Biological Forum
an International Journal 17(7): 40-49(2025)
ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

'Wetland Eco-Industrialization' for Radical Transformation of Extreme Global Poverty into Sustainable Prosperity: A Case Study on 'Bengal Eco-Craft' in West Bengal, India

Manindra Nath Mukherjee[1], Onkar Nath Maurya[2] and Tanay Shil [3]*
[1]*Sr. Personnel Officer (Retd.) Coal India Ltd., Coal Bhawan, New Town, Rajarhat, Kolkata (West Bengal), India.*
[2]*Botanical Survey of India, Central Regional Centre, 10 Chatham Lines, Allahabad (Uttar Pradesh), India.*
[3]*Central National Herbarium, Botanical Survey of India, Howrah (West Bengal), India.*

(Corresponding author: Tanay Shil)*
(Received: 14 April 2025; Revised: 23 May 2025; Accepted: 20 June 2025; Published online: 07 July 2025)
(Published by Research Trend)

ABSTRACT: The idea of 'Wetland Eco-Industrialization' represents an innovative economic 'Model' aimed at swiftly converting global poverty into sustainable wealth with equity by utilizing global natural green plant resources from wetlands such as rivers, lakes, canals, dams, ponds, and more in a pragmatic 'wise-use' manner. Water hyacinth (*Pontederia crassipes* Mart.), Reed Cane Grass (*Arundo donax* L.), Southern cattail (*Typha domingensis* Pers.), and several other wetland grasses are the primary chosen resources for this proposed wetland industrial endeavors. The World Bank aims to eradicate extreme global poverty by 2030 and encourage the distribution of prosperity to those in extreme poverty. The foremost development goal of the United Nations is to eliminate poverty by 2030. The Government of India aims to significantly reduce poverty in order to elevate the nation from its current position as a developing country to a developed country by 2047. The task of poverty alleviation is common to all. A comprehensive and innovative approach that fully utilizes both natural and human resources, combined with a strong commitment to mutual respect, honor, and acceptance among all individuals as part of a unified World Human Family, can eliminate not just extreme poverty, but overall poverty as demonstrated in the proposed Model.

Keywords: Wetland, Global Poverty, Wetland plants, Radical Transformation, Handicrafts, Innovation Economics, Entrepreneur, Trade promotion, Environment Protection, Sustainable Livelihood.

INTRODUCTION

The notion of 'Wetland Eco-Industrialization' is derived from the principle of 'Creative Destruction' as promoted by economist Schumpeter (1943). According to McCraw Thomas (2007), "Schumpeter's contributions were so impactful that contemporary views on capitalism largely reflect his ideas – particularly his focus on innovation, entrepreneurship, business tactics, and creative destruction." 'Wetland Eco-Industrialization' has been intentionally crafted as an 'Innovation Economic' new Model for quickly turning global poverty into sustainable prosperity with inclusive equity through a more pragmatic 'wise-use' of the world's natural green plant resources found in wetlands. It's a novel type of innovation in wetland resource-driven environmental economic advancements, global trade-related innovation, and innovations in consumer behavior influenced by new fashion technologies. It's an innovative industrial technology rooted in Schumpeter's theory of pro-environmental 'Creation' resulting from subsequent ante-environmental 'Destruction' due to human industrial activities aimed at preserving every wetland, both regionally, nationally, and globally.

Wetland resource identity. Different aquatic plants and green vegetation naturally develop in water bodies and wetlands. For industrialization, only water hyacinth (*Pontederia crassipes* Mart., known as '*Kochuripana*' in Bengali or *Jalkumbhi* in Hindi), reed cane grass (*Arundo donax* L., known as *Nol khagra* in Bengali or *Hathi Ghas* in Hindi), southern cattail (*Typha domingensis* Pers., known as '*Hogla*' in Bengali or *Patera* in Hindi), and several other wetland plants have been identified as key selected resources in the form of raw materials needed for wetland industrial operations. Among different wetland plants the water hyacinth (*Pontederia crassipes* Mart.), is the most extensively used raw material for crafts, industry, and agro-industry by numerous countries for approximately the last 50 years. The second highly promising raw material for producing handicrafts and machine crafts is Southern cattail (*Typha domingensis* Pers.), which is

abundantly found in wetland areas. The third type is Reed Cane Grass (*Arundo donax* L.), which flourishes in the same regions as Southern cattail. Beside these, *Pontederia hastata* L. (known as '*Boronokha*' in Bengali or *'Launkia'* in Hindi) and *Cyperus iria* L. (known as '*Motha ghas'* in Bengali or '*Moth*' in Hindi) are also used.

Wetland resource availability. Between late 19th and early 20th century, Water Hyacinth spread throughout the world (Wilson *et al*., 2005). It ranks among the 100 most problematic invasive species, recognized by the International Union for Conservation of Nature (Te´llez *et al.,* 2008) and has now spread to Europe, Africa, Asia, and North America (Shanab *et al*., 2010). Water Hyacinth is found in over 50 countries, excluding Antarctica, and is commonly found in non-saline waters across nearly all tropical and subtropical regions, such as the Amazon Basin in South America, India, Indonesia, China, Bangladesh, Zimbabwe, Thailand, Spain, South Africa, Ethiopia, Mexico, and the southern United States, among others (Klein *et al.,* 2020). It is found almost throughout India (Mastakar, 2020). Water hyacinth in undivided Bengal and Assam has been highly aggressive, invasive, and infamous since the first decade of the last century. The Government of India at that time implemented measures to regulate water hyacinth by passing 'The Assam Water Hyacinth Act-1926'. In Bengal, water hyacinth was referred to as the 'Terror of Bengal'. The government enacted 'The Bengal Water Hyacinth Act, 1936' to eradicate water hyacinth in the greater Bengal region (now Bangladesh and West Bengal, India). *Arundo donax* L., *Cyperus iria* L., *Pontederia hastata* L. and *Typha domingensis* Pers. are found almost throughout India (Prasanna *et al.,* 2020; Prasad *et al*., 2020; Mastakar, 2020; Roy, 2020).

Resource Utilization. Over 30 nations such as the Philippines, Vietnam, Indonesia, Thailand, China, Bangladesh, India etc. have been using water hyacinth in diverse industrial and agro-industrial applications, including water treatment, biofuel production, organic fertilizers, handicrafts, apparels of everyday use and high fashion, and animal and fish feed, among others. North Eastern Development Finance Corporation (NEDF) has been the first market-competitive producer of water hyacinth handicrafts in India since 2008-10, operating more profitably since 2012 after receiving training in Thailand's water hyacinth craft techniques (Das, 2013). Since that time, Water Hyacinth crafts have proliferated across various States of India, including West Bengal, achieving profitable commercialization. In Bangladesh, the 'Prakritee' group of handicraft units has been producing handmade paper for the last 30 years in their handmade paper project 'Biborton' in the village, Kalurpar in Agailjhara, Barisal (Mukherjee, 2018). Through the use of silhouette, several kinds of handicraft enterprises have prospered in Bangladesh. Thailand's water hyacinth technology has been recognized as an academic Fashion Technology program at Rajamangala University of Technology (Thanyaburi) in Thailand. In 1975, the 'National Aeronautics and Space Administration' (NASA) conducted an experiment on water hyacinth at the 'National Space Technology Laboratories' (NSTL) in Bay St. Louis, Mississippi, successfully demonstrating that water hyacinth serves as an effective natural water purifier. Currently, handicrafts made from water hyacinth have become prominent in the global commercial market. Products made from 'Southern cattail' in Bangladesh are the second choice for worldwide consumers. In West Bengal (India), particularly in Howrah district and East Midnapore district, the production of 'Hogla' mats has been a lucrative business for a long time.

Consumers Preference. Overall, consumers' preference for handicrafts made from 'Water hyacinth' and 'Southern cattail' remains quite limited. Demand for handicrafts made from 'Water hyacinth' and 'Southern cattail' exists only in certain regions and specific countries. Laundry baskets, foot mats, flower pots, handbags for both ladies and gents, and various home decorative arts primarily crafted from 'Water hyacinth' and secondarily from 'Southern cattail', along with yoga mats, make up the list of consumers' plastic alternatives that cater to both practical needs and fashion preferences. 'Water hyacinth' and green resources from wetlands used to create various consumer goods have not yet gained popularity among frontline consumers in regional, national, and global markets. The NEDFi brand product, 'Aqua Weaves,' along with the 'ASOMI' product from Assam State Rural Livelihood Mission, enjoys great popularity both in India and abroad. In Punjab, Uttar Pradesh, Tamil Nadu, Telangana, Haryana, and West Bengal, the production and market for water hyacinth handicrafts are steadily thriving. In Indonesia, avenues for online promotional support via social media and e-commerce, along with product innovation aid for water hyacinth products, have been established.

Product Diversification and Innovation. Many organizations and production units in India and overseas involved in academic research and the production of water hyacinth along with other wetland green resource-based handicrafts and agro-industrial products have been persistently evolving in product diversification and innovative techniques. In West Bengal, a volunteer organization called 'Bengal Eco-Craft' has been active since November 2019 in Kolkata and Nadia district, promoting wetland green-plant-based industrialization through research, experimentation, free mass training, production, marketing, and fostering entrepreneurship (Shil & Maurya 2021). It has created a new market for its products, widely recognized by the brand name 'Bengal Jalkachuri' (water hyacinth and wetland green plant-based product of West Bengal, India).

Ancient Folklore and Modern New Market Formation. Various Greek mythological texts reveal that the name 'Hyacinth' is associated with ancient Greek folklore noted for exceptional beauty. Contemporary fashion industrial entrepreneurs could tap into the allure of captivating ancient Greek folklore to create a new, dynamic global market for innovative,

trendy water hyacinth handicrafts and machine-made items.

Water Hyacinth Vs. Humans. 'Water hyacinth' is an exceptionally enigmatic recent invention of Nature. In the span of two hundred years, it became an aggressive, invasive, infamous, and highly detrimental to human health and well-being. It spread partly manually and mostly naturally in the whole world (Patel, 2012). In Bengal, it needed to be named after the 'Terror of Bengal.' However, Nature has been compelled to produce Water Hyacinth as its inherent water purification system (Rezania *et al*., 2015). Nature very purposively wants to be a friend of Humans. But humans still are unknown to economically utilize the water hyacinth.

Nature-Human Conflict Vs. Harmony. A major portion of existing global human poverty can be alleviated by gainfully utilizing naturally provided water hyacinth that is affluent world-wide. Humans in extreme prosperity and humans in extreme poverty, thereby showing extreme inequality can easily be transformed into simple seller-byer relationship through Wetland Eco-Industrial activities. The global market of high-fashioned goods to be made from water hyacinth may flourish rapidly just on a slight change of mindset of the upper middle class, rich, and highly top rich humans of one human family. No donation, subsidy, or benevolence is required to eradicate economic inequality. Only joint application of Innovation Economics, Market Economics and Cultural Economics may transform Nature-Human conflict into Nature–Human Harmony with the help of wetland green resources.

METHODOLOGY

i) Various stage-by-stage theoretical, experimental, field survey-focused and production-and-marketing-oriented research efforts have been conducted since 2016. The book by Sikdar & Mukherjee (2016) is the initial self-inspiration of this research work (by this 1st author) on more gainful utilization of wetland green resources.

ii) Drawing on research about the handicraft artisans in West Bengal and the 'Prakritee' group (which includes ten craft-making centers, such as the water hyacinth craft project from the Barisal unit) in Bangladesh, as well as from the book titled "Sanskritir Jeeboni Shakti O Bangali"-2018, this marks the second phase of research advancement and testing for initiating a wetland eco-industrial project throughout West Bengal.

iii) A number of practical experiments have been conducted on conventional techniques and primarily on a product diversified innovative approach. The initial organic vegan leather bag crafted from water hyacinth was produced in a home workshop in August 2019 and showcased at the Sonarpur Block Development Office (South 24 Parganas district, West Bengal). With encouragement, the knowledge gained through self-experimentation has officially begun to be shared at no cost among individuals from various districts of West Bengal. Consequently, the research-driven experimental journey commenced with the first workshop held at Majdia (Nadia district) on November 21, 2019.

The Need. The need for 'Wetland Eco-Industrialization' is to radically transform extreme global poverty into lasting prosperity. The philosophy behind the terms and phrases such as poverty, extreme poverty, prosperity, sustainable prosperity, sustainable livelihood, transformation, and radical transformation, needs to be articulated in detail.

Natural resources. Resources can generally be classified into two categories—natural resources and human resources. Other resources normally are man-made or are arranged by humans and so are included within the group of human resources for the purpose of this discussion.

Key natural resources of various types intended for industrialization have either been depleted in certain areas or are rapidly being depleted on a global scale. For any industrial operation with these resources as raw materials, the limitations, prohibition, environmental restriction, ecosystem and biodiversity-based objections and related statutory threat have to be faced by the entrepreneurs. Procurement of these natural resources wherever statutorily, environmentally and socially permitted, high cost may have to be incurred as statutory permission cost and environment conservation cost.

'Water hyacinth' is only that natural resource of the world which has been the latest contribution of Nature, abundant in volume both regionally and globally. It's a so-called human enemy of economic activity and of public health management service. But the unutilised water hyacinth is fully free of all costs except just collection cost.

Realistically, it's a point to think over that humans have gained this modern civilisation caused by industrial revolution started since 1760. But one should go for the answers as to (a) why Nature did not bring water hyacinth so many centuries earlier? (b) why Nature has empowered water hyacinth to eat away water polluting agents as its food? (c) by that time who had polluted Nature's waterbody— was it not the Humans in the name of industrialisation and civilisation? and (d) why Nature has given birth to, such water hyacinth that have their different capacity of water purification based on the gravity of polluted water, where the pollution in spectacularly proved as made by humans?

Natural resource and skilled human resource are being damaged and destroyed rapidly by some humans. Whereas, wetland resources remain almost still unutilised. Entrepreneurs may utilise the potentially skilled unutilised humans, techno-economically with innovative technology.

'**Wetland Eco-Industrialisation'** is therefore combinedly an Applied Economic, Innovation Economic, Entrepreneurial Economic and Cultural Economic new 'Model' for rapid transformation of global poverty into sustainable prosperity with equality through more realistic 'wise-use' of global natural green plant resources of wetlands including rivers, lakes, canals, dams, ponds etc. World Bank's wish is to end extreme global poverty by 2030 and to promote

sharing of prosperity to groups of extreme poverty. The United Nation's wish of eradicating Poverty by 2030 is its primary development goal. Govt. of India's wish is to reduce poverty drastically so as to transform India from its present status of developing country to developed country by 2047. The task of poverty alleviation is common to all. Only a diversified existing and innovative full utilisation of natural resources and human resources with an additional all-round hearty, vigorous efforts on interpersonal respect, honour and acceptance to each one by other as a member of one World Human Family can eradicate not only extreme poverty, but total poverty also, as is shown in the present Model.

Humans of the world perhaps are proud of around 8 billion members of their present global family, and the people of India, perhaps would be prouder with their highest population of about 1.45 billion. But we find, the world is still having extreme poverty by about 8.5% of its total population. Beyond this specific group of extreme poverty, the size of the total group of poverty is much more alarming. In India about 81 crores of people are there in the list of beneficiaries from 'Pradhan Mantri Garib Kalyan Anna Yojana' (PMGKAY). It's a wonder! more than half of the total population of the largest populated country of the world is still bearing their 'Mindset' that they are the poor. Besides the scheme of PMGKAY, there are various other free or subsidised Schemes provided by central government, different state governments, various non-government organisations and so many others for alleviating poverty. Millions of humanistic wise people, including human philosophers, economists, politicians, government officials and social scientists have been thinking and working for alleviating poverty continuously since long past. Despite the overwhelming presence of extreme poverty, people engage in diverse economic activities to sustain a life that transcends poverty.

In this paper. a planned, theorised and practised innovative techno-economic method has been applied to transform the Nature-Human Conflict into Nature-Human Harmony by industrially gainful utilisation of global wetland resources with an ambition of a revolutionary shift from Global Extreme Poverty to Sustainable Livelihood.

The selected wetland plants can be very wisely used by humans in their activities of industrial economic development linked with the task of environment protection and ecosystem conservation. The plants may be included in the category of renewable natural resources for both farming and industrial production especially under 'Green India Mission' (GIM) of the Ministry of Environment Forest, and Climate Change, Govt. of India. India is largely resourceful country in terms of wetland renewable green resources of which a very negligible amount is now being utilised. There is no accurate record of the amount of these resources at present. With the assistance of 'National Natural Resource Management System' (NNRMS) by utilising remote sensing technology, the concerned wetland management authorities and the governments may assess the volume of some selected wetland green resources including herbal plants which may specifically be used gainfully in the field of agriculture, pisciculture and industry.

The innovative Products of 'Bengal Eco-Craft' group under the different stages :

(i) Field Study (ii) Theorisation (iii) Traditional Product-based experimental Production at Kolkata centre (iv) Trial for producing methodically new products (v) Existing market study (vi) New market formation (vii) Formation of production groups (viii) Free training (ix) Products of Trained artisans (x) Leaders of newly formed market (xi) Expansion of innovative goods production and marketing (xii) Trial for formation of more groups of workers all over West Bengal (xiii) More expansion beyond the state of West Bengal.

Mainly Experimental Research and Action Taking Research procedures have been designed and followed during last 5 years since 21st November, 2019. In course of fighting against polluting thin plastic marketing carry bags in different vegetable and grocery markets of Kolkata, an urge was felt for appropriate alternative bags that might be eco-friendly and suitable for vegetable and grocery market . The experiment was started producing a new type of 'Market Bag' with paper and water hyacinth. Ultimately the trial has been proved to be successful with prospective market viability. After imparting training, three thousands of such special 'Market Bags' have been produced by the trained artisans starting from 2020 at Mukundapur (Kolkata), Majdia, Nabadwip Dham, Payradanga (Nadia District), and in Behala Bodhayan School (Kolkata). The innovative 'Bengal Jalkachuri Market Bag' of three-times extra load-carrying capacity had been very eagerly produced by the trained artisans and have been gainfully marketed. Both experiment and production have been made on some other goods, of which some are found market viable and others are there in process of further experiment, project formulation and operation. Training has also been imparted on production of some other handicrafts which are being produced by other artisans of other groups of West Bengal and of other states or other countries.

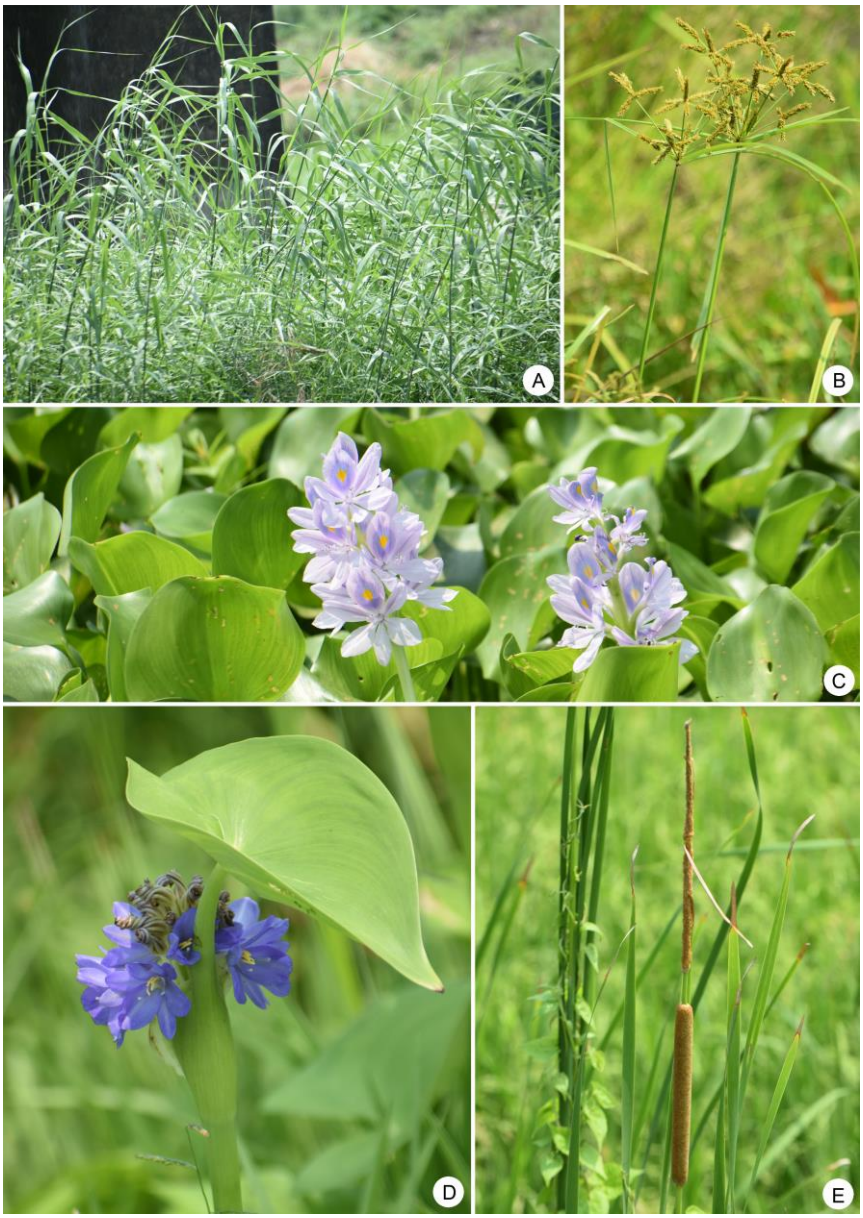

Plate 1: A. *Arundo donax* L. B. *Cyperus iria* L. C. *Pontederia crassipes* Mart. D. *Pontederia hastata* L. E. *Typha domingensis* Pers.

INNOVATIVE PRODUCTS

Rakhi (Banglar Jalkachuri Rakhi). The Program of making commercially viable 'Rakhi', from 'Water hyacinth' and 'Southern Cattail' leaves had been first undertaken by the 1st author on 21st Nov. 2019 (inauguration day of Bengal Eco-Craft in Majdia, Nadia Dist., (W.B./ India). A group of old artisans on non-water hyacinth craft and a fresh group of interested people had been imparted training by the 1st author on making innovative products from wetland resources. Several other workshops had been arranged in Nabadwip Sanskrit College and in Payradanga of Nadia District. Subsequently, the trained artisan, Debasish Kumar Biswas and socio environmental guide, editor, Krishi Sahitya News Media (Secretary of this Bengal Eco-craft group), Swapan Kumar Bhowmick trained the women of Chandannagar (Nadia district) Cooperative Credit Society during March–July, 2020. Amidst the global Covid-19 Crisis, 'Rakhi' prepared using dried 'water hyacinth' stem had been gainfully marketed in Kolkata and in districts during "Raksha Bandhan" celebration in August 2020 under special arrangement of South-East Railwaymen's Union at Santragachhi, with special initiative of a poet-cum social worker, Mr. Dilip Paul, Howrah.

A continuous process of imparting free training is going on till now (in several places in various manner from Darjeeling to Sundarban, especially in Tulsiberia Village of Howrah District in 2024, at four places of Raniganj Coalfield, especially during Feb.'25 to April 2025 at 'Karma Tirtha' (Work Centre) of Pandabeswar Block (Raniganj Coalfield) of Paschim Bardhaman District of West Bengal organised by Haripur Gram Panchayet. This training offered by Bengal Eco-Craft had been imparted to over 50 women of self-Help Groups and one Kolkata-based Project Coordinator of 'JALAJ' Project of Wildlife Institute of India (WII) assisted to this training program additionally.

Badge. Badges made of 'water hyacinth' and 'Southern cattail' leaves was first prepared and used for the guests and trainees of the inauguration day (21st Nov. 2019) at Majdia. Next year, it was first marketed and used for Guests and Volunteers in the Organisational Program-cum-Fair of Pragna Cultural Centre. In 2023, the Jalkachuri Badges have been used by cultural organisations, 'Monimalar Desh' and 'Shabda Sena', in their literary program in Jeevanananda Sava Ghar of Paschim Banga Bangla Academy, Kolkata in 2023 and further recently on 24th May 2025 by 'Shabda Sena' organisation in their cultural program held at Sealdah, Kolkata. Presently many other organisations are demanding for thousands of water hyacinth Badges from Bengal Eco-Craft.

Chandmala. In Hindu puja it is a holly ritual to put 'Chandmala' on right hand of Goddesses that was originally used to be made of wetland herb *Aeschynomene aspera* L. (known as 'shola' in Bengali). Now natural 'Water hyacinth' and 'Southern cattail' have been proved to be an appropriate eco-friendly substitute of scarce natural 'Shola'.

Vegan Leather Shoe. Slipper Boot for men & women. Medical and Health-supporting Shoe, environment protectors made from leaves of 'Water Hyacinth' & 'Southern Cattail' and stick of 'Reed crane grass'. Eco-friendly adhesive, natural sewing thread and natural polish are used. Shoe making by weaving method using dried water hyacinth stems are common by many artisans in India and abroad. Shoe making by using 'Southern cattail' leaf is perhaps beyond one's knowledge so far. Since both types of shoes are being used since last 4 years just like other available shoes, even washable with detergent, it's a successful trial as is being viewed.

Vegan Leather hand bag/shoulder bag, Purse etc. Same process has been followed as in cases as stated above. Normally bags are being prepared in weaving method by direct use of water hyacinth stems. A new method has been experimented to prepare bags by hyacinth leather combined with water hyacinth weaving. Hogla mat mixing and date-palm leaf-made mat mixing bags have also been produced.

Applique Panjabi, Shari etc. Any kind of latest high fashioned & designer clothing, including Suits and Coats are being made using specially processed water hyacinth leather and hand-stitching by water hyacinth thread. This leather sheet has been prepared partly in same process as stated above in case of water hyacinth shoe, and partly in some different process in cutting the designs and tightening the border portion of applique designs. The sewing method has been adopted in same manner as hand-stitched applique Shari, Panjabi, Shawl in West Bengal is being prepared. Experimented and tested during last 5 years from 1st preparation in Nov. 2019. It has been washed in normal water with normal detergent about 5 times, moulded and folded several times. The stitching thread has been prepared from hyacinth stem and no external thread has been used. Natural colour with natural polish has been used.

Plastic substitute durable Grocery and Vegetable Market Bag. Durable vegetable market bag with three-times higher load carrying capacity, made of normal bag making paper mixed with water hyacinth. It can't be produced by using machine at present unless the required type of machine is innovated. About 200 artisans have been trained through the training classes/ workshop and now thousands of people anywhere may be imparted training by the said trained artisans spread over different places like Majdia, Chandannagar, Nabadwip and Payradanga of Nadia District, Behala city, Behala Bodhayan School and Pailen Village of Kolkata South 24 Parganas. It has been marketed but it's required to be made popularised in using eco-friendly high load-carrying water hyacinth mixed Paper-made eco-friendly Bazar Bag instead of using polluting plastic carry bag. In several social programs these new eco-friendly bazar bags have been demonstrated and sold during 2020-24. Some of the organisations/programs where these Bags have been demonstrated and gainfully sold are: (a) 'Krishi Sahitya' News Media house (Majdia, Nadia, 2020-22), (b) Sales program by 'Behala Bodhayan School' (Kolkata during 2021-22), (3) 'Gram Krishti Utsab' (A seven days' fair organised by Kolkata Press Club) in 2021, (4) The NGO- 'South Kolkata Sannidhya'—30 bags for its social program in 2023, the Secretary Mrs. Swati Chatterjee had purchased 30 bags for the guests and members and (5) an environmental NGO, 'IFHEC' (Kolkata) which had purchased 10 Bags for their program in 2024.

Water Hyacinth Sculpture, toy, doll. Very prospective high fashionable fully eco-friendly prestigious gift items/ decorative/ religious items for domestic and global market by utilizing every part of water hyacinth, and other wetland plants with fully natural gum/ adhesive bonding is being made. It has been made on experimental basis and it's found very prospective to be viably marketed globally. It requires more research and testing. In making this, water hyacinth (75%), Southern cattail leaf and reed cane/ Nol plant (15 %) and Saw dust/ wood dust (10%) were used. Used edible cassava adhesive, no other colour used except Turmeric and natural polish. For black colour water hyacinth root was used. For white colour, inner sponge of water hyacinth stem was used. For white hair, water hyacinth fibre was used. For black hair used water hyacinth root, for green colour and different other colours, used specially processed different types of water hyacinth stem and its root, Nol plant and wetland grasses. The concept is to use everything of wetland green resources for making everything of the sculptures and dolls. Even wetland's Reed cane dust may be used without using wood dust where wood is not the wetland's resource. Some sculptures have also been made with using only wetland-grown green raw materials (without using saw dust being the non-wetland material).

Curtain. The attractive fancy curtains made of water hyacinth and other wetland plants may also be designed to be used even in remote control system and seasonal requirement basis.

Crafts from water hyacinth leaf. Water hyacinth Stem is being utilised in craft making. By introducing this

new eco-friendly fashion globally, millions of newly trained artisans may be brought under coverage of livelihood development program.

Banner/ shine boards/ festoons. Presently, it has been a very common practice of getting banners, shine boards, festoons printed on Polyvinyl Chloride (PVC) cloth, commonly known as vinyl cloth which is a synthetic plastic polymer, non bio- degradable and highly polluting to the environment. Experiment has been made by Bengal Eco-craft to prepare banners, shine boards, festoons by using water hyacinth stem and its black root for writing alphabets/ words and sentences on cotton cloths as well as on water hyacinth skin-made cloth. A very nice and good result it has achieved. Southern cattail leaf and reed cane (Nol Stick) also may be used mixed with water hyacinth for preparing eco-friendly durable Banner/ festoon.

Hat & Cap. Water hyacinth skin pasted with Cassava powder-made edible gum on ordinary paper and cotton cloth inside. This is different from any other water-hyacinth-made Hat/ cap in the market which is being made in weaving method.

MDF/ LDF Particle Board, Grass Board, Dinner Plate etc. Making of MDF/ Particle Board have also been experimented on easy process quite different from prevailing costly methods just mixing saw dust with edible cassava adhesive as most effective mortar on sliced Water hyacinth & various wetland plants. More experiment is required for more effective economically gainful result.

Plate 2. Innovative products, A-B, Rakhi, C-D, Badge, E-F Shoes.

Plate 3. Innovative products A-C. Bags, D. Applique Punjabi, E. Cap, F. Home decorative item, G. Toy.

Plate 4. Innovative products A. Uttariya, B. Neck tie, C. Identity Card cover, D-E. Sculptures, F. Heat proof curtain, G. Photo frame.

DISCUSSIONS

The analysis of the thoughts and deeds as mentioned above may be set on the four main pillars of successful operation with the goal of Shifting 'from Global Extreme Poverty to Sustainable Livelihood'. These are: (1) Industrial and agro-industrial entrepreneurs, (2) productive and creative work-prone people, (3) plenty of easily available raw materials and (4) Popularisation: with a Strategic Business Call to Consumers— 'Love Wetland—Love Wetland Craft, so Fashionable, so Beautiful.' or, likewise any other.

Entrepreneur's new Task and new Expectation from Wetland Eco-Industrial Project

• Like the Zamindars or Landlords of the Past society in almost in all countries if the entrepreneurs of the present days capture only the 'Water Hyacinth Property' of rivers, lakes, canals at their own industrial activity, the people and the Government will honour them, reward them for saving the waterbodies from the aggression of notorious water hyacinth.

• If the entrepreneurs give employment to lakhs of people to work from home with this unlimited amount of water hyacinth, people—the work-prone unemployed and underemployed people will bless them; government as well as common people will assist them in various manner on the reasons of conservation of environment

and ecosystem followed by livelihood development volunteered by the entrepreneurs.

• If the entrepreneurs produce various products unlimited in number, they'll not face any problem for market to sell the products: since "together or simultaneously the fashion trend variable and the socialization variable have a significant effect on the consumptive lifestyle" as is seen in a research study (Nadiyah *et al*., 2024). Additional inflow of fashioned goods will interestingly tend to change consumptive lifestyle in a speedy positive direction at a stretch over time as is our experience in the case of 'Rakhi', and 'Badge' of 'Bengal Eco-Craft'. Production is the outcome of technology but marketing is the outcome of technique what the entrepreneur will have learnt and act upon.

Creativity in product diversification: "Bengal Eco-Craft' Group has been trying to expand the scope of 'wise-use' of not only water hyacinth but of all prospective green plants of waterbodies and wetlands as has been presented as a model for innovative product by varieties and methods in addition to those are being produced and marketed by so many other groups regionally or globally.

Creativity in Market Formation: The Group has formed a new profitable and highly eco-friendly fashionable market for 'Rakhi', 'Badge' 'Chandmala', water hyacinth mixed high load carrying 'Market Bag' for grocery and vegetable plus multipurpose use. Formation of further markets for other innovative goods as presented above is highly expected as envisaged.

Creativity in Job Diversification and Working Group: New types of goods and new groups of Artisans have been formed. Existing Artisans of various other crafts have been trained in water hyacinth and 'Hogla' craft. But the trained artisans mostly have discontinued their work due to their deficiency in entrepreneurial skill.

Creativity in Entrepreneurship/ New initiative: After the starting of state wide free mass training activities by Bengal Eco-Craft group, highly supported by various main stream news medias, television media, social medias within and beyond the state of West Bengal some new groups have been inspired to work with water hyacinth handicrafts. Some of the innovative technologies have been transferred to others free of cost. Thus, the scope of expansion of entrepreneurship will be widened subject to availability of government support financially and socio-culturally.

Problems to deal with. On one side, millions of people are there in the group of extreme poverty and in general poverty, as per government official record. On the other side, neither individuals of extreme or general groups of poverty, nor socio-economic developmental activists, or government departmental officials on duty of livelihood development scheme or any such other socio-economic development scheme implementation or so other concerned authorities are expressing interest for self-sustained livelihood development projects through wetland eco-industrialisation projects in such manner as is qualitatively required for. India with its largest united family by population, with various ambitious government and non-government schemes and projects in operation, with sufficient financial provision for uplifting socio-economically backward class of people from their present state of vulnerability and poverty has been struggling to be transformed from the present state of 'Developing Bharat' to 'Developed Bharat' by 2047 with its proclamation of 'Viksit Bharat @ 2047'. It's the reality that these vulnerable people have their hereditary noblest natural patriotic quality to love nature, homeland, hills, mountains, forests, water bodies and wetlands. Whereas the time to reach the ambitious Vision of the people of India remains left for only about just two decades, a more effective visionary approach of gainful utilisation of these unutilised but prospective human resources is felt to be appropriate step by engaging thousands of and stage-wise lakhs of, millions of such people in industrial activity with the green abundant production cost-less raw materials of water body and wetlands. More others of non-vulnerable groups will automatically be attracted to business activities on eco-friendly goods to compete and lead the domestic and global market. The global poverty is envisaged to be lessened by India's new type of adopting 'Wetland Agro-Industrial Technology'.

CONCLUSIONS

The eternal Nature with its various resources both natural and human in plenty is standing within and in ahead of mankind with a general call for humans to utilise it most wisely. The humans have been utilising both the resources in the process of their various economic activities. But, in reality, on one side, a large portion of human resources could not be utilised sufficiently and efficiently. On the other hand, a large portion of water body and wetland grown green natural resources, have not been gainfully utilised mainly due to ignorance of its industrial and agro-industrial utility. However, a group of researchers, artisans and entrepreneurs globally have been continuously trying to transform water hyacinth into market viable products since last 50 years. Yet, in reality, the products made of water hyacinth either in the form of organic fertiliser or commonly in the form of handicrafts have not been popularised as new fashionable goods to attract the regional or global consumers except a selected few in some selected places. In addition to water hyacinth, in vast areas of wetlands various other green herbs and grasses are also growing in plenty. With these raw materials a new type of industrialisation can be made in the name of 'Wetland Eco-Industrialisation'. Global Wetland Green Resources available free of cost in plenty is the blessings of Nature on Humans in the Society to work for rapid transformation of 'Global Extreme Poverty' into 'Sustainable Developmental Prosperity'.

FUTURE SCOPE

It is the right time and unique scope for India to befittingly implement Ramsar Convention's concept of 'wise use' of wetland through India's already launched 'Amrit Dharohar Scheme' on 5th June 2023 to fulfil within the time-bound period of three years up to 5th

June 2026. The aim of India, being the largest country by population, is to be an economically Developed country by 2047 (with its declared flagship of Viksit Bharat @2047) from its present status as a developing country. Here lies a partial but most effective scope of India to reach this ambitious goal by efficient coordination of the Wetlands Division of Ministry of Environment, Forest and Climate Change (MoEF&CC) and Wetlands International South Asia with their continuing dedication to safeguard ecosystem, biodiversity, livelihood development and cultural heritage of the total areas of wetlands of India. 'Amrit Darohar Scheme' under implementation in so far declared 91 number of Ramsar Sites in India aims also to distribute its gain among other wetlands of national and international importance. Wetland's 'wise-use' comprises of the task of gainful utilization both of wetland-depending livelihood earners and gainful utilization of wetland-grown green resources as presented in this paper. The notion with its innovative applied technology of 'Wetland Eco-Industrialisation' aims to develop human life-living culture associated with a developed work culture to promote nature-human friendship-based self-conservative wetlands ecosystem, biodiversity and livelihood development. With the largest Tiger Reserve Forest of India, with the world's largest Mangrove zone and with the world's unique cost-less 'economically automatic subsidised' Kolkata and Salt Lake city and Ramsar site as the 'East Kolkata Wetland', the state of West Bengal, having plenty of wetland grown-green resources to be used as raw materials free of production cost, has its immense scope to implement the notion and the model of 'Wetland Eco-Industrialisation' for its developed inclusive socio-economic future.

Acknowledgement. The 1st author express the gratitude to Mr. Swapan Kumar Das, Executive Director, 'Prokritee' Mahammadpur, Dhaka, Bangladesh; Mr. Ashim Kumar Das, General Manager, NEDFi, Guwahati, Asam (India) and Mr. Swapan Kumar Bhowmick, Environment Worker and Editor, Krishi Sahitya News Media, Nadia, West Bengal (India). The other authors express their gratitude to Director, Botanical Survey of India (BSI), Scientist 'F' and Head of the Central National Herbarium (CNH), BSI in Howrah, and Scientist 'E' and Head of the Central Regional Centre, BSI, Allahabad for the research facilities offered.

Conflict of Interest. None.

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How to cite this article: Manindra Nath Mukherjee, Onkar Nath Maurya and Tanay Shil (2025). 'Wetland Eco-Industrialization' for Radical Transformation of Extreme Global Poverty into Sustainable Prosperity: A Case Study on 'Bengal Eco-Craft' in West Bengal, India. *Biological Forum, 17*(7): 40-49.