization of electronic waste. In 1987 Dr Tamotia went to Henley Business School, OXON (UK) for one of the several specialised trainings abroad. He is a Member of many Professional /Academic Bodies. He is a Professor holding Political Harmony Chair at the Institute of Advanced Studies in Education (IASE) Deemed University, Rajasthan.

# **Inter Linking of Rivers in India: Problems & Prospects**

*(Date of Presentation: 06.11.2016)*

**Binayak Rath**

## **Genesis of ILR**

In view of the draught-flood syndrome faced in different parts of the country owing to large scale variations in precipitations, the Government of India has recently revived the proposal of inter-linking of rivers (ILR). In the mid-19<sup>th</sup> century, Col Arthur Cotton a Madras Presidency engineer was the first person to conceive the idea of networking the rivers (Ganga-Cauvery link) to improve connectivity for navigation purposes. But with the expansion of railway connectivity in the eastern coast of India connecting Calcutta to Madras, the idea was shelved. But a part of it, viz. Mahanadi-Ganga link via Brahmani-Baitarani-Budhabalang and East Coast Canal was completed to provide irrigation and navigation opportunities and was operational till 1930s when Visweswarayya committee recommended to demolish a portion of the network to check recurrent flooding in the Mahanadi-Brahmani system. In the post independence period, the linking of Indian rivers was resurrected by Dr. K.L. Rao in terms of “Ganga-Cauvery link” in 1972 and also by Captain Dinshaw Dastur in the form of “Garland Canal scheme” in 1977. Both the proposals were rejected as they were technically unfeasible and the financial costs were prohibitive. However, in the 1980s, the conceptualisation of networking of rivers was resurged as a part of our planning process with the formulation of a National Perspective Plan (NPP) by the Ministry of Water Resources, Govt of India. The NPP had envisaged for two river development components, viz., Himalayan component and the Peninsular component. Accordingly, in 1982 the National Water Development Agency (NWDA) was established to carry out detailed studies and develop feasibility reports of the links as proposed under the NPP. Thirty links were identified for preparation of feasibility reports (16 under Peninsular and 14 under Himalayan component) for water resource development through regional water transfer to minimize regional imbalances. While the Himalayan component has entailed construction of reservoirs and canals on the main tributaries of the Ganga

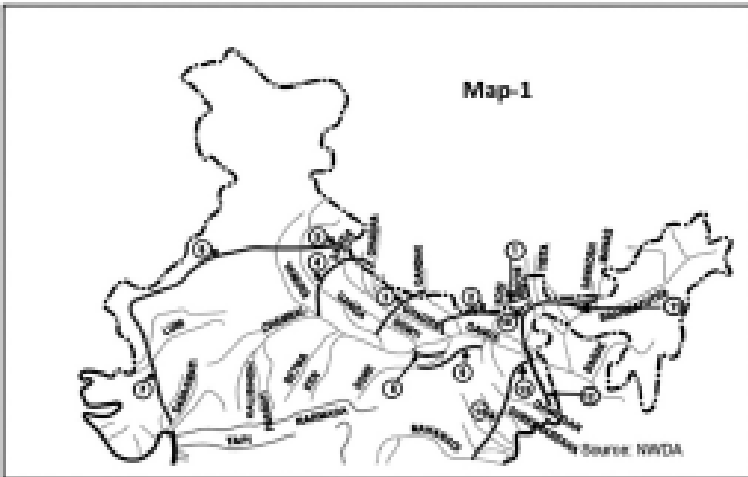
and the Brahmaputra to transfer excess water to the west, the peninsular river interlinking has two components, one of interlinking the peninsular rivers themselves and the other of linking the Ganga to the peninsular rivers. Taking into consideration the need of transferring water from the surplus region to the deficit region, in 2002 the Supreme Court of India ordered the Government of India to complete the ILR project within the next 12–15 years. In response to this order, the GoI appointed a Task Force headed by the Minister. Scientists, engineers, ecologists, biologists and policy makers started to ponder over the technical, economic and eco-friendly feasibility of this gigantic project costing about Rs 560,000 crore. To expedite the planning process of ILR and its execution, the Government placed it in a Mission mode in 2003.

In this paper, it is attempted to critically examine the various facets of the ILR in terms of its progress and potential benefits as envisaged by the Government of India, possible problems faced in execution, the social benefit cost aspects of the link, environmental impacts, and its regional conflict dimensions as well as international ramifications. Particularly, we have focused on analysing the scope of Mahanadi-Godavari link, which is considered as a critical link of the Mahanadi-Godavari-Krishna-Pennar-Cauvery-Vaigai-Gundar under Peninsular Component of NPP.

### **The Components of ILR and its Progress:**

Before examining and assessing the environmental impact of the project in terms its economic, social and bio-physical environment, it is essential to know the planning of this project in brief. Basically, a large amount of water from rivers flows into the sea, which should be prevented to enable transfer of water from surplus river to water-deficit areas for domestic, agricultural, industrial and other activities. As mentioned above, in the proposed ILR there are 30 links identified for preparation of feasibility reports for water resource development through regional water transfer to minimize regional imbalances. The maps 1 and 2 below show the proposed links of Himalayan component and the peninsular component with Mahanadi-Godabari Link.

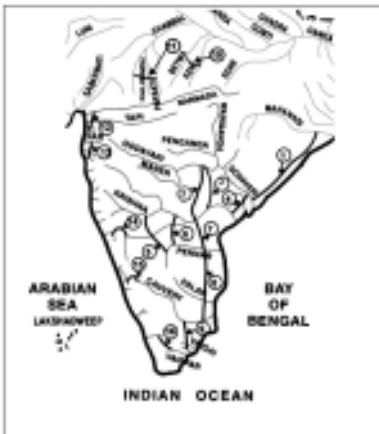
## PROPOSED INTER BASIN WATER TRANSFER LINKS HIMALAYAN COMPONENT



- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Kosi – Mechi</li> <li>2. Kosi – Ghagra</li> <li>3. Gandak – Ganga</li> <li>4. Ghagra – Yamuna *</li> <li>5. Sarala – Yamuna *</li> <li>6. Yamuna – Rajasthan</li> <li>7. Rajasthan – Sabarmati</li> </ol> | <ol style="list-style-type: none"> <li>8. Chunar- Sone Barrage</li> <li>9. Sone Dam – Southern Tributaries of Ganga</li> <li>10. Haras –Sankosh - Tista - Ganga</li> <li>11. Jogighopa – Tista – Farakka (Alternate)</li> <li>12. Farakka – Sunderbans</li> <li>13. Ganga (Farakka) – Damodar – Subernarekha</li> <li>14. Subernarekha – Mahanadi</li> </ol> <p style="font-size: x-small;">* FR Completed</p> |
|---|--|

## Water Transfer Links

### PENINSULAR COMPONENT



1. Mahanadi (Manibhadra) – Godavari (Dowlaiswaram)
2. Godavari (Inchamgalli) – Krishna (Pulichintala)
3. Godavari (Inchamgalli) – Krishna (Nagarjunasagar)
4. Godavari (Pelavaram) – Krishna (Vijayawada)
5. Krishna (Almati) – Pennar
6. Krishna (Srisailem) – Pennar
7. Krishna (Nagarjunasagar) – Pennar (Somasila)
8. Pennar (Somasila) – Cauvery (Grand Anicut)
9. Cauvery (Kottalai) – Vaigai – Gundar
10. Ken – Betwa
11. Parbati – Kalisindh – Chambal
12. Par – Tapi – Narmada
13. Damanganga – Pinjal
14. Bedti – Varda
15. Netravati – Hemavati
16. Pamba – Achankovil – Vaippar

- The Himalayan component entails construction of reservoirs and canals on the main tributaries of the Ganga and the Brahmaputra covering the states of Assam, West Bengal, Bihar, Jharkhand, Odisha, Uttar Pradesh, Madhya Pradesh, Haryana, Rajasthan and Gujarat to transfer excess water from east to the west. In terms of completion of the link, it is proposed to be completed by 2043 instead of 2016.
- The peninsular river interlinking has two components, i.e., one of interlinking the peninsular rivers themselves involving the rivers of Odisha, Andhra Pradesh, Telangana, Tamil Nadu, Karnataka and Kerala, and the other of linking the Ganga to the peninsular rivers via West Bengal, Bihar and Odisha (a part of Himalayan link). It is now proposed that by the year 2035 the Peninsular Link Projects would be completed.
- One of the important and critical components of the peninsular link is the Mahanadi-Godavari link involving Government of Odisha and Government of Andhra Pradesh. It is proposed to link Mahanadi from Manibhadra site to Godavari at Dowlaiswaram.
- Odisha is the only state having both the Himalayan component as well as the Peninsular component.

The major objectives of the project are flood and drought control, improvement of agriculture through irrigation network, drinking water supply, alternative transport and navigation, additional power generation, higher GDP growth with income generation, and both direct and indirect employment generation. Other associated benefits are likely to flow in the form of externalities such as fisheries, recreation, trade and service opportunities.

It was initially proposed that water from surplus area is to be transferred to deficit area either by gravity flow (tunnelling through mountains) or by lifting across natural barriers. It was designed with the concept that it would improve the living standard of the people of the country with higher growth of income and employment. The completion of this project would result in constant water supply for domestic use, agriculture and industries along with flood control, improvement in water flow, navigation, food security, etc. Construction of dams, canals, etc. and their maintenance would create opportunities for new jobs, which would check the migration of people from villages to cities.

The overall implementation of ILR programme under National Perspective Plan would give benefits of 35 million hectares of irrigation, raising the ultimate irrigation potential from 140 million hectare to 175 million hectare and generation of 34000 megawatt of power, apart from the incidental benefits of flood control, navigation, water supply, fisheries, salinity and pollution control etc.

### **Progress in Execution of ILR**

The National Water Policy, 2002 had focused on national perspectives and transfer of water from one river basin to another to meet the demands of water scarcity regions. Moreover, the former President of India, APJ Abdul Kalam in his broadcast to the nation on the eve of the Independence Day on 14<sup>th</sup> August, 2002 had laid emphasis on inter-linking of rivers. Taking queue from the then President, the Prime Minister of India on his Independence day speech on 15<sup>th</sup> August, 2003 also reiterated that the ILR would be taken up in a Mission Mode. The main objective of the National Water Mission (NWM) was “conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within states through integrated water resources development and management”. Under the Mission it was emphasised that the feasibility studies of ILR be undertaken without any further delay. In order to avoid the possible conflicts of ILR, the National Water Policy, 2012 focused on inter-regional, inter-state, intra-state, and also inter-sectoral disputes in sharing of water; the strained relationships that hamper the optimal utilization of water through scientific planning on the basis of river basin and sub-basin transfers.

In view of the slow progress of execution of ILR, a PIL was filed in the Supreme Court of India and the Court directed GoI to expedite the progress. In response to the decision of the Hon’ble Supreme Court, the Union Cabinet in its meeting held on July 24, 2014 approved the constitution of the Special Committee. In the first meeting of the Special Committee for ILR it was decided to constitute four specific sub-committees.

- i) Sub-committee for comprehensive evaluation of various studies / reports
- ii) Sub-Committee for system studies for identification of most appropriate alternate plan

- iii) Sub-committee for consensus building through negotiations and arriving at agreement between concerned States and
- iv) Sub-Committee for restructuring of NWDA.

Eight meetings of the Committee had been held and it had considered the views of all the stakeholders. Vigorous efforts had been taken up by the committee for generating consensus with development of alternative plans and also setting out road maps for implementation of mature projects. Further, a Task Force for ILR with experts drawn from relevant fields was constituted by the Ministry on April 13, 2015 to examine various issues associated with ILR and to advise the Government for phase-wise implementation of the ILR. A Group on Intrastate river links has been constituted by MoWR, RD & GR on 12.03. 2015. The Group has reviewed all relevant issues on intrastate river links including the definition of such link with consideration and suggestions about the funding of intra-state river link projects. The Group has held various meetings and submitted its report on 28.05.2015 to the Ministry of Water Resource, RD & GR.

As regards the progress of work, in phase I, the Ken-Betwa link project has been declared as National Project by the Government of India. Terms of Reference (TOR) for Environmental Impact Assessment (EIA) study for environmental clearance of the Project has been got approved from Ministry of Environment and Forests and Climate Change on September 15, 2014. In a high level meeting, it was discussed for implementation of Ken – Betwa link under a Special Purpose Vehicle. The public hearings for the Ken – Betwa link project were held in December, 2014 and detailed proceedings / documents of the public hearings had been submitted to Ministry of Environment and Forests and Climate Change by Madhya Pradesh Pollution Control Board in April, 2015. Revised Environmental Impact Assessment (EIA) Report had been submitted to the Union Minister of Environment & Forest and C.C. in July, 2015 and the Expert Appraisal Committee (EAC) of MoEF & CC for environmental clearance had discussed it in three sittings for its clearance. The wildlife clearance of Ken-Betwa Link Project, Phase-I had been cleared and recommended by the State Wildlife Board of Madhya Pradesh in its meeting held on 22nd September, 2015 under the Chairmanship of Hon'ble Chief Minister, Madhya Pradesh. The proposal had been submitted to MoEF&CC by PCCF (wildlife), MP in December, 2015 for

consideration by NBWL. The matter was under discussion in the meeting of NBWL held on 26.02.2016. The FRA certificates for diversion of forest land in respect of Chhattarpur and Panna Districts have been received. The technical approval of Catchment Area Treatment (CAT) Plan from Chief Conservator of Forests Chhattarpur, Sagar, Damoh has been received. All required details/documents have been submitted to the Forest Department, MP and uploaded on MOEF & CC website. The Forest Department, MP is processing the case of forest land diversion clearance. Thus the various clearances for Ken – Betwa link project are in the advance stages and the Government will start implementing this National Project as model link project of ILR programme after the statutory clearances. The phase II of Ken-Betwa Link involving MP and UP is also in progress.

The MOU for preparation of DPRs of Damanganga – Pinjal & Par-Tapi-Narmada links had been signed by the Chief Ministers of Gujarat, Maharashtra and Union Minister (WR) in the presence of Hon'ble Prime Minister on 3.05.2010.

The DPR of Damanganga – Pinjal link was completed in March, 2014 and submitted to Governments of Maharashtra and Gujarat. The Municipal Corporation of Greater Mumbai (MCGM) which had been made the nodal organization by Govt. of Maharashtra had submitted the Detailed Project Report of Damanganga – Pinjal link project to Central Water Commission during January, 2015 for appraisal. Hon'ble Minister (WR,RD&GR) held a meeting with the Hon'ble Chief Minister of Maharashtra at Mumbai on 7<sup>th</sup> January, 2015 to expedite the further course of action on the project. The issue was discussed in the 8<sup>th</sup> meeting of Special Committee on ILR held on 08.02.2016 chaired by Hon'ble Minister of Water Resources River Development Ganga Rejuvenating, wherein it was observed the negotiations may be expedited. Further, it was suggested that the discussion may be taken up at the Governmental level.

The Detailed Project Report (DPR) of Par-Tapi-Narmada Link Project had been completed by NWDA in August, 2015 and submitted to Government of Maharashtra and Government of Gujarat. The matter was discussed during the 8<sup>th</sup> meeting of the Special Committee on ILR held on 08.02.2016 chaired by Hon'ble Minister of WR RD & GR wherein the members desired that the process of water sharing agreement between the two States may be expedited.

A fresh Memorandum of Understanding (MoU) on water sharing between Gujarat and Maharashtra for Damanganga-Pinjal and Par-Tapi-Narmada link project is proposed to be signed which would pave the way for implementation of these link projects.

Manas-Sankosh-Teesta-Ganga (MSTG) link envisages diversion of 43 BCM of surplus water of Manas, Sankosh and intermediate rivers, for augmenting the flow of Ganga and provide 14 BCM of water in Mahanadi basin for further diversion to South through Peninsular link system.

Pre-feasibility Report of MSTG link was completed in 1996 and the Feasibility Report (FR) as per the original alignment could not be completed as Manas-Sankosh-Teesta link is passing through Manas Tiger Reserve, Buxa Tiger Reserve and other forests.

Considering practical difficulties for surveys and investigation in the area, now NWDA has carried out alternate alignment studies avoiding various reserved forests with about 80 m lift. The Hon'ble Union Minister (WR, RD & GR) has sent a D.O. letter to Hon'ble Chief Minister, West Bengal on December 2015 soliciting her support to the link project, which would provide large benefits of irrigation, drinking water and flood control to Assam, West Bengal and Bihar. The Feasibility Report of the Manas-Sankosh-Teesta-Ganga link for alternate alignment is under final stage of preparation.

### **Cost Escalation and International Ramifications Aspects of ILR**

Due to the high cost involved in the project, there have been talks about privatization of this project; but by allowing the private sector to invest in this project, the rights of the people for water resources may be affected. The private participation efforts in India had failed earlier. Before examining and looking forward to a loan from the World Bank or the Asian Development Bank, it is desirable that we should consider the financial and physical position of repaying capacity of the loan as we are already running in debt.

India is also having water-related conflicts among its states, e.g. Haryana and Punjab, Karnataka and Tamil Nadu, and the recent conflict between Odisha and Chhatisgarh. Already Bihar, West Bengal, Maharashtra, Kerala, Assam, Punjab and Rajasthan have opposed the ILR proposal. Bihar has always argued that its water needs have not been met with from the Ganga. The proposed canals will carry water through many

neighbouring states and each state will claim a portion of water, which may be a big problem to be tackled.

As regards the dams proposed to be constructed on the Brahmaputra and Ganga or its tributaries; neighbouring country like Bangladesh, which is a lower riparian state has already objected to and its murmur was reflected in our presence at Stockholm Water meet in 2003. Besides, Nepal and Bhutan are also expected to be affected by this project.

Some experts have proposed other alternatives of solving the water and food problems in India. Decentralized local rainwater harvesting, reviving and improving traditional techniques can meet essential requirements more effectively and at a far lesser cost. There is much scope for increasing the efficiency of the irrigation systems in place by reducing waste and through better water management. Besides, the optimal use of existing projects, traditional water-harvesting projects and recharging groundwater may be useful as alternative sources. According to UNICEF and the WWF, if the precipitation within the watersheds or sub-basins is harvested and conserved properly, domestic water needs will not be a problem in most parts of the country.

The most important points to be considered are the cost, in comparison to other alternative methods to control water and food scarcity and the impact on our economy and the environment. The project should be undertaken with full recognition of the serious ecological damages that may be caused by interlinking rivers and that the benefits should far outweigh these costs. Interlinking of rivers should be subjected to a more comprehensive and realistic assessment. There is need for examining the pre-suppositions on which the interlinking project is based.

Besides, all Indian states and neighbouring countries like Bangladesh, Nepal and Bhutan should also be brought into confidence before execution of this gigantic ILR project.

Furthermore, Indian policy planners those who are advocating the ILR should also learn from the fate of interlinking of river systems in Australia during mid-1940s. The interlinking of rivers in Murry Valley in South Australia has severely affected the environment with rivers turning saline, natural eco-system withering away, and water along the natural course of the river drying up.

Thus, the possible side effects of this mammoth project in terms of its impact on socio-economic, R&R effects, physical as well as socio-cultural environment should be examined and the possible debilitation impacts on the local population and in the region be properly investigated. Moreover, by undertaking SES and EIA studies in the project area, possible remedial measures be worked out to minimise the negative impacts or proper scientific planning be undertaken before its execution.

### **Mahanadi-Godavari Link Components**

Since our focus has been on examining the Mahanadi-Godavari Link Components and particularly its feasibility and impact on Odisha, we have attempted to discuss the various components associated with it. As water from perennial sources like Ganga and Brahmaputra are relevant for success of the Mahanadi-Godavari link, we have undertaken assessing the feasibility aspects of a part of Himalayan Component, i.e., Ganga-Damodar-Subarnrekha link and Subarnrekha-Mahanadi Link along with the Mahanadi-Godavari Link. The maps show that the Ganges water is proposed to flow to Mahanadi at the proposed dam site at Manibhadra connecting Cuttack and Nayagarh districts. It is estimated that the Mahanadi-Godavari covering the canal length of 827.7 km would cost Rs 17,540.54 crore,

As shown in the map above, Mahanadi Godavari link is the first and critical link of nine link system of Mahanadi-Godavari-Krishna-Pennar-Cauvery-Vaigai-Gundar under Peninsular Component of NPP. The Government of Odisha was not agreeable for the Mahanadi (Manibhadra) - Godavari (Dowlaiswaram) link due to large submergence involved in Manibhadra dam proposed under the link project.

As decided during weekly review meetings taken by the Hon'ble Minister for Water Resources, RD & GR on December, 2014, NWDA had examined feasibility of Mahanadi – Godavari link to address concerns of Govt. of Odisha due to considerable submergence involved in Manibhadra Dam in Mahanadi – Godavari link. Alternate proposals of Manibhadra – Mahanadi with reduced submergence had been prepared and discussed with Principal Secretary, WRD, Odisha on April, 2015 by DG, NWDA. Based on the suggestions of WRD, Govt. of Odisha, NWDA has proposed a revised preliminary proposal of Mahanadi-Godavari link project with reduced submergence. A presentation on the revised proposal of Mahanadi-Godavari link project was made to the

Hon'ble Chief Minister, Govt. of Odisha on May 2015 by the senior officers of MoWR, RD & GR. Due to variation in availability of water/water balance of Mahanadi basin at proposed Manibhadra dam site, it was decided that NIH will carry out system studies of Mahanadi-Godavari link project (Flood moderation study) and NIH has taken up the study. Hon'ble Minister (WR,RD&GR) held a meeting with the Chief Minister of Odisha on 3.2.2016 at Bhubaneswar regarding Mahanadi- Godavari link project. A positive response is expected from Govt. of Odisha in this regard.

### **Mahanadi-Rushikulya Link Component**

Before offering my comments on the Mahanadi-Godavari Link, let me critically analyse the feasibility of the Mahanadi-Rushikulya Link Component for which there has been a pressure from some political leaders, activists and NGOs from Ganjam District. Linking of these rivers is also part of the greater river- linking proposal Mahanadi-Godavari Networking Scheme. Hence, they urged Odisha Chief Minister Naveen Patnaik to personally review the matter so that the Mahanadi and the Rushikulya of Odisha could be linked in the first phase. They allege that though the National Water Development Agency (NWDA) had already submitted a report regarding the proposed Mahanadi-Rushikulya river linking project to Odisha government about a decade ago, the State government is yet to take any concrete decision regarding it. In this regard the water resources department of the State Government has declared that it will respond to the Central Government after studying the report. Vice-president of RBM said it is an irony that the State Government is yet to study the report of the NWDA although it was with the Odisha Government for the past several years. Political Leaders in Odisha have continued to support the demand of the RBM to link the Mahanadi and the Rushikulya. As per the survey report of Mahanadi-Godavari Networking Scheme, a 224-km canal will connect the Mahanadi with the Rushikulya in Odisha and from the Rushikulya river, a canal will connect with the Godavari river. This canal is proposed to start from Barmul point on the Mahanadi and will meet the Rushikulya at Kavisuryanagar in Ganjam district. According to the RBM, except during monsoons, the Rushikulya remains dry most of the months. The Mahanadi experiences floods. The link canal between these two rivers will reduce floods in the Mahanadi basin and curb the drought-like situation in Rushikulya basin.

Even though the above arguments of RBM and the political leaders hold some truth and are justified from a micro point of view, I would like to argue that further investigations and studies are required before drawing any concrete policy action. To the best of my knowledge neither the technical details, nor the socio-economic feasibility as well as environmental feasibility studies in terms of EIA have been undertaken by the NWDA nor by Government of Odisha. So the arguments of RBM are premature. Besides, we should examine the socio-economic and environmental feasibility of entire Mahanadi-Godabari Link rather than considering a small phase of it. This portion of the ILR should be subjected to a more comprehensive and realistic assessment. Hence, there is a need for critically examining the pre-suppositions on which the interlinking project is based.

### **Comments on the Mahanadi- Godabari Link**

Attempt has been made to critically examine various facets of the link in terms of its potential benefits as envisaged by the Government of India, possible problems faced in execution, the social benefit cost aspects of the link, environmental impacts, and its regional conflict dimensions as well as international ramifications. Though, I have tried to examine these aspects with the help of primary data from the field officials, the non availability of relevant data posed serious problems for a quantitative analysis. Hence, I have analysed the issues, problems and prospects with the help of secondary information as well as on the basis of my field experiences gained from other project sites including international experiences in different periods of time. Some of the Water Resource development studies undertaken by me earlier those had provided base for my analysis are my study of Brahmani- Mahanadi system in 1980, Bench Mark Study for Estimation of Indirect and Secondary Flood Control Benefits of the RMP, Orissa in 1988, my manuscript titled Planning, Implementation and Operation of Irrigation Projects in India, 1992, Sarada Shayak Command Area Study undertaken in late 1980s, Rama Ganga impact assessment study, 1990, and Impact Evaluation Study of “Biju Krushak Vikas Yojana & Pani Panchayat in all KBK Districts under RLTA”, 2008. In addition to these studies, in 1999 I had visited Adelaide, Australia to examine the river link consequences in Australia- Murry Valley and the consequent salinization. Besides I had visited NWDA office at Hyderabad in 2004 to collect some primary information from them.

On the basis of experience gained from the above studies, I have noted the following weaknesses of the Mahanadi-Godabari link project:

- The NWDA had only established its technical feasibility but not the economic feasibility. In 2002, it had recommended for the economic feasibility study. Neither SBCA study of the link as well as the EIA along with public hearing and EMP are yet to be established. The details of land required from different villages and their ownership patterns are yet to be surveyed. Indeed, on the basis of my past studies of Mahanadi and Brahmani system and also evaluation of the MIPs from KBK region of Odisha, and also on the basis of my discussions with officials of NWDA, I can say that the proposed link would not be economically feasible (of course, it is based on my intuitive calculation of social benefits and social costs and value judgement only).
- Moreover, in view of the concerns of the world on high dams and owing to the R&R problems, I do not think that a high dam across Mahanadi at Manibhadra or Barmul would be feasible in economic terms. On the other hand, if they go for a barrage at Manibhadra, (which was the original master plan of Sir M. Visweswarayya Committee) then the water has to be lifted via pumping to a canal at higher elevation. A pertinent question is that from where to get power to pump the water and at what cost? Besides there will be enormous problems in acquiring land for the canal system which will pass via the coastal area with high productivity land.
- One of the impediments of execution of our multi-purpose water resource development projects are the cost as well as time overruns. In this regard all-India level data show that the projects like Indira Gandhi Canal Project, Rajasthan, (commenced in 1959-60), Jawahar Canal, AP (commenced in 1955-56), Western Jamuna Canal, Haryana (commenced in 1956-57) are yet to be completed. Similarly many projects commenced in 1960s and 1970s are awaiting their completion.
- Coming to the fate of projects in our state, I have noted time and cost overruns for many projects including MIPs. For instance, the Rengali Multi-Purpose project across Brahmani and its canal system started in 1972 is yet to be completed. RMP that has two components, viz., High dam at Rengali for flood control and power

generation, commenced in 1972 and completed in 1985 with cost overruns to the tune of Rs 57.92 crore in 1972 to Rs 217.21 crore by 1985 ; the Samal Barrage Project down stream with an approved cost of Rs 233.64 crore for irrigation which was inaugurated in 1977-78 by the then Prime Minister, Indira Gandhi is yet to be completed. The costs and time overruns have come under the scanner of India's apex audit institute twice. In 2008, the CAG had noted that "due to delay in acquisition of land / non acquisition of land, non receipt of forest land clearance and poor contract management, the project remained incomplete at various stages with investment of Rs 1695.61 crore (March 2008) resulting in cost overrun by Rs 1461.97 crore (626 per cent) and time overrun by 17 years.

- In addition to time and cost overruns, there are also many environmental problems associated with the canal system which is around 30-40 feet deep in some segments. The deep canals have not only blocked the elephant corridors, leading man-animal conflicts resulting in loss of property and human lives but have caused obstructions for the farmers to undertake cultivation on the other side of the canal. It has also resulted in seepage of ground water to the canal leading to deep crisis in getting drinking water.
- The RMP has also resulted in loss of ecological balance in the downstream, e.g., Bhitarkanika Mangroves located adjacent to Bay of Bengal faces a unique threat since the construction of this dam. The species of trees in the mangroves are fed by the unique combination of salt and fresh water from rivers including Brahmani River. The scientists from IMMT and Spatial Planning and Analysis Research Centre Private Limited have performed a study on effect of reduced water flow through Brahmani-Baitarani river system on the mangrove population of Bhitarkanika estuary. In their study, the scientists have found that the water flow at the mangrove delta head before and after the construction of the dam in 1985 is 19,514 million cubic meters and 17,389 million cubic metres respectively. They believe that this level may go down to 14,000 once the full potential of the project will be realised around 2025. They have warned of slow decline and disappearance of the plant species in this mangrove if a sustainable amount of water is not released into the mangroves.

- These above findings have a decisive bearing for the proposed Mahanadi- Godabari link which will exasperate the problems of farmers of Nayagarh, Khurdha, Ganjam, and Gajapati districts of Odisha and also that of the farmers of Andhra Pradesh. It will also lead to ecological imbalance in Chilika Lake and Mangroves located in the estuarine range of Mahanadi System.
- Several scientists and others are worried about river diversion, which would disturb the entire hydrological cycle by stopping the rivers from performing their normal ecological functions. This project will change the composition of the sediment load, river morphology and the shape of the delta formed at the river mouths. These aspects are neglected in the technical feasibility of the proposed link.
- Thus, it will create more of deprivations rather than opportunities for the farmers of Odisha. Hence, may I appeal the protagonists of this proposed link to initiate a process of undertaking a study of its economic feasibility. One should not try to politicise the issue and to make a mileage out of it.
- Though the NWP 2102 has emphasised on “Principle of equity and social justice must inform use and allocation of water”, it is not adhered to in the ILR.
- A pertinent question is raised in the present scenario that “Is there any surplus water in the Mahanadi after a large numbers of Dams and Barrages are constructed by Chhatisgarh over last 20 years in violation of riparian rights of Odisha”? With the recent Mahanadi water sharing dispute between Odisha and Chhatisgarh, will there be any excess water to be diverted for the Godavari system?
- Few of the possible banes of Mahanadi –Godabari Link would be loss of thick forest area, homestead land, CPR and huge cultivable land of the coastal area due to land acquisition for the project. There will be loss of livelihood of the PAPs due to loss of cultivable land, forests and other economic opportunities. The interest of backward tribals of Odisha are not taken into account nor the problems of severely drought prone areas of Western Odisha are attended in the proposed link. Besides there will be mounting R&R problems, which are usually being mismanaged by the bureaucracy in Odisha as per their track records.

- On the other hand, the possible inordinate delay in project completions and the cost escalations (as experienced in other projects) are likely to benefit the contractors, some bureaucrats and few politicians but not the common man who will bear the burdens.
- The possible regional conflicts associated with a mega project like this should be examined before execution of the project.
- Above all, the augmentation of water supply into the Mahanadi system is dependent on completion of the Manas-Sankosh-Teesta-Ganga (MSTG) link of Himalayan component that envisages diversion of 14 BCM of water from Ganges system to Mahanadi basin for further diversion to South through Peninsular link system. Though the pre-feasibility report of MSTG link was completed in 1996 and the feasibility report as per the original alignment could not be completed as it has to pass through Manas Tiger Reserve, Buxa Tiger Reserve and other forests. Considering practical difficulties for surveys and investigation in the area, now NWDA has carried out alternate alignment studies avoiding various reserved forests with about 80 m lift. The Hon'ble Union Minister (WR, RD & GR) has sent a D.O. letter to Hon'ble Chief Minister, West Bengal on December 2015 soliciting her support to the link project, which would provide large benefits of irrigation, drinking water and flood control to Assam, West Bengal and Bihar. The Feasibility Report of the Manas-Sankosh-Teesta-Ganga link for alternate alignment is under final stage of preparation, which would not be smooth sailing. It may result in a doldrum.
- Thus, my hunch is that the possible banes will outweigh projected overestimated boons, resulting in social welfare loss for the country and particularly for the state of Odisha.
- Finally, let me quote from my earlier study on linking of Indian rivers, which was presented at the think tank body of the country, viz. Centre for Policy Research, New Delhi in 2003 that “the proposed project will herald the very concept of “Tryst of Destitution” instead of Nehruvian Vision of “Tryst with Destiny”.
- In order to avoid the problems and possible destitutions, let me suggest that the Government of Odisha should not be swayed away by the projected boons as indicated in ILR. In stead of accepting

this mega projects, whose possible problems are listed above, they should go for decentralised planning of all the water resource potentials existing in the Mahanadi catchment area within Odisha with a priority on conjunctive use of water resources for attainment of sustainable development. Moreover, they should focus on reviving and rejuvenating all the defunct medium and minor irrigation projects in the Mahanadi catchment with the participation of the people and stakeholders.

- Finally, let me reiterate my 3P solutions in terms “proper planning” of our water resource projects with right kind of field investigation by adhering to a multi disciplinary approach to establish its economic and environmental feasibility; “political commitment”; and “peoples’ participation” in planning, execution and monitoring of projects.

## References:

1. Indian Rivers Inter-link - Wikipedia,[https://en.wikipedia.org/wiki/Indian\\_Rivers\\_Inter-link](https://en.wikipedia.org/wiki/Indian_Rivers_Inter-link), visited on June 21,2017
2. NCIWRDP (1999), “ Integrated Water Resource Development: A plan for action” , National Commission on Integrated Water Resource Development Plan, MOWR, New Delhi,
3. Nidhi Pasi & Richard Smardom(2012), “ Interlinking of Rivers: A Solution for Water Crisis in India or A Decision in Doubt?” The Journal of Science Policy and Governance, Volume 2 Issue 1
4. Imran Ali (2004) , “Interlinking of Indian Rivers”, Current Science, Vol. 86, No. 4, 25 February, 2004
5. Rath, B. (1979), “Water Use Decision Criteria of a Multi-Purpose Project at the Stage of Project Planning”. Proceedings of the Workshop on Conjunctive Use of Surface & Ground Waters, WRDTC, Roorkee, Vol. I, pp. CW 25-38.
6. Rath.B.(1980), “Social Benefit of the Rengali Multi-Purpose Project,Orissa,” Unpublished PhD Dissertation (mimeo),IIT,Kanpur
7. Rath B.(1985), “Bench Mark Study for Estimation of Indirect and Secondary flood Control Benefits of the Multi-Purpose Rengali Project, Orissa,Submitted to CBIP,Government of India,New Delhi,May.
8. Rath, B. (1991), “Flood Control Benefits of a Multi-Purpose River Valley

- Project-A Conceptual Framework”. Irrigation & Power Journal, Vol.48, No1, Jan., pp. 95-107
9. Rath B. (1992), Planning, Implementation and Operation of Irrigation Projects in India, QIP Project, IIT Kanpur, submitted to Ministry of HRD, Government of India, New Delhi.(mimeo)
  10. Rath, B. (1992), “Irrigation Development in India: A Blessing or Bane”, Proceedings of the Seminar on Irrigation Water Management, Water Management Forum, New Delhi, Vol.IIA, July 31-Aug. 2, pp. 265-291.
  11. Rath B. (2003), “People’s Participation for Efficient and Accountable Management of Irrigation Systems”, India Infrastructure Report – 2003, Oxford University Press, New Delhi, pp 243-246.
  12. Rath B. (2004), “3Ps of Water Resource Management In India”, the lecture delivered in the Centre for Policy Research, New Delhi, January 12, 2004
  13. Rath B.(2004), “Environmental Impact Analysis of the Linking of Indian Rivers with reference to Orissa”, the lecture delivered at the Kalinga Institute of Technology, Bhubaneswar, Orissa, May 8, 2004.
  14. Mahajan Praveen, (2008), “Environmental Impact Assessment (EIA) of a Micro Hydel Power Project in the KBK Region of Orissa”, M.Tech. Thesis, IIT Kanpur.
  15. Rath B. (2008), Impact Evaluation Study of “Biju Krushak Vikas Yojana & Pani Panchayat in all KBK Districts under RLTP”, submitted to Govt. of Orissa, Planning & Co-ordination Department
  16. Rath, B. (2012), “Scope of Public Private Partnership in Water Resource Management in India”. Direction, Indian Institute of Technology, Kanpur, Vol.12, No.2, June, pp 107-121.
  17. Rath, B. (2014), “Scope of Public-Private Partnership for Sustainable Development of Water Resource Projects in a Backward Region of India” Proceedings of the Seminar on Reforms in Management of Public Irrigation System held at Bangaluru, Karnataka, October 30-31, pp 149-162.
  18. Rogers,P.(1983), “Irrigation and Economic Development: Some Lessons from India,”Havard Univ.,Division of Applied Sciences,Cambridge,U.K.
  19. Rydzewski,J.R(1987) , “Irrigation Development Planning,” John Willey & Sons Ltd.
  20. Vaidyanathan, A.(2003) , “Interlinking of rivers, *The Hindu*, 26 March 2003.
  21. Website of MoWR, RD&GR, Government of India, Achievements of Interlinking of Rivers (ILR) Programme, visited on June 21,2017



**Prof. (Dr) Binayak Rath**

Former Vice-Chancellor, Utkal University,  
brath@niser.ac.in

Tel: 09090957071(R) 0674-2383175 (R)  
09439013585(M)

Professor Binayak Rath is presently in IIT Bhubaneswar as Adjunct faculty. The parent position of Professor Rath was in IIT, Kanpur, where his work on “Social Benefit-Cost Analysis” brought him the Ph.D. degree in 1980, and he had superannuated in June 2012 when he was Professor of Economics in the Department of HSS & EEMP. Prof. Rath also served as Professor in IIM-Lucknow and NISER-Bhubaneswar. As Vice Chancellor of Utkal University Professor Rath initiated a number of academic reforms, introduced innovations to rejuvenate the NSS activities in affiliated colleges and made improvements to make Vani Vihar a clean and green campus with the participation of all stakeholders. A few new teaching programmes were introduced on a PPP mode in the emerging areas of knowledge. Prof. Rath got his Honours and PG degrees in Economics from Utkal University, and joined Orissa Education Service and taught in Dhenkanal College (1971-1975) and Ravenshaw college (1980). For the last few years, he has been deeply involved in undertaking post-evaluation studies of a number of mining projects, particularly, in assessing their impact on the socio-economic environment including R&R aspects. Presently, he is working on environmental issues dealing with land and water management in rural and urban areas as well as in evaluation of the effectiveness of the women self-help groups and participatory irrigation management in typical regions of the country. Very often Prof. Rath is invited by academic and research institutions as well as industrial houses in India and abroad to address their special programmes. In this context or as member of Indian missions he visited many countries including Australia, Canada, England, Finland, Germany, Hongkong, Ireland, Nepal, Singapore, Spain, Sweden, Srilanka, Thailand, the Netherlands, the Peoples Republic of China, & the USA. Prof. Rath has authored more than 150 papers in national and international publications. Prof. Rath has published a book on “Employment Multiplier Linkages of the Steel Industry in India”, and authored more than twenty monographs, of which the important ones are “R&R in India: Approaches, Policies and RAP”, “Management of Water Resource Projects in India”, “Impact Evaluation Study of “BKVY and PP in KBK Districts”, and “Estimation of Chief Drivers of SDP of Uttar Pradesh”.

## **Ecofriendly Industrial Technology- a Case Study NALCO**

*(Date of Presentation: 08.01.2017)*

**Chitta Ranjan Mishra**

### **Synopsis**

An Eco-friendly, Techno-Commercially Viable, Cost-effective Industrial Scale Manufacturing Technology has been successfully developed and commercialized for Manufacture of Detergent Grade Zeolite-A from the Sodium Aluminate Liquor of NALCO's Alumina Refinery, Damanjodi. The Technology was developed in collaboration with CSIR-Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar, Gujarat through rigorous laboratory and Pilot Scale Trials over the years. Based on the technology so developed, NALCO has set up a country's largest Detergent Grade Zeolite-A Commercial Plant directly in the loop of its Alumina Refinery, Damanjodi in the year 2001 at an investment of Rs. 30 crores with indigenous technology back-up. The process has been first patented in India and subsequently patented internationally through Patent Cooperation Treaty (PCT) route. The uniqueness of the process is its adaptability to integrate into the operational loop of the Bayer Process based technology without disturbing the alumina production cycle. Use of in-process Sodium Aluminate Liquor as the main feedstock material results in excess 20 % reduction in the cash cost of production as compared to the conventional route of Sodium Hydroxide and Alumina to produce Sodium Aluminate Liquor. Detergent Grade Zeolite-A Plant was commissioned in the year 2001 and is in steady commercial operation since then. Zeolite-A produced in NALCO matches well with that of the international standards and has been well accepted by the Detergent Manufacturers for producing a wide range of Domestic and Industrial Grade Detergents. Detergent Grade Zeolite-A is a well accepted eco-friendly builder material being used extensively throughout the world in place of STPP in formulations of detergents. NALCO's Detergent Grade Zeolite-A Plant is the ONLY Plant of its kind in the world producing

Zeolite-A using Sodium Aluminate Liquor as the principal raw material. All other plants in the world produce Zeolite-A using Alumina Hydrate as the Principal Raw Material. Since Sodium Aluminate Liquor is the Precursor to Alumina Hydrate in the Bayer Process for production of alumina, the process employed by NALCO in Damanjodi for production of Zeolite-A is the MOST COST COMPETITIVE in the entire world. The Technology so developed was adjudicated as the Best Chemical Technology Developed in India and 3<sup>rd</sup> World Countries in the year 1997, 1998 and 2002 and has been awarded Nationally and Internationally. The Technology has been recognized as the Brain Child of Dr. C.R.Mishra.

## 1. Introduction

Zeolites are Aluminosilicate minerals that contain alkali and alkaline-earth metals such as Sodium, Potassium and Calcium and water molecules within their structural framework  $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 2 \text{SiO}_2 \cdot 4.5\text{H}_2\text{O}$ . They are relatively porous, enclosing inter-connected cavities in which the metal cations and water molecules reside.

Because of the presence of water, the Zeolites swell and boil upon heating, and they were named by the Swedish Mineralogist A.F. Cronstedt in 1756, in allusion to this property (i.e., from the Greek Zein, “to boil” and lithos, “stone”). The cations and the water molecules have considerable freedom of movement within the framework of aluminium, oxygen and silicon atoms. This gives the Zeolites the properties for cation exchange and reversible dehydration. The porous framework of the Zeolites enables them to act as molecular sieves, i.e. they are used to separate molecular mixtures on the basis of the size and shape of molecular compounds or for the selective adsorption of gases.

These unique properties of Zeolites are utilized in diverse industrial process such as the purification of water as well as other liquids and gases, chemical separations, catalysis and the de-contamination of radioactive wastes.

## 2. Detergent :

Mineral Detergent Builders have experienced major changes over the past 40 years. With more and more nations banning detergents based on

Sodium Tri-Poly Phosphate (STPP), alternative eco-friendly builder material i.e. synthetic Zeolite (Zeolite-A) used as builder material has come to the centre stage. Besides the changes in use of Zeolite-A builder material, the trend towards liquid and compact detergents led to a sharp reduction in the use of Sodium Sulphate as a Filler Agent.

The Zeolite used in detergents is termed as Zeolite-A. The composition of Zeolite-A is therefore: 1 mole of Soda, 1 mole of Alumina, 2 moles of silica and 4.5 moles of water, which is equivalent to 22% water at complete equilibrium.

### **3. Zeolite-A**

In recent years, there is wide acceptance and interest in the worldwide detergent industry in the eco-friendly builder material: Zeolite-A. The principal cause for the same being the need to reduce or eliminate eutrofication, a process of diminishing the percentage of dissolved oxygen in water bodies and thereby affecting marine life, caused through the discharge of phosphates in the laundry effluents.

This civic need has resulted in rapid growth in demand in Zeolite-A as Phosphate Substitute Material in detergents and Industrial Cleaning Agents. In detergent powders, builders are required to carry absorbed liquid components of the formulations (e.g. surfactants) in order to produce a dry free flowing material.

Historically, STPP was the universally preferred builder material. This material, which contains essential plant nutrients, was originally considered to be safe and environmentally acceptable. However, it emerged during the early '70s that excessive amounts of phosphates in surface water contribute to eutrofication.

Since detergent phosphates accounted for substantial proportion (about one third) of the phosphate burden on the aquatic environment, the detergent manufacturers voluntarily developed alternatives to maintain their high environmental standards.

Synthetic Detergent Grade Zeolites (Sodium Alumino Silicates), which are similar to natural minerals, were found to be highly effective builder materials. Given their function, effectiveness and their safe ecological properties, synthetic Zeolites have been widely accepted as environmentally compatible builder materials and there has been a

continuous worldwide shift from phosphates to Zeolite usage based detergents.

It is also to be noted that due to the increasingly stringent environmental protection law to protect natural and man made water bodies, there is continuous R&D in development of more efficient builder and filler materials. Zeolite-A being not only efficient but also cost effective, has well withstood, till date, the stiff competition it faces from more expensive enzymes.

#### **4. How Zeolite-A Works:**

The main function of Zeolite-A is to soften the wash water by reducing the Calcium and Magnesium concentrations in the wash feed water. The exchange of Sodium for Calcium ions is partly dependent on temperature and alkalinity, where as for Magnesium; the ion exchange is strongly enhanced with increase in temperature.

Zeolite-A is a stable detergent builder material under all washing conditions; thus ensuring maximum builder efficiency during the complete wash process. The water softening action of Zeolite-A reduces precipitate formation, thereby decreasing deposits on textiles and on washing machine parts. Zeolite-A enhances detergent performance due to electrostatic effects and supports soil/dirt removal

The general problem in washing is the graying or yellowing of laundry, caused by deposit of solid during repeated wash cycles. Zeolite-A can minimize the above effect by removing (by adsorption) dissolved matter.

Another problem is dye transfer to non colored textiles, which is enhanced by high concentration of Sodium ions in the wash water. Zeolite-A can reduce this effect by adsorption of dissolved dyes. Compared with water soluble builders, Zeolite-A releases fewer Sodium ions; and hence, is the preferred builder material for detergents designed for brightly colored clothing.

Zeolite A, with suitable co-builder, gives excellent results in achieving superior and economic wash.

#### **5. Functional Properties and Advantages of Zeolite-A:**

Higher sequestering (removing soil or dirt particles from fabrics) power

for calcium ions is even at higher temperature. Alkaline reaction is preferable for washing (with pH less than 12)

Average particle size 4 micron and maximum size not exceeding 20 micron of Zeolite-A has made it suitable to pass through the mesh size of clothes, preventing graying thereby. Due to cubical shape with rounded corners and edges, Zeolite-A crystals do not remain on fabrics and are easily removed on rinsing.

The unwanted water-soluble dirt molecules do not finish up on the other articles but are absorbed on Zeolite particles. It coagulates the colloidal dirt and pigments causing easy removal.

The presence of Zeolite-A does not interfere with bio-degradation of Linear Alkyl Benzene Sulphonates (LABS). Zeolite-A particles tend to form aggregate with other sewage constituents and are largely eliminated in the pre- sedimentation of sewage treatment. Toxicologically Zeolite-A is safe. Zeolite-A is formulated in detergents to the extent of 25-30%

## **6. Applications and Consumer Acceptance:**

Unique combination of functional properties has led to Zeolite-A being widely accepted by detergent manufacturers worldwide.

Zeolite-A has contributed to the development of compact detergent powders through its high adsorptive capacity for surfactants. It can also be included in a wide variety of domestic and heavy duty laundry liquids (super - concentrates).

Zeolite - based compacts and super concentrates offer important environmental advantages and cost competitiveness. Most importantly, use of Zeolite-A in place of STPP adapts well into existing production facilities of detergent manufacturing.

## **7. Zeolite-A, NALCO and India's Interest:**

NALCO produces Alumina Hydrate and Calcined Alumina in its Alumina Refinery at Damanjodi employing the time tested Bayer's Process by digesting Bauxite with Caustic Soda. By digestion of Bauxite with Caustic Soda, first Sodium Aluminate Liquor is produced which is subsequently converted to Alumina Tri- Hydrate (ATH) by seeding and after calcinations of Alumina Tri- Hydrate, Calcined Alumina or Alumina is produced.

Zeolite –A was produced from two feed stock materials namely, (a) Sodium Aluminate Liquor and (b) Alumina Tri-Hydrate by reacting with Sodium Silicate. Though, both the feed stock materials were tried for production of Zeolite-A, the cost economics of using Sodium Aluminate Liquor was comparatively attractive from various techno- commercial considerations. Repeated Laboratory and Pilot scale Trials were conducted which established identical product quality of Zeolite-A matching with International Specifications.

Keeping in view the novelty of the process and its capability to be scaled up to a commercial size plant, NALCO engaged EIL, the leading Engineering Consultant of the country, for process and product optimization, designing and scaling up to a model size of 10,000 TPA capacity commercial plant.

Subsequently, a DPR was prepared by EIL and NALCO Board and Govt. of India took an Investment Decision for setting up a 10,000 TPA Commercial Zeolite-A Plant directly in the loop of Alumina Refinery , Damanjodi at an investment of Rs. 30 Crores.

NALCO being one of the lowest cost producer of Alumina in the world, took best advantage of the situation and opted for selecting Sodium Aluminate Liquor as the Principal Feed Stock Material for production of Zeolite-A instead of ATH for the same.

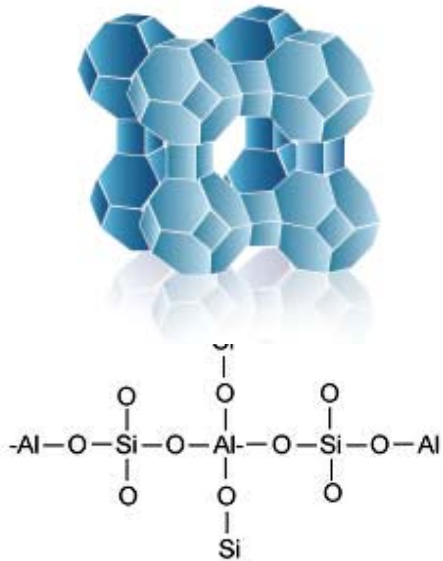
NRDC, the Technology Warehousing and Marketing Arm of Govt. of India was engaged to license the technology globally.

## **8. NALCO's Best Advantage:**

Special Investment Advantages were available in Zeolite-A Plant which was set up directly in the loop of Alumina Refinery thereby it was economical and production cost was reduced by at least 20% compared to any remotely located Zeolite Plant

NALCO had sound Raw Material Base i.e. Sodium Aluminate Liquor available for putting up such a diversification unit. Infrastructure and Auxiliary plants were also available at place. Zeolite-A and Alumina Production in the same factory increased profitability of the factory significantly and utilization of equipment were maximum. Favorable market situation both domestic and international were one of the major guiding factors for entry into such a novel area of diversifications.

Market is gradually shifting towards Zeolite based detergent manufacturing with an annual shift of 5%. Lowest production costs and high profit of synthetic Zeolite produced in the loop of alumina refinery, Damanjodi warranted NALCO to opt for entering into such a model diversification plant.



**Figure 1: Basic Zeolite Structure**

## 9. Environmental and Safety Aspects of the Project:

Production of Zeolite-A belongs to distinctly “Clean Technologies” and hence “Eco-friendly”. Production of Synthetic Zeolite-A in the loop of Alumina Refinery is a completely closed cycle without any harmful effect on environment.

Zeolite-A replaces STPP as the builder material in detergents. The usage of STPP in detergent production is legislatively banned or heavily restricted in most of the developed countries as well as in several developing countries.

Zeolite-A is completely safe from environmental point of view. It is safe from dermal, ocular and respiratory routes of exposures. It is also safe for the plant workers. Zeolite-A has no hazardous or harmful impact on micro-organisms, water flora or fauna and does not derange biological flows or waste waters.

Zeolite-A does not act as fertilizer. Zeolite-A has great capability of ion-exchange and linkage of several heavy metals, contributing to the removal of poisonous substances from surface water.

Bureau of Indian Standards (BIS) has introduced an “Eco-Mark” Scheme for detergents. The detergents qualifying for getting this “Eco-Mark” should not have any “Phosphate Builders”. The use of Zeolite- A in detergents poses no risk to man or the environment. Synthetic Zeolites do not cause any respiratory problems either. Detergent Grade Zeolites generally enter the environment via the sewerage system.

Zeolites in wash water behave physically like other inorganic particulate matter. Comprehensive studies have shown that any settling out of detergent grade Zeolite in sewers is not a problem. During sewage treatment, Zeolites improve sludge settleability and can be removed by sedimentation.

Health and safety aspects of Detergent Grade Zeolite –A have been studied extensively. It was found that Zeolite-A was essentially non-toxic via oral, dermal, ocular and respiratory routes of exposure and it comes under safe category for consumers and plant workers. Zeolite-A is safe for the environment at concentrations resulting from its use in laundry detergents. It is safe from both human and environmental standpoint.

## **10. NALCO’s Zeolite-A**

NALCO’s detergent grade Zeolite-A Plant is based on indigenously developed technologies and scaled up to appropriate commercial size plant. Further scaling up is possible both through modular addition and module resizing routes.

Production of Zeolite-A directly in the loop of NALCO’s Alumina Refinery using in-process Sodium Aluminate Liquor as the main feed stock material gives a rare distinction to NALCO’s Zeolite-A Plant as being the only plant of its kind in the world.

Zeolite-A Plant opens up new avenues for setting up a whole range of Alumino-Silicate Products, catering to various other industrial applications like catalysts, fillers, molecular sieves etc. The operation of detergent grade Zeolite-A Plant is 100% environment friendly. Product quality of NALCO’s Zeolite-A is at par with the International standards.

**11. Process Description:**

- Preparation of Sodium Aluminate Solution
- Preparation of Sodium Silicate Solution
- Preparation of Gel at Room Temperature under constant agitation in a Reactor. Sodium Aluminate solution is added to Sodium Silicate Solution at a controlled rate. Zeolite –A formation takes place at this stage. (IMPORTANT STAGE)
- Ageing of Gel in the Jacketed S.S. Reactor under constant agitation
- Filtration of Product Slurry in Polypropylene plate and Frame filter
- Drying of Wet Cake in Spray Drier
- Stored in Product Bin
- Packed in Standard Polypropylene lined Bags
- Marketing to the Consumers (Detergent Manufacturers)

**12. Specification of NALCO's Zeolite-A (As Per International Standard)**

Sl. No	Parameters	Value
1	Calcium Binding Capacity (mg. CaO/gm of dry Zeolite)	160(Min.)
2	Particle Size Analysis (a) % finer than 4.5 micron	85±10
	(b) Average Particle Size, d50	Not more than 4 micron
3	pH (5% Slurry)	11±0.5
4	Mole Composition (Based on Chemical Analysis)	
	Na <sub>2</sub> O	1.0±0.2
	Al <sub>2</sub> O <sub>3</sub>	1.0
	SiO <sub>2</sub>	1.85±0.5
	H <sub>2</sub> O	6.0(Max.)
5	Bulk Density (gm/cc)	0.45±0.1
6	Crystallinity (X-Ray Diffraction) (As Compared with 4A BDH Powder)	90% (Min.)
7	Whiteness Index	95% (Min.)

### **13. Stages of Technology Development and Commercialization: NALCO's Success Story**

- Birth of an Idea – Ideation: Year 1984
- Global Technology Survey
- Global Market Survey
- Global Production Survey
- Special Funding by NALCO for undertaking Detailed R&D
- Technology Exploration for Production of Zeolite-A from NALCO's Sodium

Aluminate Liquor (Bauxite Leachate Liquor of Alumina Refinery, Damanjodi) and other Raw Materials

- Technology Development in Laboratory and Pilot Plant Scale
- Optimization of Process Parameters in Laboratory Scale
- Evaluation of Process Parameters under Simulated Pilot Plant Conditions
- Finalization of Product Specification Vs International Specification
- Standardization of 175 kg Batch Process in Pilot Plant Scale through repeated

Pilot Scale Trials.

- Development of Technical Know-how Package based on Pilot Plant Scale Data
- Preparation of Basic Engineering Document
- Preparation of Detailed Engineering Document
- Establishment of Technical Viability of the Process Know-how
- Establishment of Commercial Viability
- Establishment Financial Viability
- Establishment of Market Viability
- Establishment of Total Techno Economics of the Project
- Appointment of EIL as Engineering Consultant for the Project
- Preparation of TEFRR
- Preparation of DPR
- Environmental Clearance from State and Central Pollution Control Boards/ MOEF

- Investment Decision by the NALCO Board/ Ministry of Mines, Govt. of India
- Setting up of the 10,000 TPA Commercial Zeolite-A Plant in the Alumina Refinery, Damanjodi at an investment of Rs. 30 Crore
- Project Execution Period = 21 Months
- Commercial Plant Trial Runs
- Quality Assurance Established
- Full Fledged Commercial Plant Operation in Rated Plant Capacity of 10,000 TPA – Year 2001
- Production Stabilization – Technology Absorption, Assimilation and Adaptation
- Marketing – Domestic and International
- Project Expansion
- Technology Transfer to 3<sup>rd</sup> Parties

#### **14. Conclusion**

Having successfully developed, installed, operated, absorbed and assimilated the technology in commercial scale, NALCO is now ready to market the technology globally. The technology has been patented Internationally, including India through PCT Route

The technology has been adjudicated as the “Best Chemical Technology” developed and commercialized in the country in the year 1997 and 2002 respectively and has bagged two highest national awards from NRDC and CSIR, Govt. of India.

The Technology has also bagged UNO-WIPO International Gold Medal from Geneva, Switzerland in the year 1998 as the “Best Chemical Technology” developed in the 3<sup>rd</sup> World Countries.



**Dr. Chitta Ranjan Mishra**

Former DGM and Head, R & D, Nalco, Bhubaneswar  
Tel.: 0674-2354027  
Mob.: 9338204993

Dr Chitta Ranjan Mishra is an eminent chemical scientist and technologist, columnist, television anchor, author, orator and popular science communicator of repute. He has written 11 popular science books in Odia and English, five of which are award winning. His popular Odia writings go beyond 200 in number. On its 2015- Foundation Day the Orissa Environmental Society honoured Dr Mishra with B.C.Panda Award for Environment and Science Communication. Dr Mishra was born in village Bhabanipur of Jajpur district on 2<sup>nd</sup> June, 1949, got his Post-Graduation degree in Chemistry from Ravenshaw College, and PhD in Chemistry from University of Calcutta on “Synthesis of Terpene Alkaloids”. His work for D.Sc from International Univ of Contemporary Studies, Washington D.C., USA relates to Novel Innovations in Product and Process Development in Alumina and Aluminium Industry”. Dr Mishra has also worked on “Synthesis of Female Sex Hormone Estrogens” at the IISc, Bangalore. He worked on Bauxite, Alumina and Aluminium for over 35 years and has 12 national and international patents to his credit, while having a distinguished 25 years tenure in NALCO before superannuation as General Manager (R&D). Based on one of the patents by Dr C. R. Mishra, NALCO has set up country’s largest Detergent Grade Zeolite-A Commercial Plant with a capacity of 10,000 tons per annum at its Alumina Refinery, Damanjodi. Dr Mishra is decorated with the most coveted UNO – WIPO International Gold Medal by the Secretary General, WIPO, Geneva, Switzerland for this technology. He has received a number of national, international and state level awards in recognition of his outstanding contributions to the field of science and technology and popularization of science. Some of these recognitions are the NALCO’s Outstanding Achievement Award as Best Officer of the Company -1998; NRDC Independence Day National Award for Meritorious Invention; CSIR National Technology Award in the field of Chemical Technology, National Award for Science Popularization as the Best Science Writer of India, Union Ministry of Science and Technology; first “Kalinga Samman” for Popularization of Science -2010; and Samanta Chandrasekhar Award for Science Popularization-2012 by Odisha Bigyan Academy and many more. Dr Mishra ia a Member and Fellow of a host of professional bodies both in the country and abroad. Presently he is a Trustee of Kalinga Foundation Trust, Bhubaneswar.

# Environmental Management Practices in Thermal Power Sector of Odisha

(Date of Presentaion: 05.02.2017)

**Rabi Narayan Prusty**

The State of Odisha is bestowed with huge deposits of minerals especially coal, bauxite, iron ore, manganese, chromite, lime stone etc. The State accounts for almost a quarter of the total proven deposits of coal of the country. Due to abundant availability of coal and water supported with basic infrastructure of railways, roadways and port connectivity, Odisha has been a favourite destination for coal based thermal power plants. So far the installed capacity of coal based thermal power plants in the State is about 16,000 MW with promising growth in future. This sector has very high risk potential towards air pollution, water pollution and solid waste generation which has a consequential impact on land resources. Most of the power plants have come up in close proximity to the coal mines region i.e., Angul-Talcher and Ib-Valley area. Industries like Steel and Aluminium have also grown causing cluster effect at Angul- Talcher and Ib Valley region. Both the above



regions have been witnessing environmental stress and declared as critically polluted areas by Central Pollution Control Board, (CPCB) wherein contribution of power plants is significant. On the above background, the Environmental Management of coal based thermal power plants has great significance in the State.

## **Editorial notes**

The presentation focused on the process of power generation, pollution potential, environmental management and pollution control measures undertaken by the thermal power plants and success achieved by the State Pollution Control Board so far. According to the Annual Report

2015-16 published by State Pollution Control Board, Odisha:—

- The Fly Ash Resource Centre (FARC) has been set up in the State Pollution Control Board. FARC is promoting safe management and utilization of fly ash in the State by preparing guidelines on utilization of fly ash in various sectors, coordinating among the users and thermal power plants. In addition, FARC is also organizing workshops and interaction meet among the stakeholders for enhancing fly ash utilization. During the financial year 2015-16, the utilization of fly ash was 59.43 %.
- The Board has undertaken initiative to facilitate bulk utilization of other industrial solid wastes like dolochar, phospho-gypsum, blast furnace slag, anode butt, ferro-manganese sludge in different sectors like brick making, road construction, cement manufacturing, power generation etc.



**Er. Rabinarayan Prusty**

Sr. Environmental Engineer,  
State Pollution Control Board, Odisha  
Email: rnprusty29@rediffmail.com,  
Tel.: 0674-2561909/09437172226

Er. Rabinarayan Prusty obtained his BE degree in 1987 and ME degree in 1988 from the University College of Engineering at Burla, now known as Veer Surendra Sai University of Technology (VSSUT)). He joined the State Pollution Control Board in the year 1989 and worked at Regional Offices, Rourkela, Angul and Cuttack covering most of the industrialised and mining zones of the State. He worked as Regional Officer, Rourkela during 2003-2006 when the State witnessed exponential growth in steel and mining sector in Sundargarh and Keonjhar district, and has undergone several training programmes in the field of environmental management. Er. Prusty visited Germany, Netherland and Austria under Central Pollution Control Board's training programme in 2001. Presently he is engaged in enforcement department of the Board dealing with the matters of consent to operate (CTO) in respect of 17 categories of highly polluting industries in Odisha which includes thermal power plants. He is also heading the branch of Water Cess collection and Consent to Operate matter of Standalone Sponge Iron Plants of Odisha.

# Responses of Plants to Environmental Stresses

(Date of presentation: 5.03.2017)

**Arun Chandra Sahu**

## Introduction

‘Plants, thus I hail thee, the ‘Divine Mother’ of mankind.  
-*The Rigveda.*

Plants are really our divine mothers. Without plants the lives of human beings are unthinkable. We, all the heterotrophs, depend upon the autotrophs for food and oxygen. Life originated first in our Planet ‘Earth’ approximately 4100 millions of years ago. The multicellular organisms appeared around 1500 millions of years ago. Land plants were evolved around 630 millions of years in the past while mammals evolved 500 millions of years ago. *Homo sapiens*, the modern human being, appeared approximately 1-2 lakhs of years ago. Evolution is a gradual process and it is still continuing. But, we may speculate unexpected impact upon it due to the altered scenario mainly by the man-made activities and environmental stresses.

According to Newton’s third law of motion – ‘To every action there is an equal and opposite reaction’. Likewise, to every stress there is an equal and opposite strain. Moreover, according to Hook’s law stress is directly proportional to strain. According to some, stress may be defined as any environmental condition that when first applied impairs Darwinian fitness. However, others defined stress as any environmental change that acts to reduce the fitness of organism. Yet some other state that, stress is an environmental factor that causes a change in the biological system which is potentially injurious. Thus, environmental stress may be defined as the physical, chemical, and biological constraints on the productivity of species and on the development of the ecosystem.

All of the above definitions of stress emphasize a reduction in the fitness of the organism or population caused by the environmental factors. To overcome such fitness reductions, organisms and populations can respond phenotypically and genotypically and evolve adaptive mechanisms to reduce the detrimental impact of the stress. Stress simply as ‘a reduction

in fitness' would mean that any reduction in fitness, whether small or large, would be regarded as stressful.

A stress is an attribute of the 'stressor', the environmental component, which causes 'stress' in the 'stressed', the biological component, where 'strain' occurs.

STRESSOR → STRESS → STRESSED → STRAIN

### **Causation of Stress**

The environmental stresses may be caused by either abiotic or biotic factors. The abiotic factors include physical features of the environment like high or low temperature (chilling and freezing), global warming, pollution, water deficit or logging, ion, salt, radiation; climatic factors like excess of precipitation, fog, snow, hail, wind, hurricane, tornado etc. flowers and fruits; decrease in grain yield in cereals etc. The physiological alterations include changes in the rate of photosynthesis, respiration, protein synthesis, fat synthesis, nucleic acid synthesis, transpiration, absorption and conduction of water and minerals, translocation of organic solutes, flowering and fruiting. Senescence process is also triggered. The metabolic alterations include altered levels of carbohydrates, proteins, amino acids, fats and nucleic acids. Proline content increases significantly in tolerant cultivar which has been visualized as an adaption of plants to environmental stresses, particularly to salt and water stresses. Overall, the anabolic processes are reduced while catabolic processes are enhanced leading towards early onset of senescence. Activities of some enzymes are enhanced while that of others is reduced under the influence of stresses.

The phytohormonal changes include alterations in the activities of auxins, gibberellins, cytokinins, abscisic acid and ethylene. Other plant growth regulators like brassinosteroids and jasmonic acids have altered levels and activities affecting the immunity of the plants. The genetic alterations include mutations, chromosomal aberrations, heteroploidy and genetic recombinations.

### **Environmental Stress and Thermodynamics**

Thermodynamics tends to describe the laws of energy changes in both living and nonliving objects. To perform various life processes, living

organisms require energy. Each individual biochemical reaction is associated with liberation or utilization or conservation of energy. There are different forms of energy out of which heat energy (H) is the commonest form of energy in biological systems. The energy which is free to do some useful work is called free energy (F). There are four laws of thermodynamics (zeroth, first, second and third), out of which the first and second law have important implications in biological systems. The first law deals with enthalpy (heat energy, H) and the principle of conservation of energy while the second law deals with entropy (S), the rate of randomness or disorderliness. If both laws are combined, then we get,

$$\Delta G = \Delta H - T \Delta S$$

Under stress, overall oxidative processes are enhanced in a biological system, means the enthalpy is decreased while entropy is increased. For example, the respiration process involves decrease in enthalpy by 673 kilocalorie/mole of glucose oxidised, and the increase in entropy is by 44 cal/deg. K (degree Kelvin). Thus environmental stresses enhance the randomness or disorderliness of the plant systems leading towards injurious and lethal events.

The entropy of the earth is increasing at a faster rate mainly due to man-made activities and ultimately the state of 'entropic dome', equivalent to 'Pralaya' according to Hindu mythology, may be reached, which is also true for the entire universe.

### **Adaptations in Plants**

Adaptation may be defined as the process of change in an organism to conform better with (new) environmental conditions by which the organism acquires characteristics involving changes in morphology, physiology and behaviour that improve their survival or reproductive success in the particular environment. Plants may be resistant or sensitive to a stress. A resistant plant may have stress avoidance or stress tolerance. For example, some mangrove plants avoid the salinity stress by growing during rainy season when the salt concentration of soil or water is less while other mangroves tolerate the stress by growing in other seasons. The glycophytes, the sweet plants like rice, wheat, maize, brinjal, potato etc., are sensitive to salt stress. The yields of crop plants are drastically reduced under salt stress. The halophytes, the salt loving

plants, growing in mangroves of Bhitarkanika in Odisha, Sunderbans in West Bengal and Bangladesh, and many parts of the world, have many adaptations to combat against salinity. These adaptations include production of pneumatophores in the root system as projections to the atmosphere for gaseous exchange, formation of salt glands in the leaves which are periodically detached from the plant body, higher concentrations of solutes in the cell to maintain osmoregulation, reduced transpiration (1/3 of normal plants) and viviparous germination of seeds still attached to the mother plants for sustainable dispersal of young seedlings and survival of the species etc.

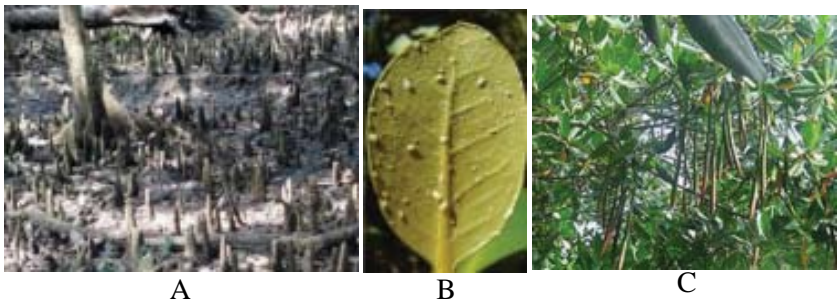


Fig.1. A: pneumatophores of mangrove , B: salt crystals on the leaf, C: viviparous germination



Fig.2. A: A cactus where stem is modified to phylloclade(flattened) and leaves are modified to spines, B: An old olive tree with heavy trunk which is slightly rotated.



A



B

Fig.3. A: The Great Banyan tree (250 years old) of Shibpur Botanic Garden, Howrah covering 4.67 acres of land, B: Its prop roots (total prop roots:3772) and branches looking like individual trees.

The xerophytic plants can tolerate water deficit stress by various adaptations like modification of stem into phylloclade which may be flattened or cylindrical with leaves modified into spines or scales, reduced transpiration, CAM (Crassulacean Acid Metabolism) pathway of carbon assimilation etc. The hydrophytic plants have adaptations to water logging stress which include absence of stomata in the lower surface of the

floating leaves, reduced leaves in the submerged hydrophytes, absence of well developed vascular system, and modified leaf and stem anatomy etc. If there is heavy rain and more water, then lotus plants may die due to water excess stress though rainy season is friend to the plants which indicates that excess of everything is bad and may be lethal and this phenomenon has been beautifully described by Odia poets. The mesophytes have also adaptations to environmental stresses like formation of new shoots at the base of the plant if broken by cyclone (wind stress) as in olive which lives even more than 2000 years, the slanting of leaves in pines which helps in sliding of ice crystals under freezing stress, the opening of stomata during day time which has a cooling effect under the hot sun and the prop roots of banyan tree which give mechanical support to the plant in case of strong wind or tornado.

### **Stress Tolerant Cultivars**

During the course of evolution, stress tolerant varieties have been produced naturally. However, many salt and drought tolerant cultivars of rice, wheat, maize, rye etc. have been produced by the scientists which can successfully grow in stressful environment. Some of the salt tolerant rice cultivars are CR644, CRM39, CSR10, CSR30, CSR36, CSR49, IET2863, IET13410, IET13427, IET13559, ORM20-17-26, ORM20-22-26, ORM26-25-35 out of which IET13559 is probably the most tolerant one. Some of the salt tolerant wheat cultivars are KRL213, KRL210, KRL19, KRL14, Durum wheat etc. In relation to water deficit stress, some drought tolerant rice cultivars like Rio Grande, Sahod Ulan, Sacobia, Pasig, Apo, Katihan I have been developed at International Rice Research Institute, Philippines, Manila.

### **Stress Tolerant Transgenic Plants**

Transgenic plants are plants that have been genetically engineered, a breeding approach that uses recombinant DNA techniques to create plants with new characteristics. They are identified as a class of genetically modified (GM) plants. In most cases, the aim is to introduce a new trait to the plant which does not occur naturally in the species. However, in recent decades a number of stress tolerant transgenic crop plants have been raised. For example, transgenic Indica rice of IR20, ADT43, IR60 and Ponni having increasing tolerance to salinity and

drought stress, have been produced by transferring genes from mangrove plants like *Avicennia marina*, *Porteresia coarctata*. Research is going on in different laboratories of the world to produce further new stress tolerant transgenic crop plants beneficial to mankind.

### **Conclusion**

Environmental stresses reduce the Darwinian fitness of the organisms or populations. To overcome this, organisms and populations can respond phenotypically and genotypically and evolve adaptive mechanisms to reduce the detrimental effect of stress. But when the stress is severe, it will cause lethality of the organism. Environmental stresses enhance the entropy of individual plant and the plant kingdom as a whole leading to higher disorderliness of the entire earth inviting 'entropic dome'.

In the present scenario, the environmental pollution of the earth is alarmingly increasing mainly by man-made activities which threatens the very existence of plant and animal species including the humans. Only one percent of the species of the living organisms are existent today and 99% species have been lost from the earth's crust. The rate in which human destructive activities are increasing, it is not far to behold the green earth to be converted to a black earth.



**Prof. (Dr.) Arun Chandra Sahu**

Former Professor and Head

Department of Botany,

G. M. Autonomous College (now G.M. University)  
Sambalpur.

Mob. 9437133387, 8249079084,

Email: sahuac52@gmail.com

Professor Arun Chandra Sahu, an academician, researcher, popular science and text book writer, poet, was born on 26<sup>th</sup> January, 1954 at Itamati of Nayagarh district. He has graduated from B.J.B. college with Botany honours and distinction and English composition, and post-graduated from Utkal University. Working on the biochemistry of rice leaf senescence under salt stress, he obtained his Ph. D. degree from Utkal University. He has refused OAS and also left banking service as an officer and opted for OES and first joined Govt. College, Phulbani, where he with Dr. S.N. Patro and other colleagues started Odisha Environmental Society in 1982. Prof. Sahu has topped the list of Professor of Botany selected by OPSC and joined G.M. Autonomous College, Sambalpur in May, 2009 from where he was superannuated in January, 2012. He also served as a Guest Professor in P.G. Dept. of Botany, Utkal University in 2013 and now actively engaged in writing text books, popular science books and Odia and English poetry books. He has more than forty research papers and abstracts in national and international journals. Many MPhil and Ph.D. students have obtained their degrees under his guidance and supervision. He is author of 26 books at present, including 12 science text books, 5 popular science books, 8 Odia literary books and an anthology of English poetry. He is recipient of a number of Indian and Foreign awards and is member of a number of national and international learned societies. He has recently received Pranakrushna Parija Popular Science Book award for 2015 by Odisha Bigyana Academy for his book 'Gene Bigyanara Jayajatra'. He is also the recipient of Mahesh Prasad Purohit Memorial Award for popularising plant science in the state of Odisha, by Odisha Botanical Society in 2010 and Rajdhani Book Fair award, 2014, and Kalinga Book Fair award, 2016 in science literature. His research biography has been included in many editions of 'Marquis Who's Who in the World' and 'Marquis Who's Who in Asia'. He is Editor-in-chief of 'Biohelica' (ISSN 0976-5204), a scientific journal of biological sciences. At present, he is staying at Anwesana, 52/II, Bhagabat Sandhan Colony, GGP, Bhubaneswar -751025.

## **World Health Day 2017**

### **Theme: Depression: Let's Talk**

*(Discussion held on 07 April 2017)*

The **World Health Day** is a global health awareness day celebrated every year on 7 April, under the sponsorship of the World Health Organization (WHO).

In 1948, the WHO held the First World Health Assembly. The Assembly decided to celebrate 7 April of each year, with effect from 1950, as the World Health Day. The World Health Day is held to mark WHO's founding, and is seen as an opportunity by the organization to draw worldwide attention to a subject of major importance to global health each year. The WHO organizes international, regional and local events on the Day related to a particular theme. World Health Day is acknowledged by various government and non-governmental organizations with interests in public health issues, who also organize activities and highlight their support in media reports, such as the Global Health Council.

World Health Day is one of eight official global health campaigns marked by WHO, along with World Tuberculosis Day, World Immunization Week, World Malaria Day, World No Tobacco Day, World AIDS Day, World Blood Donor Day, and World Hepatitis Day.

### **2017: Depression: Let's Talk**

World Health Day 2017, celebrated on 7 April, aims to mobilize action on **depression**. This condition affects people of all ages, from all walks of life, in all countries. It impacts on people's ability to carry out everyday tasks, with consequences for families, friends, and even communities, workplaces, and health care systems. At worst, depression can lead to self-inflicted injury and **suicide**. A better understanding of depression - which can be prevented and treated - will help reduce the **stigma** associated with the illness, and lead to more people seeking help.

**Dr. Seba Mohapatra** deliberated on the theme of the World Health

Day and she focused her attention on the occurrence of depression in women. Depression is widely prevalent in women in all age groups, especially in India, where 1.25 billion population live. Women are twice as likely to develop clinical depression as men, especially in a society where male chauvinism persists. Up to one in four women is prone to have an episode of major depression at some point in life. The feelings of sadness, hopelessness, helplessness and worthlessness are exhibited, which can be mild to severe with symptoms of apathy, little appetite, difficulty in sleeping, low self-esteem and low-grade fatigue. In the current scenario of under-diagnosed, untreated cases of females suffering from depression, the hurdles faced by Indian women include inadequate number of mental health professionals, lack of awareness, stigma, disadvantaged position of women, multiple roles, increased levels of stress, and domestic violence. Dr Mohapatra sought the cooperation of all concerned for the prevention and treatment of depression among women.

**Dr. Rabindra Kumar Das** stated that World Health Day-2017 is aimed to mobilize action on depression. This condition affects people of all ages, from all walks of life, in all countries. It impairs people’s ability to carry out everyday tasks, with consequences for families, friends, and even communities, workplaces, and health care systems. At the worst, depression can lead to self-inflicted injury and suicide. A better understanding of depression - which can be prevented and treated - will help reduce the stigma associated with the illness, and lead to more people seeking help. He emphasized on awareness through public education, early detection, organized national mental health programs, comprehensive management for tackling the problem of depression. The presentation by the guests followed a discussion on the theme wherein the queries of the participants were answered by the experts.

### World Health Day Themes

2017: Depression: Let’s Talk	2006: Working together for health 2005: Make every mother and child count
2016: Halt the rise: beat diabetes	2004: Road safety
2015: Food safety	2003: Shape the future of life: healthy environments for children

2014: Vector-borne diseases: small bite, big threat	2002: Move for health
2013: Healthy heart beat, Healthy blood pressure	2001: Mental Health:stop exclusion, dare to care
2012: Good health adds life to years	2000: Safe Blood starts with me
2011: Anti-microbial resistance: no action today, no cure tomorrow	1999: Active aging makes the difference
2010: Urbanization and health: make cities healthier	1998: Safe motherhood
2009: Save lives, Make hospitals safe in emergencies	1997: Emerging infectious diseases
2008: Protecting health from the adverse effects of climate change	1996: Healthy Cities for better life
2007: International health security	1995: Global Polio Eradication

(Source: Wikipedia-WHO, downloaded on April 2, 2017)





**Dr. Seba Mohapatra**

Former Director, Health Services, Govt. of Odisha,  
N1, A/10, IRC Village, Bhubaneswar-751015  
Phone: 09437035531, drsebamohapatra@yahoo.co.in

Dr. Seba Mohapatra was born in 1943 in Naradia village in Jagatsinghpur District of Odisha. After doing MBBS and MS (O and G) she served in various capacities at different places as a specialist medical officer and physician under the Department of Health and Family Welfare, Government of Odisha. She adorned the post of Chief District Medical Officer, and superannuated in 2003 as Director, Health Services. After superannuation she continues to render her services for the cause of common man, being associated with a number of social service organisations. Enjoying supervisory and consultant status Dr Mohapatra worked for the World Bank project, State Institute of Health and Family Welfare. She was also chief advisor to the White Ribbon Odisha for Safe Motherhood, and a faculty at the Asian Institute of Public Health, Odisha. She has attended, chaired and presented papers on her subject of expertise in various seminars and conferences, and been a regular discussant in the mass media on issues related to health. She is the recipient of WHO Fellowship, and a number of prestigious awards including the 'Subarna Jayanati Samman' by Odisha State Welfare Board, and 'Lifetime Achievement Award' by OBGY Society, Bhubaneswar. Dr Mohapatra also contributes popular articles to popular Odia dailies and magazines.



**Dr. Rabindra Kumar Das,**  
Formerly Senior Psychiatric Specialist,  
Capital Hospital, Bhubaneswar

Born on August 3, 1943 Dr. Rabindra Kumar Das is a specialist in psychiatry. He did MBBS from Utkal University and M.D. in Psychiatry from Patna University. Dr Das served in various capacities as a medical officer and physician under the Department of Health and Family Welfare, Government of Odisha. He served in PHCs, dispensaries in rural areas; district head quarters hospitals, circle jail hospitals, Capital Hospital and Municipal Hospital at Bhubaneswar. After superannuation in 2003 he continued to render his services in the KIMS under the KIIT University in Bhubaneswar as a faculty member and Professor of Psychiatry until 2015. Dr Das now provides services in the voluntary health camps in rural areas of Odisha and is associated with Odisha Branch of the National Cancer Society, Rotary Clubs, Lions Clubs, and other NGOs.

## **Depression: Let's Talk: WHO News Release on World Health Day-2017**

**30 MARCH 2017 | GENEVA** - Depression is the leading cause of ill health and disability worldwide. According to the latest estimates by WHO, more than 300 million people are now living with depression, an increase of more than 18 % between 2005 and 2015. Lack of support for people with mental disorders, coupled with a fear of stigma, prevent many from accessing the treatment they need to live healthy, productive lives.

The new estimates have been released in the lead-up to World Health Day on 7 April, the high point in WHO's year-long campaign "Depression: Let's Talk". The overall goal of the campaign is that more people with depression, everywhere in the world, both seek and get help.

Said WHO Director-General, Dr Margaret Chan,: “These new figures are a wake-up call for all countries to re-think their approaches to mental health and to treat it with the urgency that it deserves.”

One of the first steps is to address issues around prejudice and discrimination. “The continuing stigma associated with mental illness was the reason why we decided to name our campaign Depression: Let’s Talk,” said Dr Shekhar Saxena, Director of the Department of Mental Health and Substance Abuse at WHO. “For someone living with depression, talking to a person they trust is often the first step towards treatment and recovery.”

### **Urgent need for increased investment**

Increased investment is also needed. In many countries, there is no, or very little, support available for people with mental health disorders. Even in high-income countries, nearly 50 % of people with depression do not get treatment. On average, just 3 % of government health budgets is invested in mental health, varying from less than 1 % in low-income countries to 5 % in high-income countries.

Investment in mental health makes economic sense. Every US \$ 1 invested in scaling up treatment for depression and anxiety leads to a return of US \$ 4 in better health and ability to work. Treatment usually involves either a talking therapy or antidepressant medication or a combination of the two. Both approaches can be provided by non-specialist health-workers, following a short course of training, and using WHO’s mhGAP Intervention Guide. More than 90 countries, of all income levels, have introduced or scaled-up programmes that provide treatment for depression and other mental disorders using this Intervention Guide.

Failure to act is costly. According to a WHO-led study, which calculated treatment costs and health outcomes in 36 low-, middle- and high-income countries for the 15 years from 2016-2030, low levels of recognition and access to care for depression and another common mental disorder, anxiety, result in a global economic loss of a trillion US dollars every year. The losses are incurred by households, employers and governments. Households lose out financially when people cannot work. Employers suffer when employees become less productive and are unable to work. Governments have to pay higher health and welfare expenditures.

### **Associated health risks**

WHO has identified strong links between depression and other non-communicable disorders and diseases. Depression increases the risk of substance use disorders and diseases such as diabetes and heart disease; the opposite is also true, meaning that people with these other conditions have a higher risk of depression.

Depression is also an important risk factor for suicide, which claims hundreds of thousands of lives each year. Said Dr Saxena, “A better understanding of depression and how it can be treated, while essential, is just the beginning. What needs to follow is sustained scale-up of mental health services accessible to everyone, even the most remote populations in the world.”

Depression is a common mental illness characterized by persistent sadness and a loss of interest in activities that people normally enjoy, accompanied by an inability to carry out daily activities, for 14 days or longer.

In addition, people with depression normally have several of the following: a loss of energy; a change in appetite; sleeping more or less; anxiety; reduced concentration; indecisiveness; restlessness; feelings of worthlessness, guilt, or hopelessness; and thoughts of self-harm or suicide.



## World Earth Day-2017

OES Release: 22.04.2017

In 1969 at a UNESCO conference in San Francisco, peace activist John McConnell proposed a day to honour the Earth and start its celebration from 1970. He proposed March 21 as the date, the first day of spring in the northern hemisphere. Coincidentally, United States Senator Gaylord Nelson first organized the day in the name 'Earth Day' on April 22, 1970. Since then the April 22 has been observed as the Earth Day. However, the background is interesting. There was a tragedy of the massive oil spill in the Santa Barbara, California in 1969. This tragedy led the Gaylord Nelson towards enhancing the public consciousness for the air, water and soil pollution as well as implementing the environmental protection measures. The 1960s had been a very dynamic period for ecology in the US. Pre-1960 grassroots activism against DDT in Nassau County, New York, and widespread opposition to open-air nuclear weapons tests with their global nuclear fallout, had inspired Rachel Carson to write her influential bestseller, *Silent Spring* in 1962.

**Earth Day** is an annual event celebrated worldwide on April 22 in order to increase the awareness among people about the environment safety as well as to demonstrate the environmental protection measures. Earth Day is devoted to the preservation of the harmony in nature and yet draws upon the triumphs of technology, the measurement of time, and instantaneous communication through space. May there be only peaceful and cheerful Earth Days to come for our beautiful Spaceship Earth as it continues to spin and circle in frigid space with its warm and fragile cargo of animate life. Earth Day events in about 195 countries are now coordinated globally by a non-profit organisation called Earth Day Network.

### Theme

Each year a theme is decided and the theme for Earth Day 2017 campaign is 'Environmental and Climate Literacy'. Sometimes a week

is also celebrated. This year it will start with the March for Science on Earth Day on April 22, 2017 and will end with the People's Climate Mobilisation on April 29, 2017. Education is the foundation for progress. We need to build a global citizenry fluent in the concepts of climate change and aware of its unprecedented threat to our planet. We need to empower everyone with the knowledge to inspire action in defence of environmental protection. Environmental and climate literacy is the engine not only for creating green voters and advancing environmental and climate laws and policies but also for accelerating green technologies and jobs.

On Earth Day 2016, the landmark Paris Agreement was signed by the United States, China, India and some 120 other countries. This signing satisfied a key requirement for the entry into force of the historic draft climate protection treaty adopted by consensus of the 195 nations present at the 2015 United Nations Climate Change Conference in Paris.

Mobilizing 200 million people in 141 countries and lifting the status of environmental issues onto the world stage, Earth Day activities in 1990 gave a huge boost to recycling efforts worldwide and helped pave the way for the 1992 United Nations Earth Summit in Rio de Janeiro. A memorable event took place at the UN in Geneva, celebrating a Minute for Peace ringing the Japanese Shinagawa Peace Bell with the help of the Geneva Friendship Association and the Global Youth Foundation, directly after in deep mourning about the Fukushima Daiichi Nuclear Power Plant catastrophe 10 days before.

Our Earth is the only planet in the Universe where life is possible till date. It is very necessary to maintain the natural assets of the earth in order to continue the life on the earth. In the rush of the crowd, the most intelligent creature of the God called human is slowly losing its humanity and forgot to take care of the planet that gave it life and started using its resources very ruthlessly. People need to be made aware about day to day increasing rate of the industrialization as well as the careless attitude of the people living on the earth. It is very necessary to take care of the environmental issues to stay healthy and alive as cruel people have mercilessly utilized its resources and depleted its life supporting resources over the centuries.

Some of the examples of human error are the depletion of the Ozone layer which prevents us from the ultra violet rays of the sun,

industrialization leading to deforestation, use of non-bio-degradable polythene and plastic, pesticides and chemicals, death of rivers by getting mixed with the industrial toxic materials, climate change and global warming. These are the life ending dangers on the earth forever which can be lessened through the small steps such as new trees plantation, inhibiting the deforestation, limiting the vehicles uses to reduce air pollution, enhancing the energy conservation through reducing the unnecessary use of electricity.



#### WORLD EARTH DAY THEME

2017: Environmental and Climate Literacy

2016: Trees for the Earth

2015: “Water Wonderful World” and “Clean Earth – Green Earth”

2014: Green Cities

2013: The Face of Climate Change

2012: Mobilize the Earth

2011: Clear the Air

2010: Reduce

2009: How Do You Get Around

2008: Trees Please

2007: Be kind to the Earth – Starting from Saving Resources

## Herbal Treatment for Common Diseases

(Date of Presenttaion: 07.05.2017)

**Kunja Bihari Satapathy**

*The article deals with herbal remedies for some common ailments, gathered from knowledgeable people and local herbal healers of rural Odisha. Some of the effective remedies used regularly are 'Ambiliti' - Oxalis corniculata leaves for diarrhoea and dysentery; 'Arisha' - Crinum asiaticum leaf for hydrocele ; 'Asoka' - Saraca asoca bark for menstrual disorders in women; 'Basanga' - Justicia adhatoda leaf for bronchitis; 'Bhuin-aenla' - Phyllanthus fraternus leaves, 'Manjuati' - Lawsonia inermis roots and 'Tomatilo' - Physalis minima fruits in jaundice ; 'Bilajuani' - Seseli diffusum seeds for indigestion; 'Braja-malli' - Clerodendrum philippinum leaves and seed powder of 'Jamu' - Syzygium cumini for bringing down sugar level; 'Hada-bhanga' - Cissus quadrangula stem for bone-fracture; 'Koilikhia' - Hygrophila auriculata leaf for piles; 'Kolatha' - Macrotyloma uniflorus seeds for kidney stone; 'Lunulunia' - Solanum nigrum leaves for enlarged liver in children; 'Pasaruni' - Paederia foetida leaves for rheumatism; 'Sahada' - Streblus asper leaves for skin diseases 'Sindhuri' - Mallotus philippensis for deworming; 'Singadahara'- Nyctanthes arbor-tristis leaf for fever and 'Sunari' - Cassia fistula fruit pulp for constipation.*

A proverb in India says, "There is not a single letter of alphabet which is not a 'mantra'; there is not a single root of the plant which is not a medicine; there is not a single person who is not useful; it is only the coordinator or operator who is a rarity". Fundamentally, any herb which possesses therapeutic properties in one or more of its organs may be termed as a medicinal herb. India is rich in medicinal plant diversity. In broad sense 'Herbs' include all categories of plants starting from most primitive plants – Thallophyta up to the most advanced type – Angiosperms. The treatment of diseases by using herbs or its products

is known as herbal treatment. Use of plants as medicine has been known since the period of 'Rig Veda' (4500-1600 B.C.), while the written records of this system of natural healthcare dates back to almost 5000 years. Reports claim that around one-third of all pharmaceuticals are of plant origin. It is estimated that nearly three-fourth of the drugs mentioned in various pharmacopoeias of the world are endemic to India. In spite of the substantial advances made in the pharmaceutical sciences, especially in synthetic chemistry, plants and their derivatives continue to maintain their significance in medicine. Herbal therapy – a kind of treatment of illness using various plant parts (commonly referred to as Ayurveda/ Unani/ Siddha system of medicines) is currently gaining importance among the people of developed countries. In fact, the people of developed countries are now sharing increased interest in natural drugs in preference to synthetic ones, principally because of a high degree of adverse side effects associated with the latter. As evident from the present scenario, herbal cure is gaining worldwide acceptance, and this has emphasized on modern scientific exploration, extraction and evaluation of folk medicines from plants. This wave is apparent in India by the fast developing herbal industry. The country has over 0.4 million registered practitioners of Indian systems of medicine supported by more than 5000 licensed manufacturing units, which manufacture drugs worth over Rs. 3400 million yearly. It would, therefore, be prudent to have a look at the fast depleting data on time-tested household herbal-remedies.

The present deliberation describes 81 plants useful in treating 21 categories of diseases and provides hints on preparation application of recipes. The information has been gathered from old people practicing herbal medication in rural Odisha. Besides, some prescriptions are also based on the personal experience of the author. The folklore data is presented here disease-wise citing botanical names along with their family names, followed by local name(s) and finally method of use in brief. The nomenclature has been up-to-date as far as possible. The author tried to verify these uses with the help of botanical literature. Needless to overemphasize that there has been a growing consciousness worldwide especially in the developed countries and, of late, in India for use of plant-based medicines with little associated adverse effects. It would not be surprising, therefore, to predict that in the forthcoming days herbal drugs will be the global choice by which the synthetic chemical-based medicines would eventually be replaced.

## **Introduction**

Fundamentally, any plant which possesses curative properties in one or more of its organs may be termed as a medicinal plant. A proverb in India says, “There is not a single letter of alphabet which is not a ‘mantra’; there is not a single root which is not a medicine; there is not a single person who is not useful; it is only the coordinator who is a rarity”.

India is rich in medicinal biodiversity. Use of plants as medicine has been known since the period of ‘Rig Veda’ (4500-1600 B.C.), while the written records of this system of natural healthcare dates back to almost 5000 years. Reports claim that approximately one-third of all pharmaceuticals are of plant origin. It is estimated that nearly three-fourth of the drugs mentioned in various pharmacopoeias of the world are endemic to India. In spite of the considerable advances made in the pharmaceutical sciences, especially in synthetic chemistry, plants and their derivatives continue to maintain their significance in medicine.

Herbal therapy - a kind of treatment of illness using various plant parts is now gaining importance among the people of developed countries. In fact, the people of developed countries are now sharing increased interest in natural drugs in preference to synthetic ones, primarily because of a high degree of adverse side effects associated with the latter.

As evident from the present scenario, herbal cure is gaining worldwide acceptance, and this has emphasized on modern scientific exploration, extraction and evaluation of folk medicines from plants. This wave is apparent in India by the fast developing herbal industry. The country has over 0.4 million registered practitioners of Indian systems of medicine supported by more than 5000 licensed manufacturing units, which produce drugs worth over Rs. 3400 million annually. It would, therefore, be wise to have a look at the fast depleting data on time-tested herbal household remedies.

Medicinal plants are known by different names in different places, thus creating elements of confusion. Incorrect identification leading to use of a wrong plant or erroneous method of using a particular plant are often responsible for deterioration in the quality and effectiveness of a medicine preparation and sometimes even lead to fatal consequences. In the backdrop of this realization, this article has been designed to acquaint

the common people, students, academicians and researchers to correctly identify the some commonly used medicinal plants in Odisha.

The present article enumerates 129 plants useful in treating 31 categories of diseases and provides hints on preparation and application of recipes. The information has been gathered from old people practicing herbal medication in rural Odisha. In addition, some prescriptions are also based on the personal experience of the author. The folklore data is presented here disease-wise citing botanical names along with their family names, followed by local name(s) and finally method of use in brief. The nomenclature has been up-to-date as far as possible. The author tried to verify these uses with the help of botanical literature. The uses found in G. L. Chopra's work are marked 'C', the ones quoted in S. K. Jain's work are marked 'J' and the ones quoted in the author's work are marked 'K'.

### Herbal Therapy for Common Ailments

Botanical Name and Family	Local Name	Mode of Use
<b><i>Bed wetting in children</i></b>		
<i>Blumea lacera</i> (Burm.f.) DC. (Asteraceae)	Pokasungha	Leaf paste is prepared with cold water and given once in a week till the relief (K).
<i>Vigna mungo</i> (L.) Happer (Fabaceae)	Biri	Dry seeds (5 g) or their powder along with jiggery (10 g) are taken once during evening for at least one month or till the complete cure(K)
<b><i>Cough, cold and asthma</i></b>		
<i>Cuscuta reflexa</i> Roxb. (Cuscutaceae)	Malanga	Decoction of plant along with black pepper, tulasi and butter used thrice a day for 15 days in cough and bronchitis (K).
<i>Justicia adhatoda</i> L. (Acanthaceae)	Basanga	Fresh leaf infusion with honey and common salt (4:2:1) given for bronchial diseases (K).

<i>Ocimum sanctum</i> L. (Lamiaceae)	Tulasi	A tea prepared from the leaves of this plant with ginger and black pepper, or leaf juice with honey is given once in a day for 3 days (C, J)
<i>Piper longum</i> L. (Piperaceae)	Pippali	Fruit powder with honey is given against cold and cough (K).
<i>Tylophora indica</i> (Burm.f.) Merr. (Asclepiadaceae)	Anantamula	Leaf juice (10 ml) along with sugar candy (5 g) is given to cure bronchitis and asthma (K).
<i>Zingiber officinale</i> Rosc. (Zingiberaceae)	Ada	Sap of the rhizome with honey (2:1) given against cough and cold (J, K)
<b>Cuts and bone fracture</b>		
<i>Amaranthus caudatus</i> L. (Amaranthaceae)	Khada	Paste of the leaf applied on cuts and bandaged to stop bleeding and pain (K).
<i>Cissus quadrangula</i> L. (Vitaceae)	Hadabhanga	Stem-paste applied on affected part (bone fracture) and wrapped with bamboo pieces for 5-7 days (K).
<i>Cryptolepis buchananii</i> Roem and Schult. (Asclepidaceae)	Gopakahna	Root paste applied on fractured bone and wrapped with bamboo plates for 7 days; paste given orally also twice a day for 7 days (K).
<i>Cynodon dactylon</i> Pers. (Poaceae)	Duba	Paste made of washed leaves applied on cuts (K).
<i>Tridax procumbens</i> L. (Asteraceae)	Bisalyakarani	Fresh leaf juice applied on cuts to check bleeding (K).
<b>Deworming</b>		
<i>Andrographis paniculata</i> Nees (Acanthaceae)	Bhuin-nimba, Chireita	Decoction (10 ml) of the Nees plant mixed with lemon juice (5 ml) is given to children (C, J).
<i>Artemisia nilagirica</i> (Clarke) Pamp. (Asteraceae)	Dayana	Seed powder mixed with honey (3:1) given to children for intestinal worm (K).

<i>Barringtonia acutangula</i> (L.) Gaertn. (Barringtoniaceae)	Hinjala	About 10 ml of leaf-juice mixed with 10 g of old jaggery is given once in a day for 3 days.
<i>Mallotus philippensis</i> (Lam.) Muell.-Arg. (Euphorbiaceae)	Kapilagundi, Sinduri	Fruit hairs (1 g) taken with curd (5 ml) and 5 drops of honey (C, J).
<i>Pterocarpus marsupium</i> Roxb. (Fabaceae)	Piyasala	Crushed young leaves or tender shoots (20 g) are soaked in hot water (50 ml) and the leachate is given to children against tape-worm and thread-worm infections (K).
<i>Punica granatum</i> L. (Punicaceae)	Dalimba	Root powder (2-3 g) with 2-3 drops of honey given once a day for 2 days in empty stomach (K).
<b>Diabetes</b>		
<i>Catharanthus roseus</i> (L.) G. Don (Apocynaceae)	Sadabihari	Fresh twig with two leaf-buds given once in a day for diabetes, on empty stomach (K).
<i>Clerodendrum philippinum</i> Schauer (Verbenaceae)	Brajamalli	Leaf juice (about 10 ml) along with one black pepper given early in the morning to reduce blood sugar (K).
<i>Gymnema sylvestre</i> (Retz.) Sch. (Asclepiadaceae)	Gudamari	Dried leaf-powder (5 g) given in empty stomach for lowering of sugar content in blood and urine (K).
<i>Momordica charantia</i> L. (Cucurbitaceae)	Kalara	Juice of the immature fruits (20 ml) given to patient in empty stomach to reduce(J).
<i>Murraya koenigii</i> (L.) Spreng. (Rutaceae)	Bhursunga	Leaf juice (15 ml) is administered to reduce blood sugar (K).
<i>Syzygium cumini</i> L. (Myrtaceae)	Jammu	Fruit pulp (J) and seed powder (C) are effective against diabetes.
<i>Trigonella foenum-graecum</i> L. (Fabaceae)	Methi	Seed powder (5 g) taken early in the morning in empty stomach (K).

<b>Diarrhoea and dysentery</b>		
<i>Ficus benghalensis</i> L. (Moraceae)	Bara	Aerial roots ground (2 g) and mixed with black salt given to patients suffering from diarrhoea (J).
<i>Foeniculum vulgare</i> Mill. (Apiaceae)	Panamadhuri	Decoction of fruits (10 ml) with sugar given against diarrhoea and dysentery (J).
<i>Kalanchoe pinnata</i> Pers. (Crassulaceae)	Amarapoi	Fresh leaf-extract of one leaf with pinch of common salt and a black paper given to cure cholera (K).
<i>Limonia acidissima</i> L. (Rutaceae)	Kaitha	Juice of immature fruit (10 ml) mixed with 5 drops of honey is given for blood dysentery (K).
<i>Mentha arvensis</i> L. (Lamiaceae)	Podina	Leaf juice (10 ml) given two times a day to check vomiting and loose motion (J, K).
<i>Musa paradisiaca</i> L. (Musaceae)	Kadali	Unripe fruit boiled and given with rice and curd against dysentery (J).
<i>Oxalis corniculata</i> L. (Oxalidaceae)	Ambiliti	Cake prepared out of the leaves of this plant and boiled rice is given to children suffering from diarrhoea or dysentery (K).
<i>Papaver somniferum</i> L. (Papaveraceae)	Aphima	Very small quantity in a banana or milk given to children against dysentery or diarrhoea (K).
<i>Phyllanthus fraternus</i> Webster (Euphorbiaceae)	Bari-aenla	Roots (5 g) are crushed and taken with a glass of cold water to cure dysentery (K).
<b>Ear ailments</b>		
<i>Allium sativum</i> L. (Liliaceae)	Rasuna	Mustard oil with garlic juice put into the ear (C, J).
<i>Syzygium aromaticum</i> Merr. and Perry (Myrtaceae)	Lavanga	Mustard oil with essence of clove dropped into the ear to check earache (K).

<i>Piper betle</i> L. (Piperaceae)	Pana	The leaf juice is put in the ear to cure ear infections (K).
<i>Tagetes erecta</i> L. (Asteraceae)	Gendu	Leaf juice put into the ear against ear infection and severe earache due to pus formation (C, J, K).
<i>Trichosanthes tricuspidata</i> Lour. (Cucurbitaceae)	Mahakala	Pulp of dried fruits (10 g) is boiled in 20 ml of 'sesame' ( <i>Sesamum orientale</i> ) oil and used as ear-drop for ear infections (K).
<b><i>Epilepsy and fits</i></b>		
<i>Acalypha indica</i> L. (Euphorbiaceae)	Indramarisha	Leaves ground with onion, extract poured into ears and nose and also rubbed on neck, chest and hips of children (up to age of 10) against epileptic fits; the same with 'phutiphutika' ( <i>Cardiospermum halicacabum</i> ) boiled in neem oil and the extract also given for epilepsy or fits (K).
<i>Allium sativum</i> L. (Liliaceae)	Rasuna	Juice of bulbils (5 ml) is given with a little mustard oil once a day for six months to cure epilepsy (K).
<i>Atylosia scarabaeoides</i> (L.) Benth. (Fabaceae)	Bana-kolatha	Root juice is put into the nostril once in a day for 7 days against epilepsy (K).
<i>Bacopa monnieri</i> (L.) Penn. (Scrophulariaceae)	Brahmi	Juice of the leaves (10 ml) with 5 ml of honey is given once a day on empty stomach for 30 days to cure epilepsy (K).
<i>Lantana camara</i> L. (Verbenaceae)	Naga-airi, Naguari	Leaf paste applied on body against fits (K).
<b><i>Eye ailments</i></b>		
<i>Azadirachta indica</i> (L.) A.Juss. (Meliaceae)	Neema	Young leaves boiled in water for washing eyes (K).

<i>Euphorbia hirta</i> L. (Euphorbiaceae)	Chitakuti, Hariharika	Latex of the plant applied to the affected eyes to remove redness of eyes due to conjunctivitis (K).
<i>Jasminum sambac</i> (L.) Ait. (Oleaceae)	Malli	Leaves coated ventrally with butter kept on the eye lid overnight to cure conjunctivitis; also cure eye (K).
<i>Moringa oleifera</i> L. (Moringaceae)	Sajana	Leaves cooked and eaten for better eye sight (K).
<i>Phyllanthus emblica</i> L. (Euphorbiaceae)	Aenla	Triphala (powder of all the three fruits: <i>Phyllanthus emblica</i> , <i>Terminalia bellirica</i> , <i>T. chebula</i> ) soaked in water used for washing eyes (J).
<b>Fevers</b>		
<i>Andrographis paniculata</i> Nees (Acanthaceae)	Bhuin-nimba, Chireita	Decoction of whole plant (15 ml) given once in a day for 3 days to treat chronic fevers (K).
<i>Leucas cephalotes</i> (Roth.) Spreng. (Lamiaceae)	Bad- gayasa, Guma	Decoction of leaves (5 ml) administered against any type of fever (J).
<i>Nyctanthes arbor-tristis</i> L. (Oleaceae)	Gangasiuli, Singadahara	Infusion (10 ml) of fresh leaves with common salt (4:1) given to children against any type of fever including malaria (K).
<i>Ocimum sanctum</i> L. (Lamiaceae)	Tulasi	Decoction of the leaves of this plant, golmaricha ( <i>Piper nigrum</i> ), ada ( <i>Zingiber officinale</i> ) and guluchi ( <i>Tinospora cordifolia</i> ) mixed with a pinch of common salt is given against fever especially in malaria (J).

<b>Headache</b>		
<i>Aloe vera</i> (L.) Burm.f. (Liliaceae)	Ghee-kuanri	Mucilage of the leaves rubbed on forehead against hemicrania (K).
<i>Jasminum sambac</i> L. (Oleaceae)	Malli	Sesamum oil treated with the flowers of this plant is applied on head (K).
<i>Madhuca indica</i> Gmel. (Sapotaceae)	Mahula	Seed oil applied on the forehead (K).
<i>Santalum album</i> L. (Santalaceae)	Chandana	Paste of heartwood applied on the forehead (C).
<b>Hydrocele</b>		
<i>Crinum asiaticum</i> L. (Amaryllidaceae)	Arisha	Leaf paste mixed with cow ghee applied externally over the affected scrotum once in a day for 3 days or till relief (K).
<i>Tephrosia purpurea</i> (L.) Pers. (Fabaceae)	Banakolathia	Leuke-warm root paste applied externally 2 times a day for 7 days on hydrocele (K).
<b>Injuries (sprain)</b>		
<i>Curcuma longa</i> L. (Zingiberaceae)	Haladi	Rhizome powder (2-3 g) with hot milk (50 ml) given internally for early relief (J).
<i>Moringa oleifera</i> Lam. (Moringaceae)	Sajana	Leaves pounded, warmed and tied at the place of injury (K).
<i>Ricinus communis</i> L.	Jada	Leaves smeared with its oil, warmed and tied on the affected part of the body against severe sprain (J).
<b>Laxative</b>		
<i>Aegle marmelos</i> (L.) Correa (Rutaceae)	Bela	Serbet prepared from ripe fruit given against constipation (J).
<i>Cassia fistula</i> L. (Fabaceae)	Sunari	Fresh extract of ripe fruit pulp (50 ml) with common salt (3:1) used as mild purgative (K).

<i>Phyllanthus emblica</i> L. (Euphorbiaceae) <i>Terminalia bellirica</i> Roxb. <i>Terminalia chebula</i> Retz. (Combretaceae)	Aanla Bahada Harida	Powder of the three fruits (Triphala: <i>Phyllanthus emblica</i> , <i>Terminalia bellirica</i> and <i>T. chebula</i> ) in equal proportions given with warm water or milk on empty stomach (K).
<i>Plantago ovata</i> Forsk. (Plantaginaceae)	Isapgul, Bhusi	Seed husk (10 g) with milk or water (100 ml) given against constipation (J).
<i>Vitis vinifera</i> L. (Vitaceae)	Khismis	Dried fruits roasted, salted and taken with milk (K).
<b>Liver ailments</b>		
<i>Andrographis paniculata</i> Nees (Acanthaceae)	Bhuin-nimba,	Fresh leaf juice (10 ml) given once in a day for 7 days against liver enlargement (J, K).
<i>Boerhavia diffusa</i> L. (Nyctaginaceae)	Puruni	Root sap given in empty stomach (C, J, K).
<i>Cuscuta reflexa</i> Roxb. (Cuscutaceae)	Malanga	Plant extract with powder of black pepper (2:1) given in jaundice (K).
<i>Eclipta prostrata</i> L. (Asteraceae)	Kesadura	Decoction of leaves cures jaundice, cleans the liver, helps in curing indigestion and increases appetite (K).
<i>Lawsonia inermis</i> L. (Lythraceae)	Manjuati	About 2-3 g of fresh roots and one black pepper ( <i>Piper nigrum</i> ) is made into paste in 50 ml of cow's milk and given daily for one month against jaundice and anaemia (K).
<i>Phyllanthus fraternus</i> Webster (Euphorbiaceae)	Bhuin-amla	Leaf juice (10 ml) or aqueous extract of whole plant given against jaundice (K).
<i>Physalis minima</i> L. (Solanaceae)	Tomatilo	Decoction of the fruits (15 ml) mixed with 5 g jaggery is given once in a day for 7 days to cure jaundice (K).

<i>Solanum nigrum</i> L. (Solanaceae)	Lunulunia	Juices of leaves (10 ml) is given to children against enlargement of liver (J).
<b>Malaria</b>		
<i>Andrographis paniculata</i> Nees (Acanthaceae)	Bhunimba	Half cup each of plant decoction and milk and mixed with a pinch of black salt given in morning and evening for 7-8 days; for adults, each ingredient is doubled (K).
<i>Anisomeles indica</i> (L.) Kuntze (Lamiaceae)	Bhutamari	Roots, leaves and inflorescence extracts (20 ml) given for malarial fever (K).
<i>Eclipta prostrata</i> L. (Asteraceae)	Kesadura	Two spoons of plant powder boiled in two glasses of water; one spoon given twice a day for 6-7 days (K).
<b>Piles</b>		
<i>Alangium salvifolium</i> (L.) Wang. (Alangiaceae)	Dhalanku, Ankula	One spoon powder of root bark with half spoon sugar candy taken with water in early morning and at bed time for 10-12 days (K).
<i>Aloe vera</i> (L.) Burm.f. (Liliaceae)	Ghee-kuanri	Pulp of the leaf (20 g) with sugar candy (10 g) taken twice a day for one week (K).
<i>Amorphophalus paeniifolius</i> (Dennst.) Nicolson var. campanulata (Araceae)	Olua	Corm is encapsulated in mud, gently burnt and then pounded with little common salt and mustard oil. This paste (2 tea spoonful) given once a day for a week (K).
<i>Hygophila auriculata</i> (K. Schum) Heine (Acanthaceae)	Koilikhia	Chronic piles are said to be cured when mixture of tea spoonful of leaf juice and equal amount of honey is taken daily for 15 days (K).
<i>Plumbago zeylanica</i> L. (Plumbaginaceae)	Dhala Chitaparau	Root juice given with honey two times a day till its cure (K).

<b>Rheumatism, arthritis and body ache</b>		
<i>Curculigo orchioides</i> Gaertn. (Hypoxidaceae)	Talamuli	10-15 g of roots are ground with 5 g of dried ginger ( <i>Zingiber officinale</i> ) and 5 g of long pepper ( <i>Piper longum</i> ) and the paste is used in 3 doses daily for 7 days. During this period the leaves of 'arakha' ( <i>Calotropis procera</i> ) are heated and placed over the affected joint (K).
<i>Erythrina variegata</i> L. (Fabaceae)	Paladhua	A piece of cloth soaked in leaf-leachate used for fomentation of joints affected by rheumatoid arthritis(K).
<i>Leonotis nepetifolia</i> (L.)R.Br. (Lamiaceae)	Kantasia	Leaf powder mixed in coconut oil, rubbed on the affected part of the body to check rheumatic pain (K).
<i>Paederia foetida</i> L. (Rubiaceae)	Pasaruni	10 ml of leaf-leachate taken with little jaggery or honey for rheumatic pain; also against diarrhoea and indigestion (K).
<i>Strychnos nux-vomica</i> L. (Loganiaceae)	Kochila	Leachate of soft young leaves is used for fomentation of joints in arthritis and rheumatism (K).
<i>Vitex negundo</i> L.	Begunia	Vapour generated by heating leaves of this plant along with the leaves of 'jada' ( <i>Ricinus communis</i> ), 'arakha' ( <i>Calotropis gigantea</i> ) and 'dudura' ( <i>Datura metel</i> ) in a closed earthen vessel, passed through the swollen joints due to rheumatism for the immediate pain relief (K).
<b>Scalp infection and hair fall</b>		
<i>Acacia sinuata</i> (Lour.) Merrill.	Sikakai	The fruit paste is used to wash hair as anti-dandruff and hair conditioner. A paste of sun-dried fruits of this plant, 'methi' ( <i>Trigonella foenum-graecum</i> ) seeds along with root powder of 'bena' ( <i>Veliveria zizanioides</i> ) is used as a hair-wash to remove dandruff and making hair soft (K).

<i>Cardiospermum halicacabum</i> L. (Sapindaceae)	Phutiphutica	Paste of the plant applied on hair and washed after 5 minutes, once a week, prevents baldness and graying of hair (K).
<i>Centella asiatica</i> (L.) Urb. (Apiaceae)	Thalkudi	Leaves (3-4 nos.) are boiled in 20 ml sesame ( <i>Sesamum orientale</i> ) oil and rubbed on scalp for better hair growth (K).
<i>Citrus medica</i> L. (Rutaceae)	Lembu	Seed paste is applied on head to check hair fall (K).
<i>Dillenia indica</i> L. (Dilleniaceae)	Oou	The mucilage of the carpels with fresh turmeric (2:1) is applied as a paste to clean dandruff and lice and also for the luxuriant hair growth (K).
<i>Eclipta prostrata</i> L. (Asteraceae)	Kesadura,	Leaf juice mixed with castor oil is applied on scalp for strengthening of hair and also used as a preventive measure against premature graying of hair and alopecia. A preparation of warm sesame oil with plant paste (2:1) is applied to promote luster and growth of hair (K).
<i>Hibiscus rosa-sinensis</i> L. (Malvaceae)	Mandara	The flower paste is massaged on the head to delay graying of the hair and to check hair fall due to high fever during typhoid or malaria (K).
<i>Phyllanthus emblica</i> L. (Euphorbiaceae)	Dhatri-aenla	Fruit-rind is sun-dried, powdered and mixed with sesame oil (1:2) to be used as a hair growth promoter and as a hair stainer (K).
<i>Tragia involucrata</i> L. (Euphorbiaceae)	Bichhuati	The roots are made into a paste with country liquor and applied for thick hair growth and also arrest hair loss (K).

<b>Skin diseases</b>		
<i>Allium cepa</i> L. (Liliaceae)	Piyaja	The bulb is sliced and rubbed on the skin twice in a day for six months to cure white spots (K).
<i>Allium sativum</i> L. (Liliaceae)	Rasuna	The clove is cut into half and the cut end is rubbed on the face to cure pimples. The juice of the clove is also applied externally on the affected part of the face to clear the white spots, pimples and boils (K).
<i>Aloe vera</i> (L.)Burm.f. (Liliaceae)	Ghee-kuanri	Leaf juice is applied on the face to remove pimples and scars and also used by some tribal community for facial make-up (K).
<i>Alstonia scholaris</i> (L.) R.Br. (Apocynaceae)	Chhatiana, Chhanchana	Bark poultice mixed in 'kanji' (fermented rice water) is applied externally to cure skin eruptions and ringworm-scars. The latex is also used externally to remove acne and pimples (K).
<i>Argemone mexicana</i> L. (Papaveraceae)	Kantakusuma, Agara	Seeds boiled in mustard oil and applied externally against scabies (K). The yellow latex of this plant is applied to cure blisters and lip ulcer (K).
<i>Azadirachta indica</i> (L.) A.Juss. (Meliaceae)	Neema	Water boiled with older leaves for taking bath; bark paste applied to boils, and young leaves or flowers taken to prevent skin diseases (C, J).
<i>Bombax ceiba</i> L. (Bombacaceae)	Simuli	The gum and bark paste is used to treat acne, pimples, boils, burns, facial twitching and also to improve the texture and vigour of the skin (K). Crushed bark heated with salt and applied to boil (J).

<i>Buchanania lanzan</i> Spreng. (Anacardiaceae)	Chara	Seed oil applied on the skin to remove scars (C, J).
<i>Calotropis procera</i> (Ait) R.Br. (Asclepiadaceae)	Dhala Arakha	Latex applied on scabies (K); Oil-smearred leaves warmed and tied to ripe boil (J).
<i>Cassia tora</i> L. (Caesalpiniaceae)	Bana chakunda	Juice of the leaf applied against any type of skin diseases including ringworm (K).
<i>Cinnamomum verum</i> Presl. (Lauraceae)	Dalchini	Paste of cinnamon powder prepared with a few drops of fresh lime juice is applied to remove pimples and black heads and to restore normal skin colour on the face (K).
<i>Cissampelos pareira</i> L. (Menispermaceae)	Akanabindhi	Cow ghee-smearred leaf warmed and placed on the immature boil to ripen and expel pus (K).
<i>Clitoria ternatea</i> L. (Fabaceae)	Aparajita	About 0.5 g ash of whole plant is given with equal amount of butter (cow's) once a day for one month against acne on the face (K).
<i>Cocos nucifera</i> L. (Arecaceae)	Nadia	Oil mixed with camphor applied to small boils or scabies (K).
<i>Coriandrum sativum</i> L. (Apiaceae)	Dhania	A teaspoonful of coriander leaf juice, mixed with a pinch of turmeric powder, is an effective remedy for pimples, black heads, erysipelas and dry skin. The mixture should be applied to the face, after washing it thoroughly, every night before retiring. The leaf juice is massaged on the lips for soft and rosy colour (K).
<i>Crataeva magna</i> (Lour.) DC. (Capparaceae)	Baruna	Bark paste mixed with goat milk is used against skin eruptions and also as a facial cream (K).

<i>Piper betle</i> L. (Piperaceae)	Pana	Leaf smeared with butter is warmed and tied on a boil to open it (K).
<i>Euphorbia hirta</i> L. (Euphorbiaceae)	Chitakutei, Hariharika	The latex of the plant is used in the treatment of warts and corns. The milky juice of the plant is applied on cracked lips, nipple and tongue (K).
<i>Madhuca indica</i> Gmel. (Sapotaceae)	Mahula	The seed oil is applied as ointments to prevent crack in the skin during winter. The seed paste is massaged on the body one hour before bath to improve the texture and vigour of the skin (K).
<i>Oxalis corniculata</i> L. (Oxalidaceae)	Ambiliti	Leaf juice is locally applied to cure warts, corns and other excrescences of the skin. The extract of the whole plant mixed with onion juice (1:1) is also applied to remove warts (K).
<i>Phyllanthus emblica</i> L. (Euphorbiaceae)	Dhatri-aenla	A paste made from fruits of this tree and seeds of groundnut ( <i>Arachis hypogea</i> ) along with lemon juice (2:2:1) is applied as a lotion against dry skin (K).
<i>Psoralea corylifolia</i> L. (Fabaceae)	Bakuchi	Seed oil is applied against psoriasis and leucoderma (K).
<i>Santalum album</i> L. (Santalaceae)	Chandana	The paste of the wood along with human saliva is applied on the affected part to cure stye and pimples. The wood paste is also applied locally to cure herpes scar (K).
<i>Solanum nigrum</i> L. (Solanaceae)	Lunulunia	A juice or poultice of leaves can be effectively applied on eruptive skin diseases, whitlow and burns. The decoction of the berries and flowers is applied against erysipelas (K).

<i>Streblus asper</i> Lour. (Moraceae)	Sahada	Dried leaves with goat dung-ash (1:1) made into powder, mixed with castor oil and applied on eczema and ringworm (K).
<i>Terminalia chebula</i> Retz. (Combretaceae)	Harida	The fruit paste is applied to cure boils, pimples and acne (K).
<i>Urginea indica</i> (Roxb.) Kunth. (Liliaceae)	Bana-piaja, Bana-uli	The paste of the bulb is applied locally on the affected parts to remove warts and corns (K).
<i>Woodfordia fruticosa</i> (L.) Kurz. (Lythraceae)	Dhatuki	Leaf ash mixed with coconut oil is applied to cure ringworm and injury caused due to burning (K).
<b>Stammering</b>		
<i>Acorus calamus</i> L. (Araceae)	Bacha	One spoon root paste with one-cup milk is given at bedtime for 3-4 months (K).
<i>Polycarpaea aurea</i> Wt. and Arn. (Caryophyllaceae)	Pasanabhedi	The leaves of this plant along with 'Sunari' ( <i>Cassia fistula</i> ) flowers and leaves is advised to be smoked as cigarettes for 21 days to rectify stammering and to restore speaking power in dumb children (K).
<b>Stomach ailments</b> (indigestion, flatulence, stomach pain)		
<i>Aegle marmelos</i> (L.) Correa (Rutaceae)	Bela	Unripe fruit pulp (10 g) once in a day for 7 days against stomach ailments (J).
<i>Coriandrum sativum</i> L. (Apiaceae)	Dhania	Decoction of fruits along with equal proportions of fruits of 'jeera' ( <i>Cuminum cyminum</i> ), panamadhuri ( <i>Foeniculum vulgare</i> ) and Juani ( <i>Trachyspermum ammi</i> ) mixed with crystalline sugar given to children against indigestion (J)

<i>Cuminum cyminum</i> L. (Apiaceae)	Jeera	Jeera along with the seeds of 'juani' ( <i>Trachyspermum ammi</i> ) and a pinch of 'hengu' ( <i>Ferula assafoetida</i> ) boiled in water and decoction mixed with honey given to children against flatulence (J).
<i>Ferula assafoetida</i> L. (Apiaceae)	Hengu	Asafoetida paste applied around umbilical cord effective against stomach pain in children (K).
<i>Macrotyloma uniflorus</i> (L.) Verdc. (Fabaceae)	Kolatha	Seed decoction with jaggery (2:1) given in stomach ulcer (K).
<i>Paederia foetida</i> L. (Rubiaceae)	Pasaruni	10 ml of leaf juice taken with honey (5:1) against indigestion (K).
<i>Seseli diffusum</i> (Roxb.ex Sm.) Sant. and Wagh (Apiaceae)	Bila-juani	Seeds paste (10 g) mixed with a pinch of black salt is given against indigestion and stomach ache (K).
<i>Trachyspermum ammi</i> Sprague (Apiaceae)	Juani	Seeds with a pinch of asafetida fried and mixed with black salt and given with luke-warm water against flatulence and indigestion (J).
<b>Stones</b> (in kidney or gall bladder)		
<i>Kalanchoe pinnata</i> Pers. (Crassulaceae)	Amarapoi	Sap of leaves (10 ml) given once in a day for 7 days against kidney stone (J).
<i>Macrotyloma uniflorus</i> (L.) Verdc. (Fabaceae)	Kolatha	Seeds (25 g) soaked in water (100 ml) overnight and this water taken (50 ml) internally for gall bladder or kidney stone (J).
<i>Tribulus terrestris</i> L. (Zygophyllaceae)	Gokhara	Decoction of fruits mixed with root paste of 'paunsia' ( <i>Aerva lanata</i> ) given against gall bladder stone (K).
<b>Women's diseases</b> (Debility after delivery, galactorrhoea, leucorrhoea, menorrhagia, parturition difficulties etc.)		
<i>Abutilon indicum</i> (L.) Sweet. (Malvaceae)	Pedipedica	About 5-10 ml of the leaf- juice is prescribed for post delivery complications especially to get rid of left over placenta parts and also reduce the pain, if any (K).

<i>Achyranthes aspera</i> L. (Amaranthaceae)	Apamaranga	About 20-30 ml decoction of the whole herb with 8-10 ml of honey is given for labour pain and to hasten delivery (K).
<i>Alstonia scholaris</i> (L.) R.Br. (Apocynaceae)	Chatiana	Root powder (2-3 g) mixed with 5 drops of latex and 20 ml of freshly prepared curd is prescribed as lactagogue for nursing mother (K).
<i>Alternanthera sessilis</i> (L.) DC. (Amaranthaceae)	Madaranga	One cup plant decoction given once a day for 20 days to the feeding mother for better lactation. The patient is also advised to take the leaf of this plant along with the leaf of 'Kanta leutia' ( <i>Amaranthus spinosus</i> ) as vegetable in her daily diet (K).
<i>Asparagus racemosus</i> Willd. (Liliaceae)	Satabari	One spoon of root powder, with one cup of milk, twice a day for 7 days given against galactorrhoea (K).
<i>Bombax ceiba</i> L. (Bombacaceae)	Simuli	A mixture is prepared by mixing 50 g sugar candy and powder of two young roots (7 cm long and 3 cm broad each) of this plant with 250 ml milk of black cow. This is given for curing menstrual disorder and restoring fertility in female (K).
<i>Carica papaya</i> L. (Caricaceae)	Amrutabhanda	Green fruit (250 g) is boiled and made into a paste and is given twice a day along with a pinch of common salt and jeera powder for three months from the seventh day of the delivery as a galactagogue (K).
<i>Cassia tora</i> L. (Caesalpinaceae)	Chakunda	Young seedlings eaten for easy delivery (K).
<i>Cissampelos pareira</i> L. var. <i>hirsuta</i> (DC.) Forman (Menispermaceae)	Akanabindhi	Five to seven leaves with five black peppers ( <i>Piper nigrum</i> ) are pounded and given 3 times a day against menstrual disorder (K).

<i>Curcuma amada</i> Roxb. (Zingiberaceae)	Ambakasia- ada	Paste of rhizome (15 g) and 7 black peppers ( <i>Piper nigrum</i> ) is given along with 'chouladhua pani' (water in which rice is washed) twice daily for 7 days to regularize menstrual disorders (K).
<i>Daucus carota</i> L. (Apiaceae)	Gajar	Decoction of seeds with ghee and jaggery given in amenorrhoea (K).
<i>Lagenaria sisceraria</i> (Mol.) Standl. (Cucurbitaceae)	Laoo	Fruit pulp (100-200 g) boiled with cow milk (100-200 ml) and given daily for three months to increase the milk content of a lactating mother (K).
<i>Hemidesmus indicus</i> R.Br. (Asclepiadaceae)	Anantamula	Two spoons root decoction with little black pepper powder given once a day for 10-12 days against leucorrhoea (K).
<i>Mucuna pruriens</i> (L.) DC. (Fabaceae)	Baidanka	Dry seeds (2-3) are powdered and given with a little honey for 7 days against leucorrhoea as well as impotency in male (K).
<i>Nelumbo nucifera</i> Gaertn. (Nelumbonaceae)	Padma	A sweet prepared from the seed flour given to women as cardio-tonic after child birth (K).
<i>Nymphaea nouchali</i> Burm.f. (Nymphaeaceae)	Lal kain	One cup each of root decoction and milk, and one spoon ghee and honey, all mixed together, taken once a day for one week to avoid risk of abortion (K).
<i>Saraca asoca</i> (Roxb.) de Wilde (Caesalpinaceae)	Asoka	About 20 g of the bark is boiled in 200 ml of cow's milk for half an hour. The filtrate is given with honey twice a day for 15 days against leucorrhoea and other gynaec troubles (K).

<i>Scoparia dulcis</i> L. (Scrophulariaceae)	Kheta-papda	The leaves (about 20 g) are crushed and a cake is made with rice powder (50 g). These cakes are fried over fire and administered for inducing puberty if delayed (K).
<i>Sphaeranthus indicus</i> L. (Asteraceae)	Bhuin-kadamba	Whole plant (500 g) is boiled with one litre of water and jaggery (200 g) and stored in an earthen pot for about 15 days. The decoction (50 ml) is used as a health tonic and especially given to the mother of a new-born baby for one month (K).
<i>Syzygium aromaticum</i> (L.) Merr. and Perry (Myrtaceae)	Lavanga	Smashed cloves are soaked in water for a few minutes, warmed and given as drink twice or thrice a day to stop vomiting during pregnancy (K).
<i>Tamarindus indica</i> L. (Caesalpiniaceae)	Tentuli, Kaiyan	Extract of old tamarind fruits mixed with old jaggery in the proportion of 1:2 is given to ladies for curing menorrhagia accompanied by weakness, backache, anaemia etc. (K).

The present article shows that over 129 plants are commonly used as herbal remedies either singly or in combination with other plants in 172 prescriptions. The formulation and standardization of some effective and widely used herbal medicine either with single plant or in combination with other plants with appropriate dosage for its sustainable use should be encouraged. It is interesting to note that some of these were not reported earlier as to their use neither in indigenous phyto-therapy nor in modern healthcare. The findings embodied in this paper indicated that the age-old knowledge of rural communities on medicinal use of plant parts or extracts could provide a good deal of scope or clue in discovering new or less known sources of bioactive molecules towards development of novel drug preparations. Needless to overemphasize that there has been a growing consciousness worldwide especially in the developed countries and, of late, in India for use of plant-based medicines with little associated adverse effects. It would not be surprising, therefore, to predict that in the forthcoming days herbal therapy will be the global choice by which the synthetic chemical-based drugs would eventually be replaced.



**Dr. Kunja Bihari Satapathy**

Former Head of the Department of Botany,  
Utkal University, Vani Vihar, Bhubaneswar-751004  
Tel.: 0674-2540873, Mob.: 9861126749

Born on 25<sup>th</sup> February, 1955 at Kuruan, in the Jajpur district of Odisha, Dr. Kunja Bihari Satapathy graduated in 1976 from Regional College of Education, Bhubaneswar and obtained M.Sc in Botany from Utkal University with specialization in Microbiology in 1978. He was awarded with M.Phil., Ph.D. and D.Sc. Degree from Utkal University in the year 1985, 1991 and 2007 respectively. He is a person with expertise in ‘Plant Taxonomy’ particularly on medicinal and aromatic plants. Besides, he has been actively engaged in detoxification of municipal sewage, industrial effluents and mine’s waste water through phytoremediation employing *Azolla* and its floating associates. Dr. Satapathy has supervised ten PhD students working in the field of Botany, Environmental Science, Microbiology and Life Sciences. He guided fifteen students for M.Phil., one student for M.Tech. and twenty eight for M.Sc. dissertation work. Dr Satapathy has published 170 number of research papers in national and international journals, in book chapters as well as conference proceeding volumes. His books on ‘Herbal cure of Diabetes’ and ‘*Azolla* as Biofertilizer and Waste Disposer’ published in three international languages has been acclaimed worldwide. Dr. Satapathy have successfully executed research and consultancy projects of UGC, OBB, ICAR, NALCO, MIEL, MCCL, Bhusan Steel Ltd. etc. Dr Satapathy worked on ethnobotany, plant biodiversity inventories, qualitative and quantitative assessment of flora in different districts of Odisha and Jharkhand with mining activities. He has developed protocol for production and utilization of *Azolla*-biofertilizer in rice cultivation and its popularization among the farmers in Odisha. Dr. Satapathy holds over 37 years of experience in teaching, research in the lab as well as in the field and Environmental Consultancies. He has been serving the cause of science in a wide spectrum of roles - a dedicated teacher, an honest scientist and an able researcher. Dr Satapathy was elected as the Secretary of Orissa Botanical Society for the tenure of 2012-2015. He has received many awards and recognitions within the state, and at national level for his achievements and outstanding contributions to Plant Taxonomy.

## **World Environment Day 2017**

### **Theme: Connecting People to Nature**

(05.06.2017)

Orissa Environmental Society highlights

World Environment Day (WED), observed every year on 5 June, is the United Nation's principal vehicle for encouraging worldwide awareness and action towards the protection of our environment. First held in 1974, it has been a flagship campaign for raising awareness on emerging environmental issues from air, water and land pollution and global warming to sustainable consumption and wildlife crime. WED has grown to become a global platform for public outreach, with participation from over 143 countries annually.

World Environment Day was designated by the UN General Assembly in 1972 on the first day of United Nations Conference on the Human Environment, resulting from discussions on the integration of human interactions and the environment. Two years later, in 1974 the first WED was held with the theme "Only One Earth". Even though WED celebrations have been held annually since 1974, in 1987 the idea for rotating the centre of these activities through selecting different host countries began.

Each year, WED has a new theme that major corporations, NGOs, communities, governments and celebrities worldwide adopt to advocate environmental causes. The theme for the current year of 2017 is 'Connecting People to Nature'- in the city and on the land, from the poles to the equator. 'Connecting People to Nature', the theme for World Environment Day 2017, implores us to get outdoors and into nature, to appreciate its beauty and its importance, and to take forward the call to protect the Earth that we share. The global host country for WED 2017 is Canada.

**WED Celebration Year-wise and the Global Host Country**

<b>Year</b>	<b>Theme</b>	<b>Host Country</b>
1974	Only One Earth	United States
1975	Human Settlements	Bangladesh
1976	Water: Vital Resource for Life	Canada
1977	Ozone Layer Environmental Concern; Land Loss and Soil Degradation	Bangladesh
1978	Development Without Destruction	Bangladesh
1979	Only One Future for Our Children – Development Without Destruction	Bangladesh
1980	A New Challenge for the New Decade: Development Without Destruction	Bangladesh
1981	Ground Water; Toxic Chemicals in Human Food Chains	Bangladesh
1982	Ten Years After Stockholm (Renewal of Environmental Concerns)	Bangladesh
1983	Managing and Disposing Hazardous Waste: Acid Rain and Energy	Bangladesh
1984	Desertification	Bangladesh
1985	Youth: Population and the Environment	Pakistan
1986	A Tree for Peace	Canada
1987	Environment and Shelter: More Than A Roof	Kenya
1988	When People Put the Environment First, Development Will Last	Thailand
1989	Global Warming; Global Warning	Belgium
1990	Children and the Environment	Mexico
1991	Climate Change. Need for Global Partnership	Sweden
1992	Only One Earth, Care and Share	Brazil
1993	Poverty and the Environment – Breaking the Vicious Circle	People's Republic of China
1994	One Earth One Family	United Kingdom

1995	We the Peoples: United for the Global Environment	South Africa
1996	Our Earth, Our Habitat, Our Home	Turkey
1997	For Life on Earth	Republic of Korea
1998	For Life on Earth – Save Our Seas	Russian Federation
1999	Our Earth – Our Future – Just Save It!	Japan
2000	The Environment Millennium – Time to Act	Australia
2001	Connect with the World Wide Web of Life	Italy and Cuba
2002	Give Earth a Chance	People’s Republic of China
2003	Water – Two Billion People are Dying for It!	Lebanon
2004	Wanted! Seas and Oceans – Dead or Alive?	Spain
2005	Green Cities – Plan for the Planet!	United States
2006	Deserts and Desertification – Don’t Desert Drylands!	Algeria
2007	Melting Ice – a Hot Topic?	England
2008	Kick The Habit – Towards A Low Carbon Economy	New Zealand
2009	Your Planet Needs You – Unite to Combat Climate Change	Mexico
2010	Many Species. One Planet. One Future	Bangladesh
2011	Forests: Nature at Your Service	India
2012	Green Economy: Does it include you?	Brazil
2013	Think.Eat.Save. Reduce Your Foodprint	Mongolia
2014	Raise Your Voice, Not the Sea Level	Barbados
2015	Seven Billion Dreams. One Planet. Consume with Care.	Italy
2016	Zero Tolerance for the Illegal Wildlife trade	Angola
2017	Connecting People to Nature- in the city and on the land, from the poles to the equator	Canada

## **World Environment Day 2017**

### **Theme: “Connecting People to Nature”**

Press Release by UN Environment

‘Connecting People to Nature’, the theme for World Environment Day 2017, implores us to get outdoors and into nature, to appreciate its beauty and its importance, and to take forward the call to protect the Earth that we share.

World Environment Day is the biggest annual event for positive environmental action and takes place on every 5 June. This year’s host country Canada got to choose the theme and will be at the centre of celebrations around the planet. World Environment Day is a day for everyone, everywhere. Since it began in 1972, global citizens have organized many thousands of events, from neighbourhood clean-ups, to action against wildlife crime, to replanting forests. This year’s theme invites you to think about how we are part of nature and how intimately we depend on it. It challenges us to find fun and exciting ways to experience and cherish this vital relationship.

#### **The value of nature**

In recent decades, scientific advances as well as growing environmental problems such as global warming are helping us to understand the countless ways in which natural systems support our own prosperity and well-being.

For example, the world’s oceans, forests and soils act as vast stores for greenhouse gases such as carbon dioxide and methane; farmers and fisher-folk harness nature on land and under water to provide us with food; scientists develop medicines using genetic material drawn from the millions of species that make up Earth’s astounding biological diversity. Billions of rural people around the world spend every working day ‘connected to nature’ and appreciate full well their dependence on natural water supplies and how nature provides their livelihoods in the form of fertile soil. They are among the first to suffer when ecosystems are threatened, whether by pollution, climate change or over-exploitation. Nature’s gifts are often hard to value in monetary terms. Like clean air,

they are often taken for granted, at least until they become scarce. However, economists are developing ways to measure the multi-trillion-dollar worth of many so-called 'ecosystem services', from insects pollinating fruit trees in the orchards of California to the leisure, health and spiritual benefits of a hike up a Himalayan valley.

### **Hit the park**

This year's World Environment Day is an ideal occasion to go out and enjoy your country's national parks and other wilderness areas. Park authorities in some countries may follow Canada's example and waive or reduce park entry fees on June 5 or for a longer period. Once you are there, why not set yourself a challenge (seek out a rare mammal, identify five butterflies, reach the remotest corner of the park). Record what you see, and send us a photo of yourself and/or your discoveries so we can post it on our digital channels and encourage others to go exploring too. You could join the growing number of citizen scientists. More and more smart-phone apps help you log your sightings and connect with others who can identify the species. The records feed into conservation strategies and map the effects of climate change on biodiversity.

### **Nature up close**

Connecting to nature can involve all the physical senses: why not take off your shoes and get your feet (and hands) dirty; don't just look at the beautiful lake, jump in! Take a hike at night and rely on your ears and nose to experience nature. You can also connect with nature in the city, where major parks can be a green lung and a hub of biodiversity. Why not do your bit to green the urban environment, by greening your street or a derelict site, or planting a window box? You could put a spade in the soil or lift a paving slab and see what creatures live beneath. Wherever you are, you could vow to pick up 10 (or 100) pieces of trash, or take inspiration from the citizens of Mumbai, India, and organize a mass beach clean-up. Your activity doesn't have to take place on 5 June itself. UN Environment, for instance, will soon begin testing your knowledge and raising your appreciation of a healthy environment with competitions and online quizzes and provide a whole menu of ideas to help you celebrate the day. In the age of asphalt and smart-phones and among the distractions of modern life, connections with nature can be fleeting. But with your help, World Environment Day can make clearer than ever that we need harmony between humanity and nature so that both are able to thrive.

## VAN MAHOTSAV

### **Theme: ‘Sapling to Tree – Our Responsibility’**

*(Date of observation: 1<sup>st</sup> week of July 2017)*

OES pick-ups from online resources

Van Mahotsav or Forest Festival is a yearly tree-planting festival in India. This movement was started and launched by the India’s Union Minister for Agriculture, Kulapati Dr. K M Munshi in 1950. On this week of the Forest Festival, people take the chance to help themselves to remember the fineness and superiority of backwoods and trees, and to mark the implication of their inherited assets, without which trees can’t adjust or survive.

The planting of trees during the festival serves various purposes like providing alternative fuel, increase production of food resources, helps create shelter-belts around fields to increase productivity, provide food for cattle, offers shade and decorative landscapes, helps conserve soil deterioration, etc. The festival educates the awareness of trees among people and portrays the need of planting and tending of trees, as trees are one of the best ways to prevent global warming and reduce pollution.

The government of India emphasizes the celebration of this festival among children, that’s why all schools, colleges and academic institutions are asked to supply with free seedlings. Due to the celebration of this festival in the month of July, the onset of the monsoon, planting trees proves to be beneficial. At present the forest cover of the country including the trees outside the forest is 23.81 percent and our national target is 33 percent as a threshold limits to maintain ecological balance by 2020. It is really a challenge to achieve.

Forest Festival or Van Mahotsav is very different from the International Day of Forests that is observed on the 21st March with a resolution of the United Nations General Assembly.

Various countries motivate to take on efforts to organize local, national, and international activities involving forests and trees, such as tree planting campaigns, on International Day of Forests, the Secretariat of the United Nations Forum on Forests, in collaboration with the Food and Agriculture Organization. “The best time to plant a tree was 20 years ago. The next best time is now.” » Chinese Proverb

## Environmental Issues of Concern in Factories

**Dr Malay Kumar Pradhan**

*(Date of Presentaion: 06.08.2017)*

Dr Malay Kumar Pradhan expressed that developed countries pay greater attention to the abatement of pollution and providing occupational safety to the employees working in the industrial sector with greater commitment. However, in developing countries like India, the initiatives taken by the factories and industries for protecting the internal as well as the external environment are deficient. Consequently, there is deterioration in the quality of our environment and the workers face various types of occupational hazards and accidents. Thus, our priority is to adopt latest, green technologies that minimize the pollution level and provide safety. The industrial managers, engineers, supervisors, workers, lawyers and judiciary – all have to perform their responsibility for creating an excellent industrial environment and ensuring environmental and human health security. Dr. Pradhan cited the examples of a number of industrial accidents and opined that instead of waiting to learn from our own mistakes, we should learn from the mistakes already committed by others in creating environmental hazards. Providing necessary skills by way of training and required safety equipments to the workers is the foremost, moral responsibility of the industry management.



Safety, Health & Environment  
Consulting, Training & Testing

### **OSID Accident compilation (1993-2003):**

- Out of the total 91 accidents (property loss / fatality / loss of 800MH / led to plant SD), 66% were fire accidents
- 47% accidents happened during operational jobs
- Causes of accidents:
  - 71% Human error
  - 11% Failure of plant
  - 18% Presence of ignition source

[www.indohaan.com](http://www.indohaan.com)

Contact +91 9810081140

**OISD: OIL Industry Safety Directorate**



**Dr Malay Kumar Pradhan**

Deputy Director (Safety),  
Directorate of Factories and Boilers,  
Odisha, Bhubaneswar.  
Phone: 9439210915; malay.pradhan@yahoo.com

Born in Baripada on 26 Aug 1967, Dr Malay Kumar Pradhan completed B.Sc. in Mechanical Engineering from CET-Bhubaneswar, M. E. in Heat Power Engineering from UCE-Burla; Ph.D. in Safety, Health and Environment from Sambalpur Univ., and PG Diploma in Environmental Education and Management from Sambalpur Univ. along with an LLB from Utkal Univ. Dr Pradhan held various positions under the Government from where he handled a wide variety of assignments relating to training, designing, monitoring and analysis of issues relating to safety, health and environment in factories. Dr Pradhan holds a number of publications emerging from his professional career. He is an expert member of some industrial projects, a life member of many professional bodies and a member Board of Studies. He has received awards and honours from different organizations.

**Some safety equipments**



## **Environmental Education for Lasting Solutions to Environmental Challenges**

*(Date of Presentaion: 03.09.2017)*

**M. C. Dash**

*What is Environmental Education?  
Can it be an instrument for lasting Solutions to Environmental  
Challenges?*

### **ABSTRACT**

*The concept of Environmental Education originated in ancient human civilization and people's awareness was based on moral and ethical values, and narration through fables for children. The roots of environmental education can be traced back to Vedic Times' Rakhaye Prakrutim Pantu Loka'. In eastern culture; importance of nature study (first phase) started in Guru Ashrams but did not take a concrete shape to develop a curriculum for the schools and colleges to address the problems. However, nature was considered as the expression of the Almighty. People worshiped Sun, Moon, Planets, Trees, Rivers, and Soil, some animal species etc. Manusmruti comprises 2684 verses in 12 chapters. The treatise focused on environmental protection and gave a meaningful structure and is deductive. These ethical laws had significant effect in post vedic period to protect trees, forests, animals, and the five gross elements such as the Ether( Aakaassa, ), Vaayu (Air), Tejas (Fire) Aaapa( Water) and Kshiti (earth/ Soil)(Buhler,G.1886). These laws have ethical and moral values but were not inductive.*

*In the second phase, Vernadsky of Russia ( www.rdasia.com) developed the concept of Biosphere, the zone that supports life on earth and recognised the geological force and described the atmosphere as extension of Life in 1922. James Lovelock (1919-) of England proposed the Gaia hypothesis suggesting that the*

*earth is a single living organism. The biodiversity interact with the earth, each having its small effect on the system as the individual cells cause some effect on human body. Ultimateky the planet is self regulating and maintains its own surface condition. (www.rdasia.com)*

*The third phase dealt with systems concept and scientists tried to incorporate management aspects of natural resources for human welfare. This led to develop Environmentalism. During the last 200 years, the concepts of nature study (Jean-Jacques Rousseau) and systems approach has developed by the western scholars into two broad aspects such as (i) rigorous science, technology and management aspects; and (ii) sensitization of people about the environmental degradation, their responsibility and role to improve the situation and their rights as per the provisions of the national constitutions and by the national and international environmental laws enacted by the legislative bodies and UNO.*

*At present, (4<sup>th</sup> phase) importance is given to Ecosystem Analysis (structural change, functional change, stress factors, stability, restoration and sustainability) and impact of anthropogenic activity and climate change on natural and man-made ecosystems.*

*International and national conventions have played important role and have influenced educators to frame syllabus and courses befitting to the requirement of the present day. This lecture deals with history, definition, progress of environmental education and the need of study of ecosystem analysis.*

### **Introduction: Brief History**

The roots of environmental education can be traced back to Vedic Times' **Rakhaye Prakrutim Pantu Loka**'. In eastern culture; importance of nature study started in Guru Ashrams but did not take a concrete shape to develop a curriculum for school. However, nature was considered as the expression of the Almighty. People worshiped Sun, Moon, Planets, Trees, Rivers, and Soil etc. Manusmruti comprises 2684 verses in 12 chapters. The treatise focused on environmental protection and gave a meaningful structure and is deductive. These ethical laws had significant effect in post vedic period to protect trees, forests, animals, and the five

gross elements such as the Ether( Aakaassa.), Vaayu (Air), Tejas (Fire) Aaapa( Water) and Kshiti ( earth/Soil)(Buhler,G.1886, Padhy,S et al,2006). These laws have ethical and moral values but were not inductive.

In recent times as early as the 18th century, Jean-Jacques Rousseau stressed importance of an education that focuses on environment. Several decades later, Louis Agassiz, a Swiss-born naturalist supported Rousseau's philosophy. He encouraged students to 'Study nature'. Both the scholars laid the foundation for environmental education program, known as **Nature Study**, which happened in the late 19th century and early 20th century.

In 1876, the German Biologist, Ernest Haeckel coined a word 'Ecology',- Eco means House/Home and logus means discourse. Environmental Education has a strong root in understanding ecological principles.

Initially the nature study movement used fables and moral lessons to help school students to develop an appreciation of nature as man is part of the nature (originally Eastern Concept).. Anna Botsford Comstock, the head of the Department of Nature Study at Cornell University, USA, was a prominent figure in the nature study movement and wrote a Handbook for Nature Study in 1911, to educate school children on cultural values. Comstock and other leaders of Nature study movement, such as Liberty Hyde Bailey, involved community leaders, teachers, and scientists and changed the science curriculum for school children across the United States.

Vernadsky of Russia ( [www.rdasia.com](http://www.rdasia.com)) developed the concept of Biosphere, the zone that supports life on earth and recognised the geological force and described the atmosphere as extension of Life. James Lovelock of England proposed the Gaia hypothesis suggesting that the earth is a single living organism. The biodiversity interact with the earth, each having its small effect on the system as the individual cells cause some effect on human body. Ultimateky the planet is self regulating and maintains its own surface condition.( [www.rdasia.com](http://www.rdasia.com))

A new type of environmental education, named **Conservation Education**, emerged during 1920s and 1930s. Conservation Education dealt with natural world and focused on rigorous scientific training involving scientific management and planning tool that helped to solve social, economic, and environmental problems during that time.

In 1935, a British biologist- A.G.Tansley extended the system concept (**Ecosystem**) developed by William Harvey,-a human physiologist in 16<sup>th</sup> century and few physical scientists to Ecology, the mother of Environmental Science.(Dash and Dash,2009).

He thought the living cell is a tiny system and its function is quantified by the resource inputs, biosynthesis, metabolism and the output (growth) etc. The quantification helps to understand the structure of functional dynamics with predictable characteristics. In this way, all type of living cells under different conditions can be quantified and compared. He extended this idea to a mega-system such as an ecological system or ecosystem. This concept led to develop a new discipline **Ecosystem Analysis**.

### **Modern Environmental Education Movement**

The modern environmental education movement, gained significant momentum in the late 1960s and early 1970s, as more people began to fear the fallout from radiation, significant amounts of air and water pollution and solid and liquid waste generation, chemical pesticides mentioned in Rachel Carson's 'Silent Spring', the minimata disease due to mercury pollution, forest clearance for developmental projects and public's concern for their health and the health of their natural environment. This led to a unifying movement known as 'Environmentalism. We are aware of Chandi Prasad Bhatt's movement ably supported by Sunderlal Bahuguna (**Chipko movement**) to protect forests in Uttarakhand by hugging the trees and not allowing forest contractors to cut the trees, the 'Narmada Bacchao' movement, 'The Gandhamardan movement' not allowing mining of bauxite ore by Balco Company etc.These are examples of Environmentalism.

Environment houses resources and is an enabler to provide livelihood support sustainably if protected and managed scientifically. Environmental education was thus born of the realization that solving complex local, regional and global environmental problems cannot be accomplished by politicians and experts alone, but requires "the support and active participation of an informed public in their various roles as consumers of resources, employers, business and community leaders and voters,'

A definition of "**Environmental Education**" first appeared in The Journal of Environmental Education in 1969, authored by William B.

Stapp, who later went on to become the first Director of Environmental Education for UNESCO. Simultaneously, another first articles about environmental education as a new movement also appeared in the Phi Delta Kappa in 1969 authored by James A. Swan.

Ultimately, the first Earth Day on April 22, 1970 paved the way for the modern environmental education movement. Later that same year, National Environmental Education Act was enacted in USA, which was intended to incorporate environmental education in Higher Secondary Schools. In 1971, the National Association for Environmental Education (now known as the North American Association for Environmental Education) was established to improve environmental literacy by promoting environmental education programs.

Internationally, environmental education gained recognition when the UN Conference on the Human Environment held in Stockholm, Sweden, from June 5 to 16, 1972, declared environmental education must be used as a tool to address global environmental problems. The United Nations Education Scientific and Cultural Organization (UNESCO), and United Nations Environment Programme (UNEP, 2011) created three major declarations that have guided the course of environmental education. In India in late 1990s, the Supreme Court ordered to introduce Environmental Studies in + 3 level in undergraduate studies.

**Stockholm Declaration: June 5–16, 1972** - *The Declaration of the United Nations Conference on the Human Environment*. The document was made up of 7 proclamations and 26 principles “to inspire and guide the people of the world in the preservation and enhancement of the human environment.”

**Belgrade Charter: October 13–22, 1975** - The Belgrade Charter was the outcome of the International Workshop on Environmental Education held in Belgrade, Yugoslavia (now Serbia). The Belgrade Charter was built upon the Stockholm Declaration and detailed the objectives, and guiding principles of environmental education programs, for schools and for general public.(Wikipedia .com)

**Tbilisi Declaration: October 14–26, 1977** - The Declaration “noted important role of environmental education in the preservation and improvement of the world’s environment, as well as in the sound and balanced development of the world’s communities.” The Tbilisi Declaration updated ‘The Stockholm Declaration’ and ‘The Belgrade

Charter' by including new goals, objectives, characteristics, and guiding principles of environmental education (.Wikipedia .com).

The **components of environmental education** are:

1. **Awareness and sensitivity** to the environment and environmental challenges,
2. **Knowledge and understanding** of the environment, ecosystems, and environmental challenges,
3. **Attitudes** of concern for the environment and motivation to improve or maintain environmental quality,
4. **Skills** to identify and help resolve environmental challenges,
5. **Participation** in activities that lead to the resolution of environmental challenges

Environmental education does not advocate a particular viewpoint or course of action. Environmental education teaches individuals how to weigh various sides of an environmental issue through critical thinking and it enables them in solving their problems and decision-making skills. Environmental education increases public awareness and knowledge of environmental issues, provides facts about environmental issues and enhances individual problem solving capability, Environmental education (EE) involves organized efforts to teach how natural environments function, and particularly, how human beings can manage ecosystems to live sustainably.

Environmental Science and Education is a multi-disciplinary field integrating disciplines such as biology, especially ecology, earth system science (geology, geography), chemistry, physics, atmospheric science, and mathematics. However, environmental education must include efforts to educate the public and print media, websites, media campaigns, etc for solutions to these issues. The UNESCO states that EE is vital in imparting an inherent respect for nature amongst society and in enhancing public awareness. UNESCO emphasizes the role of EE in safeguarding future global developments of quality life through the protection of the environment, eradication of poverty, minimization of inequalities and insurance of sustainable development (UNESCO, 2014a,b).

Focus on Environmental Education: The focuses are on:

1. Engaging with citizens of all ages to;

2. Think critically, ethically, and creatively when evaluating environmental issues;
3. Make educated judgments about those environmental issues;
4. Develop skills and a commitment to act independently and collectively to sustain and enhance the environment; and,
5. To enhance their appreciation of the environment; resulting in positive environmental behavioural change (Bamberg & Moeser, 2007);

An environmental education curriculum to explore the human-nature relationship

Environmental Education encourages the discovery and understanding of the Earth's natural systems (Forests, Grasslands, Lakes, Geo-systems, and Bio-systems etc) and the human role in those systems. Environmental educators teach about the interrelationships among all living things and with surroundings. They have a solid comprehension of ecological concepts, (on ecosystem productivity, energy flow, consumption patterns, matter circulation, balance of nature etc) and an understanding of environmental history and the ecological effects that humans have had on the Earth and the homeostatic mechanisms. Students pursuing this emphasis explore the literature and philosophy concerning the human-nature relationship.

Environmental educators must have ecology, environmental science, economic, political, and environmental law background in order to teach about relationships among local communities, technological society, and the local, regional and global environment. A foundation in the field of education with an understanding of learning theories, curriculum design, and experiential and field study education, appreciation of the beauty of the natural world provides them with the necessary knowledge and skills to develop their teaching and to demonstrate their competence. (Tanner, 1974). This is a big challenge.

Benefits of Environmental Education (EE): Few important benefits are described below.

(i) Imagination and enthusiasm are heightened in Youth

EE sparks the imagination and unlocks creativity among youth. When EE is integrated into the curriculum, students are more enthusiastic and engaged in learning.

(ii) Learning transcends the classroom to the Real World

Not only does EE offer opportunities for experiential learning outside of the classroom, it enables students to make connections and apply their learning in the real world. EE helps learners see the interconnectedness of social, ecological, economic, cultural, and political issues.

(iii) Skill development and enhancement

EE encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues. By developing and enhancing critical and creative thinking skills, EE helps foster a new generation of informed consumers, workers, as well as policy or decision makers. In the evolution of environment study, the discipline has developed into two broad categories i/e. (i) Environmental Science consisting of rigorous scientific analysis of theory, field scientific studies involving monitoring, and environmental management etc; keeping human interest and sustainability in mind; (ii) Environmental Studies involving society, creating awareness and sensitizing people ,especially school students and public at large.

(iv) Tolerance and understanding are inculcated

EE encourages students to investigate varying sides of issues to understand the full picture. It promotes tolerance of different points of view and different cultures.

(v) Interdisciplinary learning

By incorporating EE practices into the curriculum, teachers can integrate science, math, language arts, history, and more into one rich lesson or activity, and still satisfy numerous state and national academic standards in all subject areas. Taking a class outside or bringing nature indoors provides an excellent backdrop or context for interdisciplinary learning.

(vi) Appreciating nature's beauty and playing for fun

By exposing students to nature and allowing them to learn and play outside, EE fosters sensitivity, appreciation, and respect for the environment. It combats “nature deficit disorder” ... and it's FUN!

(vii) Healthy lifestyles are encouraged

EE gets students outside and active, and helps address some of the health issues we are seeing in children today, such as obesity, attention deficit disorders, and depression. Good nutrition is often emphasized through EE and stress is reduced due to increased time spent in nature.

(viii) Communities are strengthened

EE promotes a sense of place and connection through community involvement. When students decide to learn more or take action to improve their environment, they reach out to community experts, donors, volunteers, and local facilities to help bring the community together to understand and address environmental issues impacting their neighborhood.

(ix) Responsible action for betterment of the environment

EE helps students understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. Service-learning programs offered by PLT and other EE organizations provide students and teachers with support through grants and other resources for action projects.

(x) Empowerment of students and teachers

EE promotes active learning, citizenship, and student leadership. It empowers youth to share their voice and make a difference at their school and in their communities. EE helps teachers build their own environmental knowledge and teaching skills.

Through an interdisciplinary curriculum that covers topics such as ecosystem analysis, biodiversity, and other resources conservation, environmental thought, environmental debates, chemistry of pollution, its effects on biodiversity and man, and its abatement, climate change and environmental politics, one will gain an understanding of the theories, policies, and ethics that have shaped public discourse and understanding of our environment; examine national and local models of environmental

education; analyze their relationship to contemporary issues of environmental literacy; and develop competencies in planning environmental education programs. In Indian context folk song, folk dances, Jatra, Daskathia, Pala, etc can create environmental awareness in people, especially village people.

During the last few decades development of environmental studies has grown in two interrelated aspects such as (i) the scientific and technological aspects of Environmental Science; and (ii) softer way to sensitizing people in various ways; and to abate environmental degradation by creating legal instruments. Environmental laws have now become integral part of legal education. Besides, all developmental projects before implementation are to assess the impacts the project would create if implemented and to look into the environmental management plan for sustainable development.

## **Ecosystem Analysis**

### **What is a System?**

A *system* is a set of interacting or interdependent component parts forming a complex or intricate whole. Every *system* is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose and expressed in its functioning.

### **What is a Living System?**

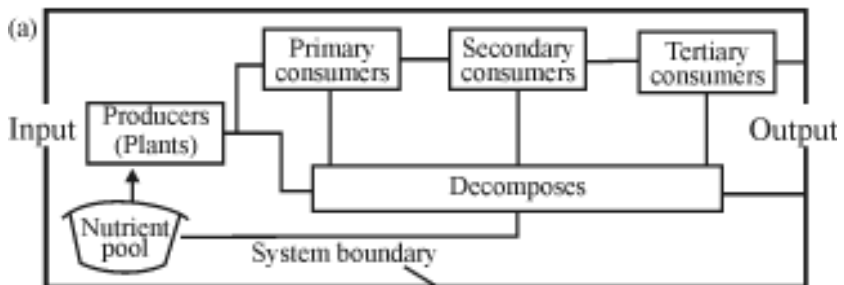
*Living systems* are open self-organizing *living* things that interact with their environment and interact with individuals of same organism and between other organisms. These *systems* are maintained by flows of energy and matter. The microorganisms, plants and animals of a habitat & their nonliving environment function together as these are connected to each other through food chain ( eating and being eaten), matter (sodium, potassium, calcium, phosphorous, sulphur etc) circulation, energy flow etc. as one unit, which is called as an Ecological System or Ecosystem, coined by A.G.Tansley, British Ecologist in 1935. Ecosystem concept is holistic because all component parts of the ecosystem function together (if one component part shows malfunction then the entire system fails) and therefore, has functionally obligatory relationship and Man is part of the ecosystem. A natural pond, lake, bay, ocean, grassland, forest, etc. are individually considered as natural ecosystems.

The component parts of an ecosystem: (i) Producers' (green plants), which transduce solar energy and produce carbohydrates in a biochemical process called photosynthesis, and they produce food for other biodiversity and for man; (ii) Consumers such as herbivores, who graze over plants, living or dead, and Carnivores, ( called C1) who predate on herbivores and large carnivores (called C2) predate on herbivores and on small carnivores, and (iii) Decomposers decompose organic matter and in the process materials are released for use of the producers (plants) to grow and produce carbohydrates in photosynthetic process; (iv) the abiotic (non-living) matter such as some minerals and organic nutrients and factors such as temperature, and other environmental factors.

The structure of an ecosystem refers to the above cited components and to the species diversity, their distribution, numbers, and biomass in the ecosystem, the qualities and distribution of organic and inorganic nutrients and the physicochemical conditions characterizing the system.

Ecosystem function/ ecosystem services refers to the energy flow and its rates, nutrient cycling between the biotic and non-biotic components, biogeochemical cycles such as water cycle, oxygen and carbon dioxide and other gaseous cycles, and mineral cycles, such as calcium, potassium, sodium, sulphur etc and the homeostatic mechanisms that determine the structure and stability of the ecosystem (Figure 1).

**Figure 1: Ecosystem Concept**



The natural ecosystems of the world include Tundra, Desert, Lakes, Rivers, Ponds, Oceans, Forests (Tropical, Subtropical, Mangroves, Temperate, Alpine, etc), and Grasslands such as prairies of Canada, in different latitudes and altitudes and they provide with all necessities (food, fodder, shelter materials, ayurved medicines, raw material for

pharmaceutical processes to prepare allopathic medicines, oxygen for all aerobic organisms including man etc) of human beings and to other species. These ecosystems may vary with respect to species composition at producer, consumer and decomposer levels but they perform similar functions. Photographs (Plate 1-4) of a subtropical forest ecosystem, natural grassland, a temperate region lake ecosystem, a mangrove ecosystem, are given below. Photographs of natural ecosystems and list of biodiversity found in ecosystems are shown in these plates.



A sub-tropical ecosystem Odisha, Inida

Plate 1.

All forms of Plants-producers; Herbivore consumer- Deer, Rabbit, Plant eating birds, Grasshoppers, etc , Carnivore Consumers- Hyena, Jackal, Kites, Mantid, Etc., Decomposers- Bacteria, fungi & other microorganisms, Soil earthworms and some other soil biodiversity.



Temperate region grassland ecosystem

Plate 2

Producers are grasses; Herbivore Consumers are Cattle, Rabbits, other small mammals, plant eating birds, Consumer Carnivores – Mountain Lion, Coyote, etc, some animal flesh eating birds; Decomposers- Cold adapted Bacteria, fungi, etc, Earthworms etc.



A temperate region cold water lake ecosystem

Plate 3.

Producers- Shore plants, phytoplanktons, Herbivore Consumers- land herbivores such as bison; cold adapted fishes, insects,etc, Carnivore Consumers;- Mountain lion, Coyote, etc, carnivore fish, Carnivore insert; Decomposers;- Cold adapted Bacteria,Fungi, other microorganisms, earthworms etc



Bhittarkanika Mangrove forest ecosystem  
with river and Ocean tidal water system

Plate 4.

Producers are mangrove plants; phytoplanktons, Herbivore Consumers are- Cattle, Birds in the forest, Sea turtles, etc Carnivore Consumers- Hyena, Jackal, Birds, Crocodiles, Predator fishes, Crabs etc, Decomposers – Bacteria, Fungi, Crabs, Earthworms etc.

The ecosystems shown in the photographs are natural ecosystems with multispecies, provide different niches to biodiversity and possess the component parts mentioned above and function holistically. What is difference in these systems? We may analyse from the structural point of view. We may analyse the functions and we will find there is structural and functional convergence at gross level coinciding with ecosystem structure and functions.

What are the component parts of a forest/grassland ecosystem? What are the component parts of the aquatic ecosystems? Are the producers, consumers such as herbivores and carnivores, and decomposers are same in these ecosystems? What is about the functional aspects? What are the ecosystem services provided by these natural ecosystems? How the natural ecosystems can be utilized to increase food, fodder and fuel, production and resource for ayurved and pharmaceutical science and to

protect environment (landscape) from erosion, pollution etc. and manage the resources? This is a big question mankind faces in the context of climate change. India is one of the eighteen mega biodiversity countries of the world having about 8 % of world's biodiversity although land area is only 2.4 % of the planet.

The Himalayan ecosystems and the Western Ghats ecosystems are international biodiversity hot spots. There are 26 Ramsar Sites (aquatic sites) in India. They harbour rich biodiversity and provide invaluable ecosystem services to mankind. The Chilika Lake in Odisha was the first Ramsar site declared in Ramsar Convention, held in Iran in 1976 for the protection of aquatic ecosystems and biodiversity, especially water fowl.

The functioning of natural systems is based on certain basic principles and understanding of these principles will help man to solve many of its own problems.

### **Ecosystem Services**

All forms of life owe their existence to the mother Earth and to the maintenance of ecological order (ecological balance) in nature. This balance is maintained by: (i) Rich bio-diversity, (Microbes, Plants, Animals, & Man), (ii) Interdependence among the different life forms, (iii) Sustained productivity and food chain relationships, (iv) Maintenance of natural processes of nutrient cycling, energy, flow, homeostatic mechanisms and evolutionary process, (v) Adapting potentiality of the living forms to the changing environment.

A forest ecosystem combats climate change. It absorbs excess and harmful carbon dioxide (CO<sub>2</sub>) from our atmosphere. In fact, in a single year, an acre of mature trees absorbs the same amount of CO<sub>2</sub> produced by driving the average car 26,000 miles. Forests help us breathe clean air. Forests absorb odors and pollutant gases (nitrogen oxides, ammonia, sulfur dioxide and ozone) and filter particulate matter out of the air by trapping them on their leaves and bark. All the living forms including man get their requirements of gases such as oxygen, other matter, and energy from the ecosystems where they live.

Forest ecosystems help mankind to achieve long-term economic and environmental sustainability and provide food, energy and income. They

enrich soil with nutrients and carbon. We can scan different species of trees for higher C-sequestration potential and recommend plantations. We can study carbon -sequestration by forest soil fauna and flora and suggest their maintenance and conservation.

The biosphere consisting part of hydrosphere (water), pedosphere (soil), atmosphere (air) and the living forms (bio-diversity) have arisen in the evolutionary process. The living microorganisms, plants and animals have specific requirements for existence, continuance and perpetuation.

Ecology, a word derived from the Greek word Oikos, meaning house, is concerned with the biology of organisms, populations, communities etc. and their functions in natural surroundings. In another words, ecology deals with the understanding of the structure and function of nature; this includes the living world including man and the nonliving substances, which are constantly taken by the living organisms from their surroundings to keep them alive.

The practical importance of ecosystem analysis results from the presence of man in the ecosystem. Man's evolution, its dependence on environment, his relationship with nature and the development of his position from one of struggle against natural forces to the recent influence and use and abuse of it are included in ecology and ecosystem analysis. Pre-agricultural human society, agriculture- based society, industrialization, urbanization, the atomic age and the electronic age, and the global warming and climate change have brought the science of ecology to the forefront of human knowledge. The green plants are the autotrophs. The consumers and decomposers are the heterotrophs. The green plants, the consumers such as herbivores and carnivores, the detritus feeders such as bacteria, fungi, and soil invertebrate animals form the biodiversity of an ecosystem. Man is also a part of the ecosystem.

**Man-made ecosystems:** Agriculture is a man-made ecosystem, so also man-made fishery ponds. Agriculture involves usually monospecies crops such as paddy, wheat, maize, barley etc. Many cultures required species of fish for quick growth for his consumption. What are the component parts of these systems?

Differences between natural and man made ecosystems : The natural ecosystems are largely pollution free and less energy intensive systems as they depend upon solar energy. These are multispecies, rich biodiversity, stable, with very complex food webs systems.

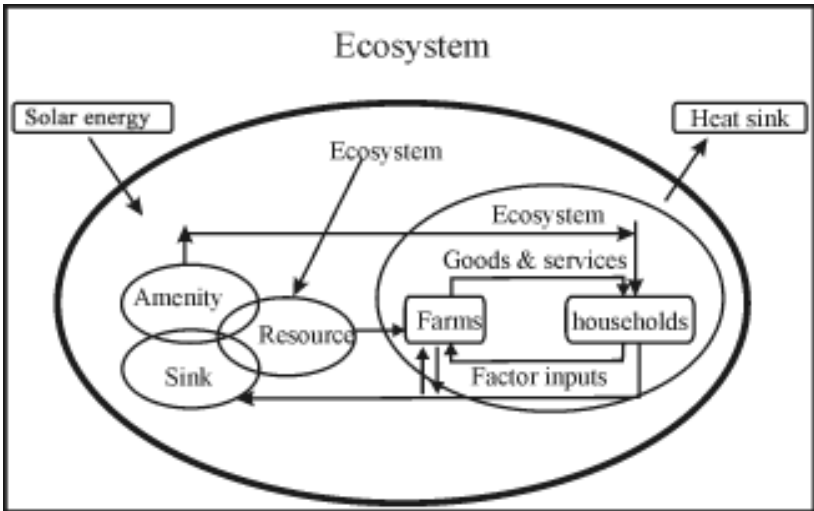


Figure 2. A comparison of a natural ecosystem with an economic system (conceptual).

Manmade ecosystems are the agro ecosystems, aquaculture systems, industrial systems, urban systems etc. These systems are fragile and require huge amount of energy; usually fossil fuels, resources, human labor or machines for their functioning. These systems, however provide jobs and productive, although they generate pollutants that create health hazards. At present, importance is given to Ecosystem Analysis (structural change, functional change, stress factors, stability, restoration and sustainability) and impact of anthropogenic activity and climate change on natural and man-made ecosystems. International and national conventions have played important role and have influenced educators to frame syllabus and courses befitting to the requirement of the present day.

## References

Bamberg, S.; Moeser, G. (2007). *Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of proenvironmental behaviour*. *Journal of Environmental Psychology*. 27 (1): 14–25. doi:10.1016/j.jenvp.2006.12.002.

Buhler, G. (1886). *The Laws and Manu*. In 'The Sacred Books of the East' Edited by F. Max Muller, Oxford in Clarinda Press, London.

Dash, M.C. and S.P.Dash (2009). Fundamentals of Ecology, McGraw-Hill Publications, New Delhi, 562 pages,

Earthday.net

Padhy, S., S.K.Dash and Ratnaprave Mohapatra (2006). Environmental Laws of Manu: A Concise Review, Journal of Human Ecology, 19(1):1-12.

Tanner, R.T. (1974). "Ecology, environment and education," *Lincoln, NE, Professional Educators Publications*

Swan, J. A. (1969). The challenge of environmental education. Phi Delta Kappan. 51: 26–28.

Stapp, W.B., et al. (1969). "The Concept of Environmental Education" (PDF). The Journal of Environmental Education. 1 (1): 30–31.

The Belgrade Charter, Adopted by the UNESCO-UNEP International Environmental Workshop, October 13–22, 1975.

<http://unesdoc.unesco.org/images/0001/000177/017772eb.pdf> accessed 3 March 2011

UNESCO (United Nations Educational, Scientific and Cultural Organization), 2014a.

Ecological Sciences for Sustainable Development. [online] Available at: <<http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/capacity-building-and-partnerships/educational-materials/>>

UNESCO (United Nations Educational, Scientific and Cultural Organization), 2014b.

Shaping the Future We Want: UN Decade of Education for Sustainable Development. [pdf] Paris: UNESCO. Available at: <<http://unesdoc.unesco.org/images/0023/002301/230171e.pdf>>

Wikipedia.com: the free encyclopedia on Environmental Education

[www.rdasia.com](http://www.rdasia.com)



**Professor Madhab Chandra Dash**

Formerly: Professor & Head of Life Science, Chairman, SPCB, Odisha, VC, Sambalpur University, 45, VIP Area, Flat-101, Nayapalli, BBSR-751015

Tel.: 0674-2555109/9437209935,

Email: mcdash1939@gmail.com, mcdashh@yahoo.co.in

Professor M. C. Dash, an eminent academician and authority, was born in 1939 in Puri district of Odisha. After education upto MSc in Zoology from Utkal University he joined University of Calgary, Canada in 1967 and completed PhD in Biology-Ecology and Environmental Science. Professor Dash holds over 54years of experience in teaching, research and environmental consultancies. After return from Calgary Prof. Dash joined Berhampur University in February 1971 and then started his School of Life Sciences in Sambalpur University from April, 1973. Prof.Dash conducted pioneering work on the conservation of sea turtles and amphibian life history strategies, ecology, larval energetic, intra- and inter-specific competition studies in lab and developed models which are widely cited. One of the most significant works by Prof Dash is on soil biology and vermitechnology. He introduced modern Ecology/ Environmental Biology in all universities of Odisha in 1970s. Professor Dash supervised 38 doctoral and D.Sc. students. He has written 250 research and technical papers and 40 books and book chapters on Ecology and Environmental Sciences. Now he is interested in studies on land use management and reclamation of degraded land, food security aspects and carbon sequestration. He has received NABET accreditation with A category. Professor Dash received fellowships of National Academy of Sciences, India and several other reputed scientific bodies. He functioned as the Vice Chancellor of Sambalpur University, Chairman of Odisha State Pollution Control Board, Sectional President of 'Animal, Fisheries and Veterinary Sciences' Section of the Indian Science Congress Association (1999 Session at Chennai), and was a member in a number of expert committees on environment. Prof. Dash conducted pioneering research on development of vermitechnology in India, during which the *Dashiela* genus of earthworm was named after him by scientists of Zoological Survey of India. In his name, the ZSI, Bodh Gaya has instituted a gold medal for 'Ecological Research Excellence'. He has contributed remarkably to the fields of Environmental Laws, Environmental Impact Assessment (EIA) and Environment Management Plan (EMP) for studies on mining and industrial projects, hazardous waste management, carrying capacity, ecosystem and

biodiversity; and modelling among other aspects. Prof. Dash has received many Scientific Awards, which include the Samanta Chandra Sekhar Award of Excellence in Life Science (1991), Zoology Excellent Award (1995 and 1999) from Zoological Society of India (Bodh Gaya), Society of Geoscientists and Allied Technologists Excellence Award for Ecology and Environmental Science (2002), and Professor Pranakrushna Parija Samman (2010) for excellence in Life Science Research. Prof. Dash has been bestowed with Life Time Achievement Awards by Odisha Bigyan Academy, Bhubaneswar (Government of Odisha) in 2006; Society of Geoscientists and Allied Technologists (SGAT) in 2011; National Environmentalists Association (NEA), Ranchi in 2012, and Orissa Environmental Society in 2012. On other occasions Prof. Dash has been felicitated and honoured with awards from National Institute of Ecology, New Delhi for significant contribution to the knowledge of Ecology and Environmental Science in India; Indian Science Congress Association Bhubaneswar Chapter (2010); and Prof. Ramdeo Mishra Centenary Lecture Award (4<sup>th</sup> annual lecture) (2011-2012).



### GLOBAL ACTION TO CLEAN UP THE PLANET

UN Environment Assembly-2017 (4-6 December) in Nairobi creates opportunity for all of us to drive global action to clean up the planet. Sixty days before the Assembly they asked which of the following I am ready to do!

1. Never throw rubbish, chemicals or solvents into storm drains or sewers.
2. Stop using disposable shopping bags and other single-use plastic.
3. Let my electronics live longer, then dispose of them properly or resell them.
4. Choose natural cleaning products and lead-free paint.
5. Compost and recycle.
6. Eat less meat and more organic and unpackaged foods.
7. Use public transport, carpool, cycle or walk.
8. Never burn wastes and minimize the burning of wood.
9. Refuse to buy cosmetics with microbeads.
10. Use clean technologies to light and power my home.
11. Use pesticides and fertilizers efficiently and choose natural alternatives when I can.
12. Collect and use rainwater.

**LET's try and be a "Beat-Pollution-Hero"**  
**Dr Lala Aswini Kumar Singh, PhD**

## **2. Prasanna Kumar Dash Memorial Lecture**

- 2016 Er. Nanda Kumar Mohapatra, Former Chief Engineer- Irrigation, Government of Odisha
- 2015 Shri Priyanath Padhi, Former Principal Chief Conservator of Forests, Odisha
- 2014 Prof. (Dr) Omkar Nath Mohanty, Director, Technology and Academic Initiative, RSB Metaltech, RSB Group
- 2013 Dr Trilochan Mohapatra, Director, Central Rice Research Institute, Cuttack
- 2012 Dr Bijay Ketan Patnaik, Former Principal Chief Conservator of Forests and Chief Wildlife Warden, UP

## **3. Awards Instituted by OES**

### **(A.) Lifetime Achievement Award**

- 2016 Prof. Lalit Narayan Patnaik, Former Chairman, State Pollution Control Board, Odisha
- 2015 Prof. Satyananda Acharya, Former Vice Chancellor, Utkal University
- 2014 Prof. Rebati Charan Das, Former Vice Chancellor, Berhampur University
- 2013 Dr Chitta Ranjan Mohapatra, Former Principal Chief Conservator of Forests (WL) and Chief Wildlife Warden, Odisha
- 2012 Prof. Madhab Chandra Dash, Former Vice-Chancellor, Sambalpur University

**(B.) Environmentalist of the Year Award**

**(Smt. Parbati Mishra Memorial Award)**

- 2017 Prof. Gopala Krushna Panda, Former Professor of Geography, Utkal University
- 2016 Dr Sudhakar Kar, Former Sr. Research Officer, Forest Dept (Wildlife Wing), Govt. of Odisha
- 2015 Dr Lala Aswini Kumar Singh, Former Sr. Research Officer, Forest Department (Wildlife Wing), Govt. of Odisha
- 2014 Dr Chandra Sekhar Kar, Former Sr. Research Officer, Forest Department (Wildlife Wing), Govt. of Odisha. (Posthumous award)
- 2013 Dr Bibhuhendra Pratap Das, President, Odisha Krushak Maha Sangha
- 2012 Dr Sudarsan Sasmal, Former Principal Scientist, Central Rice Res. Inst., Cuttack
- 2011 Mr. Prafulla Kumar Dhal, Director, Biswa Research and Innovation Centre
- 2010 Mr. Biswajit Mohanty, Wildlife Society of Orissa

**(C.) Dr. B.C.Panda Award**

**Environment and Science Communication Award**

- 2016 Dr Jayakrushna Panigrahi, Past Convener, ISCA Bhubaneswar Chapter
- 2015 Dr Chitta Ranjan Mishra, Former GM, NALCO
- 2015 Dr Bijay Ketan Patnaik, Former PCCF (Wildlife), Odisha

## **4. Awards and Felicitations Received by OES Members from other Organisations**

Members of Orissa Environmental Society are achievers at different levels and are from various walks of life like academics, engineers, doctors, architects, planners, economists, development managers, bureaucrats and persons interested in biodiversity, natural resources and environment conservation. Some reputed institutions are the members of the Society, and some members have grown their own organisations. From this year we are trying to list such members of OES who are awarded or felicitated by other organisation, or given high academic positions. We congratulate them and feel proud of their recognition outside OES campus.

Award '**Senior Scientist of Odisha**' by  
Odisha Bigyan Academy, Govt. of Odisha to:

- Prof. Prafulla Chandra Tripathy, Former Parija Professor of Botany, Utkal University
- Dr Sarat Chandra Mishra, Orchid Expert and Former Chief Engineer
- Prof. Debi Prasad Ray, Former Vice Chancellor, OUAT
- Dr. Sundara Narayana Patro, Retired College Principal

Recognitions as  
**Vice Chancellors and Visiting Professors**

- Prof. G B N Chainy has been awarded by The Department of Biotechnology (DBT), Government of India the Visiting Research Professorship (VRP) for the North-Eastern Region in recognition of his distinguished and outstanding scientific contributions in biotechnology.
- Dr Pradeep Kumar Chand, Professor of Botany faculty in Utkal University has been posted as Vice Chancellor, North Orissa University
- Dr Amarendra Narayan Misra, Professor at Central University of Jharkhand, Ranchi has been posted as as Vice Chancellor of Khallikote Cluster University

### **Other Felicitations and Honour:**

- Prof.(Dr.) Arun Chandra Sahu received Pranakrushna Parija Popular Science Book Award, 2015 by Odisha Bigyana Academy and Kalinga Book Fair Award, 2016 for Science Literature.
- Prof. Madhab Chandra Dash was honoured with a Citation by Hon'ble Chief Minister, Odisha at the Golden Jubilee function of Sambalpur University on 19th March 2017 for his contributions to the growth and development of the University.
- Prof. Amulya Kumar Panda was honoured with “Sikshyaabit Samman” by Abhimanyu Smruti Sansad, Bhubaneswar in February 2017.
- Dr Jafran Keshari Roy, Former Jt. Director, CRRI, Cuttack was honoured with Padma Samman by Indian Genetics and Plant Breeding Association, New Delhi
- Er. Binod Chandra Padhi, Former Engineer-in-Chief Honoured with Odisha Technocrat Award by Ever Green Forum, Bhubaneswar.
- Dr Sarat Chandra Misra is felicitated with the T N Khoshoo Memorial Lecture Award- 2017 by the Orchid Society of India, Chandigarh.
- Prof. Sharat Kumar Palita has been honoured by Hon'ble CM Odisha with a citation and cash award from Red Cross Society of Odisha on Utkal Divas, 2017.
- Dr. Nihar Ranjan Das, Foundation for Environmental & Social Research (FESR) has been nominated as Member of National Executive Council of “Indian Meteorological Society” for 2016-2018.
- Er. Prakash Jena, Ever Green Forum received ‘Prakruti Bandhu’ Award from Forest and Environment Department, Government of Odisha on World Environment Day
- Prof. Jitendra Narayana Dash (Dash Benhur), a prolific writer and former College Principal is honoured with ‘Biswanath Pasayat Saraswat Samman’ 2017.

## 5. Felicitations to Senior Life Members

On the occasion of the 36th Foundation Day on 29th October 2017 Orissa Environmental Society will felicitate the following Senior Life Members in appreciation of their persistent support to the society's progress. The programme starts from 2017.

1. **(Er.) Sri Somanath Mishra**, Former Secretary (Works), Govt. of Odisha
2. **Sri S. N. Bohidar**, IFS (Retd.)
3. **Dr Rabindra Nath Padhi**, Dy.DG (Retd.), GSI
4. **Sri Ramesh Chandra Pani**, Former Chairman & MD, Central PSU
5. **Sri Sarat Chandro Patnaik**, Former District Panchayat Officer

## 6. Fellows of OES

The following Life Members of Orissa Environmental Society are nominated as Fellow in appreciation of their outstanding contribution and persistent support to the field of Environment and Natural Resources Management. The certificate of Honour as fellow will be presented on the occasion of the Foundation Day of the Society during 2017. The programme starts from 2017.

01. **Prof. Satyananda Acharya**  
Former Vice Chancellor, Utkal University
02. **Prof. Amulya Kumar Panda**  
Former Principal, Ravenshaw College (now University)
03. **Prof. Madhab Chandra Dash**,  
Former Vice Chancellor, Sambalpur Univeristy
04. **Prof. Debi Prasad Ray**  
Former Vice Chancellor, OUAT
05. **Dr. Bijay Ketan Patnaik**, IFS (Retd.)  
Former PCCF (WL) &  
Chief Wildlife Warden, Odisha

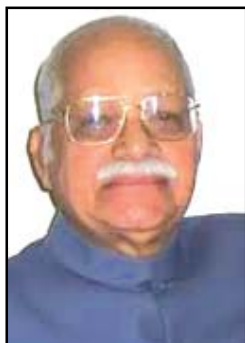
- 06. Er. Binod Chandra Padhi**  
Former Engineer-in-Chief, Odisha
- 07. Dr. Sachidananda Tripathy**  
Former Professor of Geography, Utkal Univ.
- 08. Dr. Bipra Charan Patnayak**  
Former Director, ICAR
- 09. Dr. Naba Kishore Mahalik**  
Former Professor of Geology, Utkal University
- 10. Dr. Sarat Chandra Mishra**  
Former Chief Engineer (Works), Govt. of Odisha
- 11. Mr. Shailendra Kumar Tamotia**  
Former CMD, NALCO
- 12. Dr. Sundara Narayana Patro**  
Former College Principal
- 13. Dr. Chitta Ranjan Mohapatra,**  
Former Principal Chief Conservator of Forests (WL) and Chief  
Wildlife Warden, Odisha
- 14. Prof. Rebati Charan Das,**  
Former Vice Chancellor, Berhampur University
- 15. Dr. Jaya Krushna Panigrahi**  
Associate Professor in Zoology,
- 16. Dr. Jitendra Kumar Sundaray,**  
Head, Division of Fish genetics & Biotechnology, CIFA,

## **7. Patrons of OES**

2015. **Tamotia (Dr) Shailendra Kumar,**  
Hon. Dean- cum- Director Genaral  
and Vice Chairman, Bharatiya Vidya Bhavan,  
Bhubaneswar Kendra, Flat No. D/801, Gymkhana Palm Heights,  
Near SUM Hospital, Shampur, Po- Ghatikia, Bhubaneswar-751003  
09937011356, Email: sk\_tamotia@yahoo.co.in

2015. **Patnaik (Dr) Lalit Narayan**  
Former Chairman, OSPCB,  
116, Mechatech House, Kalyan Nagar, Cuttack – 753 013  
9437000973, Email: lnpatnaik116@gmail.com
2015. **Patro (Dr) Sundara Narayana**  
Former Reader in Botany and Principal,  
MIG-106, Phase-1, Khandagiri Enclave,  
Housing Board Colony, Khandagiri, Bhubaneswar-751030  
09437190420; Email: snpatro11@rediffmail.com
2015. **Ray ( Prof.) Debi Prasad**  
Former Vice-Chancellor, OUAT,  
H.N: HIG -105,(K-5), Kalinga Vihar, Patrapara, BBSR-19  
09881721435; 08087815770, Email: dpray1949@gmail.com
2015. **Panigrahi (Dr) Jaya Krushna**, Associate Professor in Zoology,  
41-A, Prachi Enclave, Chandrasekharapur, Bhubaneswar-751016  
09437076100; Email: jk.panigrahi@gmail.com
2016. **Sundaray (Dr) Jitendra Kumar**, Head,  
Division of Fishgenetics & Biotechnology, CIFA  
Kausalyaganga, Bhubaneswar- 751002  
C/o. Purna Chandra Sundaray, At.Po. Aiginia, Bhubaneswar-19  
09437166872; Email: sundarayj@yahoo.com,
2016. **Patnayak (Dr) Bipra Charan**  
Former Director, Central Sheep & Wool Research Institute  
(ICAR), S/30, Maitree Vihar, Bhubaneswar-751023  
09937000824, Email: bpatnayak@yahoo.co.uk
2016. **Panda (Prof.) Amulya Kumar**  
Former Principal, Ravenshaw College,  
73, Cooperative Colony, (Near Chandrasekharapur)  
PO.: KIIT, Bhubaneswar-751024  
09937440390, Email: amulyapanda39@gmail.com

## 8. Obituaries: 2016-17



**Gobinda Chandra Senapati (04 January 2017 Exp.)** was the former Director General of Police, Odisha and past Rotary Governor. Mr Senapati was a Life Member of OES from the year 1991 and guided the Society as Vice President for a term in the past. He dedicated his skill and expertise in dealing with diverse environmental and archeological issues aptly in various programmes of the Society and in other forums. He lived in 14, Cantonment Road, Cuttack- 753001.



**Bishnu Charan Panda (16 February 2017 Exp.)** was an eminent doctor of Gynaecology & Obstetrics of Odisha. He became a life member of OES in 2006. With a contribution of Rs. 1 Lakh, Dr Panda instituted the award for “Environment and Science Communication” which is presented by OES from 2015. The ‘Pioneer Clinic & Nursing Home’ founded by him was dedicated mostly for the service of the marginalized section of the society. He lived in HIG-19 / 1, Housing Board Colony, Chandrasekharpur, Bhubaneswar-751016.



**Kailash Nath Adhikari (29<sup>th</sup> July 2017 Exp.)**, Former Director, Geological Survey of India, lived at 408, Paik Nagar, 1<sup>st</sup> Lane, Delta Square, Bhubaneswar-751003. He became Life Member of OES in 2010 and served as Co-opted Member of OES Executive Committee during 2012-2015.

## 9. Activities of OES: 2016-17

(Upto October 2017)



**23/10/2016:** The Foundation Day of OES was observed in the premises of the Society. As Chief Guest we had Dr S. K. Tamotia, Dean-cum-Director General and Vice Chairman of the Centre for Communication and Management at Bharatiya Vidya Bhavan, Bhubaneswar. Er. Nanda Kumar Mohapatra, Former Chief Engineer- Irrigation, Government of Odisha was the Guest of Honour. Er. Mohapatra delivered the Prasanna Kumar Dash Memorial Lecture on “Water Resources: Engine for Improvement of Quality of Life and Economic Development”, and Dr Tamotia gave a speech on “Industrial Safety”. The Lifetime Achievement Award-2016 was presented to Prof. Lalit Narayan Patnaik, Former Chairman, State Pollution Control Board, Odisha. The B.C.Panda Award For Environment and Science Communication-2016 was presented to Dr Jayakrushna Panigrahi, Past Convener, ISCA Bhubaneswar Chapter. Dr. Amulya Kumar Panda, Dr. B. C. Patnaik and Dr J.K. Sundaray were honoured with OES Patron Certificates, and the names of new Life members were announced and they were inducted in the Society with honour. For the first time the Annual Report of OES containing compilation of Lectures on Environment and Science delivered at monthly meetings was released by the Chief Guest. The book contained fourteen illustrated articles that encompassed lectures or event-based releases by OES. It also contained list of winners of different Awards and Felicitations, interviews of Dr S N Patro and Dr Lala A K Singh published in print media, the activity report of OES for 2014-15 and 2015-16, the list of Patrons, List of Life Members (from April 2013), category wise different Office Bearers and Advisers in different committees and the OES Publication list.

**06/11/2016:** The 84<sup>th</sup> monthly seminar of OES was held on November 06, 2016 at 10 am. The thematic lecture on ‘Inter Linking of Rivers: Problems and Prospects’ was delivered by the Chief Speaker Prof. Binayak Rath, former Vice Chancellor, Utkal University who is also the former Professor of Economics, IIT Kanpur. Prof. Rath talked about various projects proposed for inter-linking of rivers (ILR) in different parts of the country. Prof. Rath critically examined the various facets of the ILR in terms of its potential benefits as envisaged by the Government of India, possible problems faced in execution, the social benefit and cost aspects of the link, environmental impacts, and its regional conflict dimensions as well as international ramifications. Analyzing the scope of Mahanadi-Godavari link, Professor Rath opined that it would neither be economically feasible nor environmentally sustainable. Finally, he suggested a 3P solution in terms of “Proper Planning”, “Political Commitment”; and “Peoples’ Participation”.



**03-04/12/2016:** The Odisha Bigyan and Paribesh Congress-2016 was conducted in OUAT with National Seminar on ‘Forestry and Agriculture for Sustainable Future’. As Chief Guest Dr. Pradeep Kumar Panigrahy, Minister, Higher Education, Sc. and

Tech. and RWSS, as the Guest of Honour- Prof. Vinod Kumar Singh, Director, IISER, Berhampur, and as the Chief Speaker Prof. Siba Prasad Adhikary, Vice Chancellor, F M University addressed the participants. Dr. Trilochan Mohapatra, Director General, ICAR was the Chife Guest at the Validictory Function.

**08/01/2017:** Dr. Chitta Ranjan Mishra, Former DGM and Head, R & D, Nalco, Bhubaneswar a Popular Science Writer gave a very popular talk on “Eco-friendly Industrial Technology- A Case Study NALCO”.

**26/01/2017:** Flag hoisting and observation of Republic Day.

**05/02/2017:** A popular talk on ‘Environmental Management Practices

in Thermal Power Sector of Odisha' was delivered by Er. Rabi Narayan Prusty, Sr. Environmental Engineer, State Pollution Control Board, Odisha.



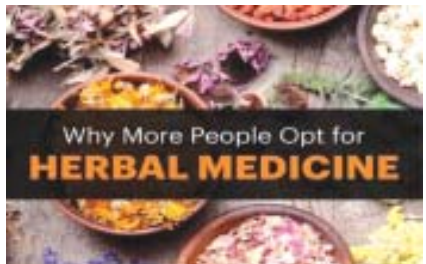
**05/03/2017:** Popular talk on 'Responses of Plants to Environmental Stress' was delivered by Professor Arun Chandra Sahu, Former Professor of Botany, and a Science Writer.

**07/04/2017:** To mark the occasion of World Health Day observed worldwide on 7<sup>th</sup> April each year the monthly seminar of OES for April 2017 was held with Guest of Honour of the occasion Dr. Seba Mohapatra, former Director of Health Services, Govt. of Odisha, and Chief Guest of the seminar Dr. Rabindra Kumar Das, a specialist



in psychiatry who earlier worked in Capital Hospital and Municipal Hospital at Bhubaneswar before his superannuation. The theme of the seminar was 'Depression: Let's Talk'. Dr. Seba Mohapatra deliberated on the theme of the World Health Day and she focused her attention on the occurrence of depression in women. Dr. Rabindra Kumar Das emphasized on awareness through public education, early detection, organized national mental health programs, comprehensive management for tackling the problem of depression.

**07/05/2017:** Herbal Treatment for Common Diseases was discussed in length by Dr Kunja Bihari Satpathy, Former Head, Dept. of Botany, Utkal University, Bhubaneswar. The topic aroused a lot of interest and questions from members.



**05/06/2017:** World Environment Day-2017 with the theme 'Connecting People to Nature' was observed by OES members and invited guests. The programme was graced by Chief Speaker Prof. Rama Chandra Mohanty, Emeritus Professor of Botany, and Chief Guest- Padma Shri Dr. Ajay Kumar Parida, Director, Institute of Life Sciences. Shri Prafulla Samantara, Goldmen Environmental Awardee 2017 was felicitated during the occasion. Smt. Parbati Mishra Memorial Environmentalist of the Year Award was presented to Prof. Gopal Krishna Panda.

**July-2017: Van Mahotsav** was carried out at different places with initiative and participation of OES. The theme for Van Mahotsav this year was 'Sapling to Tree – Our Responsibility'.

**Van Mahotsav** in Rajdhani Engineering College, Bhubaneswar was conducted with Invited Guest Dr Akshaya Kumar Patnaik, Deputy Conservator of Forest (Enforcement), Office of the PCCF, Odisha. The monthly programme for July 2017 was organized on the occasion of the Van Mahotsav Week in association with the Raajdhani Engineering College, Mancheswar, Bhubaneswar on 7<sup>th</sup> July. The meeting was held under the chairmanship of Prof. S N Patro, President of the Society. The theme of the occasion was 'From Saplings to Frees: Our Responsibility'. At the beginning, Prof. Bimal Sarangi, Principal of Raajdhani Engineering College delivered the welcome address and explained the significance of the Van Mahotsav programme. Prof. G S Mishra, Director of the College presented a brief account of the activities of the college and its association with OES in organizing various environmental programmes. Dr. J K Panigrahi, Secretary, OES made a detailed presentation on the theme of the programme elucidating the roles of the plants and the forests in providing various goods and services to the mankind as well as the animal world. In the present scenario of diverse environmental problems gaining greater momentum, increased greenery can play a very significant role in combating these challenges. The younger generation has a greater responsibility in this regard. Prof. S N Patro made his presidential remarks and initiated the students and staff present in the programme to take oath for plantation of saplings and nurturing them to grow into big trees. The meeting ended with vote of thanks to the chair by Dr. (Mrs.) Usharani Dash, Principal of Raajdhani +2 Science, Arts and Commerce College. Over three hundred students

and members of the staff participated in the programme. After the meeting, a plantation programme was carried out in the college campus and the members of the OES and Raajdhani Engineering College planted a large number of saplings.

**07/07/2017:** Observed **Van Mahotsav** in Chadheibara, Baliana, District Khurda organized by Balipatna Range, Khurda Forest Division. Dr S. N. Patro and Dr Lala A. K. Singh participated in the programme.

**09/07/2017:** Observed **Van Mahotsav** in Bhubaneswarpur, Near Panikoili, Jajpur where guests were Dr. S.N.Patro, Dr. J.K.Panigrahi, Dr. Pradeep Rath and Dr. Bimal Sarangi.

**14/07/2017:** Dr S. N. Patro, President and Dr B. S. Patro, Treasurer- OES had a special meeting with the Director, Central Inland Fisheries and Aquaculture and offered help for a study on CIFA Campus Biodiversity.



**28/07/2017:** Observed **Van Mahotsav** in Maharishi College of Natural Law with guests Prof. Binayak Rath, Dr. S.N.Patro and Dr. J.K.Panigrahi.

**06/08/2017:** Popular talk on Environmental Issues of Concern in Factories was delivered by Dr Malay Kumar Pradhan, Deputy Director (Safety), Directorate of Factories and Boilers, Bhubaneswar. Dr. Pradhan expressed that in developing countries like India, the initiatives taken by the factories and industries for protecting the internal as well as the external environment are deficient. As a moral responsibility the industry management, instead of waiting to learn from own mistakes, should learn from the mistakes already committed by others and provide necessary skills by way of training and required safety equipments to the workers.

**15/08/2017:** Observation of Independence Day followed by discussion on various current issues in the country.

**19/08/2017:** A few years back OES proposed to Bhubaneswar Municipal Corporation to institute ‘BMC Nagara Bandhu Samman’. From that time onwards BMC works closely with OES in all processes of selection of persons for the award. This year the meeting was held on 19<sup>th</sup> August in the BMC Conference Hall to chalk out programme for inviting applications, their scrutiny, field visits and selection of citizens from Bhubaneswar area to be honoured as ‘Nagara Bandhu. The meeting was attended by Dr S. N. Patro, Dr Lala A K Singh, Dr J. K. Panigrahi, Dr B. S Patro, Engineer Sri Prakash Jena, Sri Pravat Sutar and Dr Pradeep Rath. The awards were instituted on 31<sup>st</sup> August 2017 during observation of Swayat Sasan Day.

**03/09/2017:**

Prof. Madhab Chandra Dash gave a very educative, interesting and popular talk on “Environmental Education for lasting solutions to Environmental Challenges”.



**02.10.2017:**

Dr Anup Kumar Nayak, IFS, who is currently the Additional PCCF (Forest Diversion) and Nodal Officer (Forest Conservation Act) in the Forest Headquarters of Odisha State delivered a popular talk on “Human-Animal Conflict”.



## 10. 18<sup>th</sup> Bigyan ‘O’ Paribesh Congress

(3-5 Dec. 2017)

The 18<sup>th</sup> Bigyan ‘O’ Paribesh Congress was organized by Orissa Environmental Society in collaboration with the Orissa University of Agriculture & Technology, Bhubaneswar on December 3-4, 2017 in the MS Swaminathan Auditorium of the OUAT. Dr Jaya Krushna Panigrahi-the Secretary (EMD) of OES functioned as the Convenor, and Prof. C.S.K. Mishra, CBSc & H of OUAT was the Organising Secretary of OBPC.

### Background

The genesis of Odisha Bigyan Congress was in the year 1997 aimed to endow the scientific community of the State with an apt platform for deliberating on the advances in science and technology in diverse frontiers. Since then it is being organized as an annual event in reputed universities/institutions of the State. The Congress is pursuing the objective for bringing to a common forum the scientists, academics, engineers, technologists and nature-lovers of the State as well as from other parts of the country for sharing their experiences and innovations. On the occasion of the Congress, a national seminar is organized on a theme of current significance. Some noted scientists and academics of the State are felicitated during the Congress for their lifetime contributions, while young researchers are awarded prizes for best oral and poster presentations. A little amendment was made to the title of the Congress from its 18<sup>th</sup> session held in 2016. It is now and for future the “**Odisha Bigyan ‘O’ Paribesh Congress**” focusing attention on the environmental challenges confronting the mankind at the present juncture. The focal theme of the national seminar for 2016 was ‘Forestry and Agriculture for Sustainable Future’.

### Focal Theme

*‘Forestry and Agriculture for Sustainable Future’*

The UN resolution adopted in September 2015 on ‘Transforming our World: the 2030 Agenda for Sustainable Development’ resolved to free the human race from the tyranny of poverty and want, and to heal and secure our planet. The 17 Sustainable Development Goals (SDGs) and

169 Targets which it announced demonstrate the scale and the ambition of this new universal agenda and seek to complete what the Millennium Development Goals (MDGs) did not achieve. These goals and targets balance the three dimensions of sustainable development: the economic, social and environmental. They are supremely ambitious and have transformational vision that will stimulate action over the next 15 years in areas of critical importance for humanity and the planet.



The agenda envisaged a world in which consumption and production patterns and use of all natural resources - from air to land, from rivers, lakes and aquifers to oceans and seas - are sustainable. The environmental dimension emphasizes on sustainability and resilience of development and seeks to make the application of technology climate-sensitive and respect biodiversity. The humanity is required to live in harmony with nature, and wildlife and other living species should be protected.

Natural resource depletion and adverse impacts of environmental degradation, including desertification, drought, land degradation, freshwater scarcity and loss of biodiversity, add to and exacerbate the list of challenges which humanity faces. Global warming and climate change are among the greatest challenges of our time and their adverse impacts undermine our ability to achieve sustainable development. The survival of many societies, and of the biological support systems of the planet, is at risk at the present juncture.

In the context of the UN Agenda, forestry and agriculture are two prominent focus areas that need to be managed sustainably to achieve the desired goals. In the forestry sector, our prime task is to halt deforestation, restore degraded forests and substantially increase afforestation and reforestation across the globe. The multiple-use management of forests, including the provision of timber, fuel wood, wildlife habitat, natural water quality management, recreation, landscape and community protection, employment, aesthetically appealing landscapes, biodiversity management, watershed management, erosion control, and preserving forests as 'sinks' for atmospheric carbon dioxide,

must be promoted. On the other hand, to end hunger, achieve food security and improved nutrition and promote sustainable agriculture, we need to ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production. The genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species should be maintained. Enhanced international cooperation in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks is of paramount importance in order to enhance agricultural productive capacity, especially in developing countries. The 18<sup>th</sup> OBPC makes an endeavour to deliberate on these issues of prime concern for the mankind.

### **A Brief Account of the Congress**

The Chief Guest of the inaugural function was Dr. Pradeep Kumar Panigrahy, Minister, Higher Education, Science & Technology, Govt. of Odisha and the Key-note Speaker was Prof. Siba Prasad Adhikary, Vice Chancellor, F M University, Baleswar. The session President was Prof. Surendranath Pasupalak, Vice Chancellor, OUAT. During the two-day programme, four invited lectures, a panel discussion, and technical sessions and a poster session for presentation of research papers were conducted. As many as 238 abstracts were received, which were published in the Proceeding volume of the Congress. Dr. Trilochan Mohapatra, Secretary, DARE and DG, ICAR, New Delhi was the Chief Guest, and Prof. Amulya Kumar Panda, Former Principal, Ravenshaw College and Dr. Virendra Pratap Upadhyay, Advisor (S), MoEF & CC, Shillong were the Guests of Honour in the valedictory function. Over 500 scientists, academics, researchers and environmentalists attended the Congress as the delegates.

### **Felicitation at the Congress**

The 18<sup>th</sup> OBP Congress used the occasion to felicitate **Prof. Uma Charan Mohanty, Prof. Uday Chand Biswal, Dr. Trilochan Mohapatra and Prof. Surendranath Pasupalak** for their contributions in the field of science and environment. Prof. Mohanty is Former President, Odisha Bigyan Academy; Former Prof., IIT Delhi, and Emeritus Prof., IIT Bhubaneswar. Prof. Biswal is Former Prof. of Life Sciences & Vice Chancellor, Sambalpur University, Burla. Dr. Mohapatra is Secretary (DARE) and Director General (ICAR), New Delhi, and Prof. Pasupalak is the Vice Chancellor, OUAT, Bhubaneswar.

## 11. OES Publication List

01. Environment and Natural Resources Management	1983
02. Mass Mobilization Campaign on Wildlife (Black Buck) Conservation	1984
03. Environmental Conservation	1984
04. Conservation of Similipal in its Wilderness	1985
05. Environment and Indira Gandhi (Odia)	1986
06. Chilika: the Pride of our Wetland Heritage	1986
07. Environment and Sustainable Development	1990
08. My Home (Cost Reduction Techniques and Low Cost Materials for Rural Housing)	1990
09. Public Hearing on Environment 1991 and Development Strategies-Orissa Report	1991
10. Mahendragiri: The Pride of Eastern Ghats-1991	1991
11. Environment Conservation Movements in Orissa	1991
12. Noise Pollution	1992
13. Save Environment: Save Yourself	1992
14. Eastern Ghats in Orissa: Environment, Resources and Development	1994
15. Spatial Dimension of Geography	1995
16. Useful Plants for Diabetes	1997
17. Similipal: A Natural Habitat of Unique Biodiversity	1998
18. Auto- Vehicular Pollution (Odia)	1998
19. Biodiversity Conservation: Problem and Prospects	1998
20. Keep Our Water Resources Clean (Odia)	1999

21. Kathina Barjyabastu Parichalana (Odia)	2000
22. Manaba Sebare Udbhida (Odia)	2001
23. Sahania Bikash (Odia)	2002
24. Jala o Jibana (Odia)	2003
25. Jibana Paain Jala (Odia)	2004
26. Kathina Barjyabastu (Odia)	2005
27. Kathina Barjyabastu: Samasya ebam Nirakaran (Odia)	2006
28. Kathina Barjyabastu: Eka Samikhya (Odia)	2007
29. Souvenir: Silver Jubilee Commemoration Volume	2007
30. Jaiba Bibidhata: Eka Samikhya (Odia)	2008
31. Biswa Tapana Ebam Jalabayu Paribartan (Odia)	2009
32. Jalabayu Paribartan: Eka Samikhya (Odia)	2010
33. Mahendragiri (English)	2010
34. Jaiba Bibidhata (Odia)	2011
35. Nirantara Jiban Dharan Paain Aranya (Odia)	2012
36. Manaba Sebare Jaiba Bibidhata (Odia)	2013
37. Orissa Environmental Society- A Profile	2013
38. Jaiba Bibidhata (Odia)	2014
39. Jayadev Vatika (English)	2015
40. Orissa Environmental Society- Annual Report with compilation of lectures on Science and Environment	2016

Besides the above publications, the Society has brought out a good number of souvenirs, proceedings and research reports.

## 12. Note from Sri Bibhudhendra Pratap Das

Sri Bibhudhendra Pratap Das, is a life member of OES from 2009. He is also the President of Odisha Krushak Mahasangha, Bhubaneswar. Sri Das uses every possible forum to draw attention to some 18-point suggestions aimed to avoid “water famine” in Odisha and also protect the forest and wildlife. Some suggestions may have been implemented in part. We reproduce extracts from the note, dt.18<sup>th</sup> October 2017 and request comments and suggestion, if any, direct to Sri Das (Mobile 08763333672).

**Background:** The flow of water in all rivers of Odisha and other states has decreased by 70% in the last 30 years. Boating is no longer possible at 90% Ferrighats. The scenario is the result of drying up of nearly 80% of the streams on hill tops, and alarming devastation of forest on 99% of hills. Ground water level has also gone down, excepting coastal districts, in all cities and rural areas due to indiscriminate tree cuttings, construction of high rise buildings as well as misuse of natural water bodies.

**Suggestions:** The use of **wooden materials** in private building may completely be banned. Offender may be denied electricity and pay heavy fine. A part of the money collected from offenders may be paid to informers as incentive.

With technical support and training, **plantation** of selected species may be assigned to private agencies. The T.T. permit system for commercial tree may be abolished. Tree plantation may be made a compulsory curriculum for students in high school, +2 and +3.

Abandoned mine pits may be used for **storage of rain water** and allow use by industrial houses relieving pressure on natural rivers. Revival of hills and degraded forest work may be entrusted to industrial and mining houses.

**Ecotourism** may be promoted in such locations. Old tanks and natural water bodies of villages and urban areas may be renovated and restored. All **MGNREGS funds** should be utilized for water harvesting structures. New building plan should have provision for rain water harvest.

**Reward system** should be attractive and pronounced for those helping in detection of forest and wildlife offense. **Protection work** may be given to retired defense personnel. Forest Mafias and poachers should be arrested under N.S.A. Police power with arm ammunition be provided to forest officials. **National Green Tribunal Branch** at state level may be established all over the country.

The **export of ores** may be banned to reduce pressure on forest land. Top priority may be given for production and usage of **Bio-Diesel**. Light and energy units based on **solar power** may be exempted from taxes imposed by state and Union Government.

Bibhudhendra Pratap Das  
dt.18.10.2017

### 13. Life Member List (From 2016)

- 595 Panda (Mr.) Mukti Pada, Retd. Govt. Servant, 09776001947  
(2016) RP-77, Pandab Nagar, Tankapani Road,  
Bhubaneswar-751018  
Email: muktipadapanda@yahoo.com
- 596 Behera (Mr.) Harish Chandra, 09437056384  
(2016) Retd. EIC-cum-spl. Secretary,  
Deptt. of Water Resources.  
“Banyosoda” Plot No. 195/208, Khandagiri Vihar,  
Kolathia, Po- Aiginia, Dist.- Khurdha-751019  
Email: harishchandra.behera@037gmail.com
- 597 Senapati (Dr.) Manas Ranjan, 09437237797  
(2016) Prof. & HoD Chemistry,  
Trident Academy of Technology,  
60/61, Laxmivihar, Sachibalaya Marg,  
Bhubaneswar 751005  
Email: dr-senapti@yahoo.com
- 598 Nayak (Mrs.) Maya, Professor,  
(2016) Plot No. 3299, Sriram Nagar, Old Town,  
Bhubaneswar 751002  
Email: mayanayak3299@yahoo.com
- 599 Nayak (Mrs.) Niva, 09437403679  
(2016) Associate Professor in Chemistry,  
C/o- N.C.Nayak, Plot No. 14-A,  
Brahmeswar Bag, Tankapani Road, Po-  
Badagada Brit Colony, Bhubaneswar- 751018  
Email: nivanayak72@gmail.com, nnayak\_n@yahoo.co.in
- 600 Rath (Dr.) Bijaya Kumar, 0120- 2472191  
(2016) Chief Geologist (ONGC) 09643301931  
A-14, Millenium Apartment, Sector-61,  
Noida-201301, Uttar Pradesh  
C/o- Dr. Nabeen Kumar Rath, Hatibandha Street,  
Berhampur-760001, (Ganjam), Odisha  
Email: bijay.rath1960@rediffmail.com

- 601 Gupta (Mr.) Ram Narayan, 09437479291  
(2016) Sr. Scientist (Retd.) C.G.W.B,  
Min. of Water Resources G.O.I,  
House No. MP-II-24, H.B.Colony, Khandagiri,  
Bhubaneswar-751030  
Email: rngupta2006@gmail.com
- 602 Acharya (Prof.) Prasant Kumar, 09853194572  
(2016) Former Prof. Sanskrit, 4, Khandagiri Vihar,  
Khandagiri, Bhubaneswar-751030  
Email: prasantchry@gmail.com,
- 603 Prasad (Mr.) Gulab, Scientist 'D' 09437480754  
(2016) CGWB (SER), Bhubaneswar.  
MIG- 20, Phase-II, Khandagiri Housing Board Colony,  
Khandagiri, Bhubaneswar-751030  
Email: gpd\_cgwb@yahoo.co.in
- 604 Er. Chaudhury Ananga Das, 0647-2555487  
(2016) Retd. Sr. G.M. (Elec.) OPTCH. 08658014048  
N-4/62, IRC Village, Bhubaneswar-751015  
Email: -
- 605 Mohanty (Mr.) Jitasatru, IFS (Retd.) 09437080233  
(2016) Former Conservator of Forest,  
Odisha Forest Department,  
Plot No.: C/61, Sec-08, CDA,  
Cuttack-753014  
Email: jitasatrumohanty@gmail.com
- 606 Swain (Mr.) Manoj Kumar, OAS-I. 09437254639  
(2016) Special Officer,  
The Odisha Mining Corporation Ltd.  
OMC House, Bhubaneswar-751001  
Email: manojkumarswainoas@gmail.com
- 607 Pathak (Dr.) A. K., IFS, 09438659962  
(2016) Chief Conservator of Forest,  
Kendu Leaves, Balangir,  
Plot No. - 101, Biswanath Villa, Vivekanda Marg,  
Old Town, Bhubaneswar-  
Email: ak.pathak@rediffmail.com,

- 608 Rath (Dr.) Shiba Prasad, 08895926002  
(2016) Former Vice-Chancellor,  
258, Kanan Vihar, Phase –ii, Patia,  
Bhubaneswar-751031
- 609 Hota (Mr.) Prashant Kumar, 09777443999  
(2016) Executive Vice-President, Jindal Steel & Power,  
Near Rotary Eye Hospital, Bhubaneswr-751024  
Email: prashanthota@gmail.com
- 610 Choudhury(Mr.) Prashant, Manager, ABB Ltd. 09937223422  
(2016) M- 09, Padmalaya, Versa Villa, Shree Vihar, Patia,  
Chandrasekharapur, Bhubaneswar-751031  
Emai: prashantwildies@gmail.com
- 611 Parija (Mrs.) Jayanteebal,  
(2016) Lecturer in Botany, Salipur (A) College, Salipur,  
At: College, Road, Salipur, Cuttack- 754202  
Email: jayanteebala@gmail.com
- 612 Swain (Dr.) Gouranga Charan, 0674-2581918  
(2016) Retd. Asst. Professor, 09438077329  
B/L-54, V.S.S. Nagar, Bhubaneswar-751007.  
Email: emerging.scince08@gmail.com
- 613 Sahu (Mrs.) Kuntala Kumari, 09437176978  
(2016) Reader in Botany,  
Atal Behari College, Basudevapur,  
C/o: Rajkishore Sahoo, At: Kundibag (Ichhapur),  
Po: Bhadrak Bypass, Bhadrak
- 614 Sahu (Prof.) Krishna Chandra, 022, 25704983  
(2016) Professor (Retd.), 09769398235  
F-302, Powai Park Co-op. Society,  
Hiranandani Gardens, Powai, Mumbai- 400076  
Email: sahu\_kc@yahoo.com
- 615 Sahoo (Mr.) Krupasindhu, 09437001251  
(2016) President, FUSCAO,  
A/42, Nilakantha Nagar, Bhubaneswar-751012  
Email: krupasindhuvss@gmail.com

- 616 Saha (Mr.) Sidharth, 09937200000  
(2017) Vice- Chairman, Sambalpur Municipality.  
At- Nayapada, PO- Sambalpur, Dist.- Sambalpur,  
Email: sidharthsaha@gmail.com
- 617 Hota (Mr.) Tapan Kumar, 09583558755  
(2017) Rain Water Harvesting Consultant,  
(Certified Govt. of Odisha),  
At/Po- Chiplima, Dist.- Sambalpur-768025  
Email: tapankumarhota@gmail.com
- 618 Bhanja (Dr.) Prafulla Kumar, 08895326001  
(2017) Senior Scientist & Secretary, 09853334997  
Odisha Bigyan Academy, S & T Deptt. GoO,  
D-11/4, Rental Colony, IRC Village,  
Bhubaneaswar- 751015  
Email: prafullakumarbhanja@gmail.com
- 619 Das (Dr.) Kali Sankar, M.B.H, 06854-232808/240197  
(2017) Homoeopathic Doctor, 09437472434  
Homoeopathy International,  
Main Road, Jeypore- 764001  
Dist: Koraput, Odisha, India  
Email: dr\_ksdas@rediffmail.com
- 620 Satpathy (Er.) Subas Chandra, 0674-2384568  
(2017) Former Engineer-in-Chief, 09861096579  
HIG-1/19, Sri Satyasai Enclave,  
Lane-13, Khandagiri,  
Bhubaneswar- 751030  
Email: subas\_satapathy@yahoo.co.in
- 621 Mohapatra (Dr.) Pavitra Mohan, 09437485663  
(2017) Senior Breeder,  
Centre for Pulses Research, Berhampur,  
Po- Krupasindhupur,  
Via- Nimakhanti, Dist.- Ganjam-761001  
Plot No.- 2115/15/1, Rath Road,  
Bhubaneswar- 751002  
Email: pavitramohan@rediffmail.com

- 622 Panda(Dr.) Prasant Kumar 09437414202  
(2017) Scientist (Agronomy),  
CDR (OUAT), Berhampur,  
Po- Krupasindhupur, Via- Nimakhand,  
Dist.- Ganjam- 761001, Odisha.  
Email: pkpanda\_69@yahoo.com
- 623 Sahu Prof. (Dr.) Arun Chandra, 09437133387  
(2017) Professor and Head (Retd.)  
GM Autonomous College, Sambalpur,  
Anwesana, 52/II, Bhagabat Sandhan,  
GGP, Bhubaneswar- 751025  
Email: sahuac52@gmail.com,
- 624 Patra (Mr.) Prasanna Kumar, 09437051905  
(2017) Secretary, Jupiter +2 Sc. College,  
2, Gopabandhu Nagar, Unit- 8,  
Bhubaneswar- 751012  
Email: prasannakumarpatra@yahoo.co.in
- 625 Patro (Mr.) C. Jawaharlal, 09861007579  
(2017) Plot No.- 524, Swiss Villa,  
Sahid Nagar, Bhubaneswar  
Email: c.jawaharlalpatro@yahoo.com
- 626 Jammula (Mr.) Murali, 09437030840  
(2017) N-6/456, IRC Village,  
Near Hotel CROWN, Bhubaneswar-751015  
Email: murali@ppamktg.com
- 627 M. Ganesh, 09437091233  
(2017) Chartered Accountant  
418, Prachi Vihar, Near Palasuni Hata,  
Bhubaneswar- 751025  
Email: mganesh7@yahoo.com
- 628 Subudhi (Mr.) Chandra Sekhar 07894433663  
(2017) Chartered Accountant,  
18/60, Gayatri Vihar, Baramunda,  
Bhubaneswar-751003  
Email: bessubudhi@gmail.com

- 629 Subudhi (Mr.) B. Sarbeswar, 09437022977  
(2017) Professional (CA)  
Duplex-10, Manorama Enclave,  
Rasulgarh, Bhubaneswar-751010  
Email: subudhias@gmail.com
- 630 Mishra (Dr.) Suryakanta Choudhury, 09861073501  
(2017) Professor and Head,  
Depatt. Of Zoology, OUAT,  
Bhubaneswar.  
45 VIP Area, Flat-301, Ananda Villa, Nayapalli,  
Bhubaneswar-751015  
Email: cskmishra@yahoo.com,
- 631 Kejriwal Swati, 0674- 2397227  
(2017) Partner, M/S O.M. Kejriwal & Co. 0674-2397890  
66, Lord's Galaxy,  
Bhakta Madhu Nagar, Talabania,  
Jagamara, Bhubaneswar-751003  
Email: swati@omandco.com
- 632 Acharya (Mr.) Gopeswar, 9090952337  
(2017) Administrative Officer, Hi-Tech Medical  
College & Hospitality, BBSR  
Plot No. 582/E/1, Narayan Mishra Lane,  
Mahatab Road, Cuttack- 753012  
Email:
- 633 Fatesingh (Mr.) Himansu Sekhar, 08908289411  
(2017) Teacher,  
At- Baligadia, Po.- Jankia,  
Dist.- Khordha, Odisha- 752020  
Email: himansu1972@gmail.com
- 634 Choudhury (Mr.) Ramesh Chandra, 09437424011  
(2017) Director, Raajdhani Engineering College,  
Near Mancheswar Rly. Station,  
Bhubaneswar, Odisha-751017  
Email: rameshchoudhury11@gmail.com

635 Sarangi (Dr.) Bimal, 0674-240179, 09437123892  
(2017) Principal, Raajdhani Engineering College,  
Near Mancheswar Rly. Station,  
Bhubaneswar, Odisha-751017  
At/Po. Panikoili, Jajpur-755043  
Email: bimal\_binit@yahoo.com

636 Panda (Dr.) Sarad Chandra 09437077210,  
(2017) Secretary, Raajdhani Engineering College,  
Near Mancheswar Rly. Station,  
Bhubaneswar, Odisha-751017  
Email: saradchandrapanda@gmail.com

637 Pradhan (Dr.) Malay Kumar, 09439210915, 0674- 2390363  
(2017) Deputy Director of Factories and Boilers (SAFETY),  
Unit-3, Kharavela Nagar, Bhubaneswar.  
Qrs. No. VR-40, Unit-6, Bhubaneswar-  
Email: malay.pradhan@yahoo.com

638 Dhala (Sri) Prasanna Kumar, Teacher, 08280711176  
(2017) Plot No. 316/5853, Niladri Vihar, Chandrasekharpur,  
Bhubaneswar-751021  
RS: At- Bhogada, Po- Dhanchangada, Via- Kantilo  
Dist.- Nayagarh-752078  
Email: pk.dhal09@gmail.com

639 Mishra (Sri) Sarat Chandra, 08763763656  
(2017) Krishna Vihar Khandagiri Kolathia,  
Bhubaneswar- 751019  
At/Po- Kamaladiha, Via-Narsinghpur,  
Cuttack-754032  
Email: debani11@gmail.com, debani@IIIT-bh.ac.in,

640 Pradhan (Dr.) Sunil Chandra, 09437305097  
(2017) Lect. In Zoology, V.N.(Auto) College, Jajpur Road.  
Plot No. 486/2175 A, Kanan Vihar, Phase-II  
Patia, Bhubaneswar-751031  
Email: sunilch\_pradhan@yahoo.com

***Please inform if any rectifications needed in the list of Members***

## 14. Executive Committee of OES Including Office Bearers

- 01 Dr Sundara Narayana Patro** 09437190420  
President  
MIG-106, Phase-I,  
Khandagiri Enclave, Khandagiri,  
Bhubaneswar-751030  
Email:snpatro11@rediffmail.com;
- 02 Dr Budruddin Mohammad Faruque** 09938661814  
Vice President (EMD) 0671-2417583  
Former Director, GSI, Zahirland,  
Tinikonja Bagicha,  
Cuttack-753001  
Email:bmfaruque@gmail.com;
- 03 Dr Lala Aswini Kumar Singh** 07377727949  
Vice President (EAP)  
Former Sr. Research Officer (Wildlife), 09861092928  
Member, IUCN-Conservation Breeding Specialist Group,  
1830- Mahatab Road, Friends Colony, Old Town,  
Bhubaneswar-751002  
Email: laksinghindia@gmail.com,  
laksingh2005@yahoo.co.in
- 04 Dr Jaya Krushna Panigrahi** 09437076100  
Secretary (EMD) 0674-2741542  
Reader in Zoology,  
41-A, Prachi Enclave,  
Chandrasekharapur,  
Bhubaneswar-751016  
Email:jk.panigrahi@gmail.com;
- 05 Dr Rekha Das,** 09938454233  
Secretary (EAP) 0674-2551011  
Reader in Zoology  
130, VIP Colony, Ekamra Vihar,  
IRC Village, Bhubaneswar-751015  
E-mail:rekhadas1957@rediffmail.com;

- 06 **Dr B. Seetarama Patro** 09437309977  
Treasurer 09556342407  
Former Dean & Prof. 0674-2354330  
Mechanical Eng. BPUT,  
L-1, Housing Board Colony, Baramunda, Bhubaneswar - 751003,  
Email: bspatro@gmail.com;
- 07 **Dr Ladukesh Prasad Mishra** 09861238619  
Joint Secretary (EMD) 09437138228  
Lecturer in Botany, 0674-2550969  
22,VIP Area, IRC Village, Bhubaneswar – 751015  
Email: lpmishra\_2006@yahoo.co.in
- 08 **Er. Prakash Jena** 09437572053  
Joint Secretary (EAP) 09937623053  
Director, Ever Green Forum,  
LIG- 877, K-4, Kalinga Vihar,  
Po: Patrapada, Bhubaneswar-751019  
Email: prakashjena81@gmail.com;
- 09 **Dr Veerendra Pratap Upadhyaya** 0674-2302417  
Member, Director (S), 09650039945  
Ministry of Environment & Forests, 09437129945  
Eastern Regional Office,  
A/3, Chandrasekharpur, Bhubaneswar- 751023  
Email: vpupadhyay@gmail.com
- 10 **Dr Sailabala Padhi,** 09937095353 /  
Member 09937188514  
Former Prof. of Botany, Brahmapur University,  
Gajapati Nagar, Lane-1, Brahmapur (Ganjam) – 760007  
Email: sailabalapadhi@gmail.com;
- 11 **Dr Sudhakar Kar** 09438054614  
Member, Former Senior Research Officer,  
Odisha Forest Deptt., Member: IUCN/SSC  
Crocodile Specialist Group.  
“Subhadra Nibas”, Durgamadhab Nagar, (Lane-1),  
Near Central Ayurvedic Research Centre and Hospital,  
Sampur, Po- Ghatikia, Khandagiri, Bhubaneswar- 751003,  
Email: kar.sudhakar@gmail.com;



## 15. Advisors

### Advisors to President

Prof. Satyananda Acharya, Principal Adviser  
Former Vice Chancellor, Utkal University and Past President, OES

Prof. Amulya Kumar Panda Adviser  
Former Principal, Ravenshaw College

Prof. Debi Prasad Ray Adviser  
Former Vice Chancellor, OUAT

### Advisory Body of OES

Prof. Madhab Chandra Dash, Chairman  
Former Vice Chancellor, Sambalpur Univeristy

Dr Bijay Ketan Patnaik, IFS (Retd.) Member  
Former PCCF (WL) & Chief Wildlife Warden, Odisha

Er. Binod Chandra Padhi, Member  
Former Engineer-in-Chief, Odisha

Dr Sachidananda Tripathy, Member  
Former Professor of Geography, Utkal Univ.

Dr Bipra Charan Patnayak, Member  
Former Director, ICAR

### Academic Advisory Committee

Dr Naba Kishore Mahalik, Chairman  
Former Professor of Geology, Utkal University

Dr Sarat Chandra Mishra, Member  
Former Chief Engineer

Mr. Gandharba Behera, Member  
Former Dy. Director, ISRO

### Financial Advisory Committee

Mr. Santosh Kumar Tamotia, Chairman  
Former CMD, NALCO

Dr Surendra Kumar Sarangi, Member  
M.D., GEOMIN

Dr Chitta Ranjan Mishra, Member  
Former General Manager, NALCO

## 16. OES Membership Application Form



### Orissa Environmental Society

(Registered under Societies Registration Act 1860,

Regd. No. PBN 100/19 of 1982-83

And Foreign Contribution (Regulation) Act 1996,

Regd. No. 104830132 of 2003)

ND-4, VIP Area, IRC Village, Bhubaneswar-751015, Odisha, India

Telephone: 91-674-2557423

Email:oesbbsr@rediffmail.com,oesbbsr@gmail.com

www.orissaenvironment.com

### APPLICATION FORM FOR MEMBERSHIP

To

The Secretary, Orissa Environmental Society,

ND-4, VIP Area, IRC Village,

Bhubaneswar (Orissa, India) – 751015

Dear Sir,

I wish to be enrolled as an Annual Member\*/ Life Member of the Orissa Environmental Society.

**(In case of individuals)**

We wish to enroll our Organization/Institution/Department as an Institutional Member of the Orissa Environmental Society.

**(In case of Organization/Institution/Department)**

Enclosed herewith, please find the bank draft/\*cheque/cash for an amount of Rs. \_\_\_\_\_

(Rupees \_\_\_\_\_) only towards individual- annual / life membership subscription;

Institutional Membership subscription (Strike words not applicable).

**Details of Individual**

Name in full (block capital letters) \_\_\_\_\_

Designation \_\_\_\_\_

Present Address (with pin code) \_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_, Fax \_\_\_\_\_,

e-mail \_\_\_\_\_

Permanent Address (with pin code) \_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_, Fax \_\_\_\_\_,

e-mail \_\_\_\_\_

Date of birth \_\_\_\_\_

Academic qualification \_\_\_\_\_

(Attach copy of the last educational qualification certificate)

Brief note on the activities (attach separate sheet)

**Details of Institution / Organisation / Department**

Name of the Organization \_\_\_\_\_

(Attach copy of the registration certificate in case of Non-Government Organization/ Trust/ Company)

Address (with pin code) \_\_\_\_\_

\_\_\_\_\_

Telephone \_\_\_\_\_, Fax \_\_\_\_\_,

e-mail \_\_\_\_\_

Contact person \_\_\_\_\_

Brief note on activities (attach separate sheet)

**Signature with date** \_\_\_\_\_

**Kindly read objectives, membership fees, instruction, etc. overleaf**

*\*Send an additional amount of Rs. 70/- (Rupees seventy) only in case of outstation cheques towards collection charges.*



## **Orissa Environmental Society**

ND-4, VIP Area, IRC Village, Bhubaneswar-751015,  
Odisha, India

Email: oesbbsr@rediffmail.com, oesbbsr@gmail.com

Website: [www.orissaenvironment.com](http://www.orissaenvironment.com)

The quality of life on the Earth is fast deteriorating consequent upon resource depletion and environmental degradation. This poses a threat to the very existence of the mankind and all other forms of life. The challenge before us now is the reversal of this situation through enrichment of the environment and conservation of the natural resources for a sustainable future. The World Conservation Strategy defines sustainable development as the kind of development that meets the needs of the present without compromising the ability of the future generation to meet their own needs. In other words, it means improving the quality of human life while living within the carrying capacity of the supporting ecosystem. Realising this, the Orissa Environmental Society (OES) was founded in 1982 to promote education and awareness on the fast deteriorating quality of human environment and the need for conservation of the Nature.

### **Objectives**

- Promote knowledge, understanding and appreciation of nature, and the principles and practices of conservation of natural resources among the common mass.
- Establish contact with regional, national, and international organizations, the Department of Environment and other such departments/agencies of the State as well as the Union Government so far as these contacts are beneficial to the Society or its objectives.
- Advise the government and non-government agencies on the environmental matters in the public interest.
- Conduct and encourage activities like tree plantation, nursing, habitat conservation, education and awareness programmes- padayatra, mass mobilization campaign, workshop, seminar, conference, training, popular lecture, exhibition, competitions, study, survey, research, publication of proceedings, books, brochures, bulletins,

extension materials etc. towards protection, regeneration and conservation of environment and natural resources.

- Frame curricula and co-curricula, and organize courses on environmental sciences at all levels of education.
- Work regardless of race, religion and political belief.
- Adopt any other means that might be advantageous to the Society's objectives.

### DETAILS OF SUBSCRIPTIONS

Member	Individual	Institution
Life	Rs.2,000	Rs.25,000
Annual*	Rs.200	-

---

Payment should be made in shape of bank draft in the name of Orissa Environmental Society to be drawn on any nationalized bank in Bhubaneswar. \*In case of out station cheque an additional amount of Rs. 70/- (Rupees Seventy) only should be paid towards collection charges.

---

\*The annual subscription year- 1<sup>st</sup> April to 31<sup>st</sup> March

### FOR OFFICE USE ONLY

Money Receipt No. \_\_\_\_\_, dated \_\_\_\_\_,

Membership No. \_\_\_\_\_ Bank Draft/Cheque No. \_\_\_\_\_,

dated \_\_\_\_\_ Name and address of the bank on which

to be drawn \_\_\_\_\_ Name and

address of the draft/cheque issuing bank \_\_\_\_\_

## 17. OES Fellow- Guidelines

In the bylaws of Orissa Environmental Society there is a provision of 'Fellow' (under article IV (b)- Category of Members). The Society is going to award the certificate of honour as 'Fellow' to the Life Members from the current year.

Interested members are requested to furnish the relevant information as per the format (Annexure -1). Enclosed please find the guidelines suggested by the OES Fellow Nomination Committee.

### Guidelines for selection

1. The total strength of OES-Fellows in any year will remain at a maximum of 20% of the number of existing OES Life Members. The calculation will be based on the strength of Life Membership by 25 October each year, which is the Foundation Day of OES.
2. In the first year (2016 as base year), 5% of the total Life Members will be nominated as the Founder Fellows of OES. All eight Patrons of OES, as on 20 Oct, 2016, may be included in the list of "Founder Fellows" as all of them have made significant contributions towards environment. In the starting year, up to 30 (thirty) "Founder Fellows" may be nominated by the Executive Committee of OES.
3. In subsequent years 5 (five) Fellows may be selected out of about 10 (ten) identified or invited nominations.
4. It is not necessary to award the honour of 'Fellow of OES' every year, if suitable nominations do not come forth..
5. Individuals or organisations nominated for consideration should have done noticeable field work and made significant contributions to the fields of science and technology, and environment.
6. Normally, the nominee should have been a Life Member of OES for 5 (five) years

7. Life Members who are Patrons of OES and have demonstrated significant contributions towards environmental protection shall be considered for nomination, even if they have not been Life Members for five years.
8. Life Members who have been felicitated with 'Lifetime Achievement Award' by OES will ordinarily be considered for award of the honour as 'Fellow of OES'.
9. Persons who are not Life Members yet but have very significant contributions in the field towards environment protection/conservation / research may be nominated for consideration for award of the honour as 'Honorary Fellow of OES'.
10. Biographical profiles will be requested from nominees and considered for final selection.
11. Financial mechanism to meet the expenses- the nominees will be appealed for paying a 'good will subscription' of at least Rs.2000/- (Rupees two thousand) only for promoting environment protection.
12. Draft Application Format for record of the Society has suggested in Annexure-I.
13. An Undertaking/ Oath as in Annexure-II will be taken by the OES-Fellow

## **Annexure-I**

### **OES Fellow Guideline**

#### **Orissa Environmental Society**

(Resume of Prof./ Dr. \_\_\_\_\_ ‘Fellow’ of OES)

(1.) Name of the applicant:

(2.) Present address and occupation:

(3.) Date of birth:

(4.) OES Life Membership No. with year:

(5.) Academic qualification:

(6.) Significant contribution in the field of science, technology and environment:

(Mention within maximum ten lines only):

(7.) Awards, Felicitations, Honours, etc. received:

(8.) Contribution to the activities of Orissa Environmental Society to achieve its objectives, and welfare of the society in general.

*The information furnished is true to the best of my knowledge*

Signature with date

(Full Name:.....)

## **Annexure-II**

### **OES Fellow Guideline**

#### **Undertaking**

“I \_\_\_\_\_  
the undersigned, do hereby subscribe to the obligation that I will make endeavour to promote the interest and welfare of the Orissa Environmental Society for the furtherance of its objects, and observe its rules and regulations so long as I shall continue to be a Fellow thereof”.

Signature with date

(Full Name:.....)

## 18. OES Patron- Guidelines

There is a provision of ‘Patron’ in the Rules and Byelaws of Orissa Environmental Society (Article IV, b) under the category of members. As per the provision, an eminent person of repute and merit is nominated as ‘Patron’ of Orissa Environmental Society for distinguished contributions to the cause of protection, conservation and promotion of natural resources and environment.

Any Life Member eligible to become a ‘Patron’ of Orissa Environmental Society, may submit an application in the enclosed format. The application, basing on the merit, will be considered for the award of the ‘Certificate of Honour’ as ‘Patron’.

Any Life Member to be chosen as ‘Patron’ will be requested to contribute an amount not less than Rs. 10,000/- (Rupees ten thousand) only to the Corpus Fund of the Society. Donations made to Orissa Environmental Society shall qualify for deduction U/s, 80G (5)(vi) of the IT Act 1961.

### **Application Form for Award of the Certificate of Honour as ‘Patron’**

1. Name of the applicant:
2. Present address and occupation:
3. Date of birth:
4. OES Life Membership No. with year
5. Academic Qualification:
6. Significant contribution in the field of environment, natural resources, science & technology: (Mention within maximum ten lines only):
7. Awards, Felicitations, Honours, etc. received:  
(Supporting documents may be attached)
8. Contribution to the activities of Orissa Environmental Society to achieve its objectives.

Signature with date

(Full Name:.....)

### **Undertaking**

“I\_\_\_\_\_ the undersigned, do hereby subscribe to the obligation that I will make endeavour to promote the interest and welfare of the Orissa Environmental Society for the furtherance of its objects, and observe its rules and regulations so long as I shall continue to be a Fellow thereof”.

Signature with date

(Full Name:.....)

