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# Future of energy and environmental sustainability and progress of science and engineering- a West Bengal , India experience.

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Abstract: Human mankind and science and technology is moving steadily towards one newer visionary generation over another. Sustainable development is a primordial issue which needs to be tackled at every step of present history and time. The world of challenges in establishing and ensuring environmental sustainability is need of the hour in a developing country like India. Mankind's history of development needs to be readdressed and restructured. Environmental disasters and depletion of fossil fuel sources has propelled the scientific domain to surge towards an effective and purposeful vision. West Bengal state in India stands today in the midst of immense optimism and in the similar manner technological uncertainities. Sustainable development is at stake in India as well as West Bengal. Man's vision is at a definite disaster. The author deeply highlights the future strategies of the application of sustainable development in the progress of science, engineering and society in the state of West Bengal, India. The history of development in India is at the threshold of a virtual disaster with regards to energy and environmental sustainability. Man's as well as a scientist's challenges are never surpassed as regards sustainable development in West Bengal state or India. The author lucidly delineates the status, vision and objectives of application of sustainable development in West Bengal along with the imminent barriers of the success of development of science and technology. The author also deals with rigour the future perspectives of environmental catastrophes such as Arsenic groundwater contamination and its effect on successful environmental sustainability in West Bengal, India. Groundwater metal contamination in West Bengal, India is the largest human disasters on a large scale in the world. The treatise covers the immense potential of scientific and technological development in West Bengal if successful energy and environmental sustainability is achieved. The treatise addresses concerns, immediate strategies and the future of environmental sustainability in India. The discussion will surely open a new chapter of innovation in the field of global sustainable development. Keywords: sustainability, energy, environment, vision, ecology.

# Introduction:

Scientific innovation and sustainable development in a developing country like India are interlinked. Scientific steadfastness and scientific vision are the pillars of successful sustainable development. History of mankind is a visionary witness to the challenges, difficulties and barriers of scientific progress. The world of challenges needs to be readdressed with respect to energy and environmental sustainability in West Bengal State of India. Over the last two decades, the visionary challenges in successful development in India and West Bengal are vociferously and strongly addressed giving place towards successful industrial development in the state. In this regard, the author targets in this treatise a brief and comprehensive insight into the future of industrial development, successful sustainability and the economic development of West Bengal.<sup>1,2,3,4</sup>

#### Vision behind the present treatise:

Environmental engineering paradigm and the linked environmental and energy sustainability are moving drastically between one optimistic future over another. The state of West Bengal in India today stands in the midst of vicious foothold.<sup>1,2,3</sup> Future generations needs to be cautioned over the cause of successful sustainable development in state. The treatise brings forward the imminent and extremely important concern of the future of energy and environmental sustainability in the state. In today's world, energy and environmental sustainability stands in the midst of economic development of a state and immense justified optimism. The optimism will go a long way in opening up barriers of innovation and path of intuition in the future vision of successful sustainable development. Man's vision will be emboldened and bolstered if successive human generation takes effective steps in addressing successful sustainability.<sup>1,2,3</sup>

The author with cogent insight deals lucidly the sustainability issues in West Bengal such as arsenic groundwater contamination, marauding infrastructural development and distinct ecological imbalance. Environmental catastrophes and the blunders of immense progress of infrastructure without care for ecology or sustainability in West Bengal are brought to the forefront. The vision, objective and the target stands today in the midst of immense scientific optimism and scientific judgement. Progress of state of West Bengal today lies in the hand of efficient planners and a vibrant civil society.

#### Absolute and purposeful vision of sustainability:

Successful sustainable development is the primordial issue of our present day human civilization. Challenges, difficulties and barriers will go a long way in realizing the purposeful vision of energy and environmental sustainability. The present state of human civilization is at a difficulty stake as regards to environmental sustainability. Environmental catastrophes are ruining the path towards progress of science and engineering. Surpassing frontiers of science and technology along with effective sustainable development should be the vision of tomorrow. In West Bengal state of India, climate change and ineffective policy decisions are ruining the path to development. Energy and environmental sustainability is at a disastrous and difficult state of affairs in the state. Drinking water shortage, ground water contamination and lack of vision surmounts the barriers and difficulties. Lack of effective and holistic infrastructural and sustainable development are boons to disasters for the future in this state of immense neglect. In such a critical juncture of visionary history and time, the world of challenges needs to be readdressed and re-envisaged.<sup>5,6,7</sup>

Human development is only successful when the concept of sustainability is re-envisioned. The advancement of science and technology and the advancement of human mankind have an unsevered umbilical cord. Scientific provess and scientific vision will go a long visionary way in opening up new doors of sustainability issues and sustainability solutions in years to come.

Resources in West Bengal are plenty and awesome. Sustainability issues needs to be raised in every forum in order to garner support for effective planning for the future. History of progress of science and technology in West Bengal, the deep comprehension and purposeful vision all will go a long way in instilling the cause of sustainability, whether it is energy or environmental, to the minds of our society's planners. The world of challenges needs to be readdressed and reshaped with the passage of history and time.<sup>5,6,7</sup>

In India, the progress of science, technology and engineering does not take into consideration the vision of sustainability. History of the nation, urge to excel and indomitable progress towards infrastructural development has led this developing nation along with its states to a disastrous blunder. West Bengal also falls in this scenario. The blunders need to be rectified at the immediate utmost with the passage of time. The concern is befitting to the economic development of the country. A man's as well a scientist's vision needs to be readjudicated with the economic progress of the nation. Economic imbalance as well imbalanced sustainability has brought India or West Bengal to a disastrous and concerning situation. The only vision is towards effective planning and participation of civil society in decision making.

#### **Energy sustainability and future of West Bengal:**

Vision, urge to strive in scientific endeavour and creating engineering marvels will go a long way in opening new paths of progress in sustainable development in West Bengal. An engineer's as well as a scientist's vision needs to be restructured and reshaped with the progress of history and time. West Bengal state of India is endowed with immense resources-water or minerals. The civil society should come forward to ensure energy sustainability in improving the power situation of the state. On the other side of the coin, Infrastructural

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development should progress parallely with ecological balance. According to the visionary Prime Minister Gro Harlem Brundtland of Norway, sustainable development needs to readdressed and re-envisioned at every point of history and time. The world of challenges is applicable in India as well with the progress of human civilization.<sup>8,9,10</sup>

# Mankind's vision, human civilization's prowess and the optimistic path of progress:

The path to progress and the visionary age of tomorrow will go a long way in evolving newer futuristic vision and newer optimism and hope for the future. Mankind's vision will be restructured and reshaped with the passage of time and history if human society and civil society gears up for enhanced sustainable development. Sustainability issues are the focal points of the new generation and newer civil society. The optimistic path towards progress needs to be reorganized and revitalized with the passage of one decade over another. Sustainable development whether it is of energy, economic or environmental, a concerted effort will usher in a new era of human development.

Man's vision, mankind's vision and the march of science and technology are the torchbearers to a newer human civilization of immense hope and optimism. Ecological disbalance, environmental disparities and disastrous infrastructural development are destroying the motto of successful energy and environmental sustainability in West Bengal and India. The world of challenges of a sound planning and effective vision is absent in the infrastructural decision process. The urge to progress needs to be restructured and reshaped. The path to progress needs to have a balance between holistic economic development and effective sustainability. If that goal is achieved, then the parameters of progress will be emboldened.<sup>11</sup>

## History of science and technology, urge to excel and the future of sustainability:

History of science and technology in our present day human civilization is redefined itself. The world of challenges in effective implementation of sustainability needs to be readdressed. Sustainable development in West Bengal is at a nascent state. The concept of sustainability needs to be redefined with respect to Indian and West Bengal scenario. Man's challenges needs to be reshaped and re-emboldened with the passage of time. Environmental and energy sustainability needs to move parallel with successful infrastructural development. With this vision in mind man's vision can be surely realized.<sup>11</sup>

History of science and technology is moving steadily towards a new generation of hope, optimism and vision. Development of a nation will in today's world depend vehemently and intensely on the future of successful development. West Bengal and India are moving towards a new generation of successful sustainability along with infrastructural provess. The urge to excel will open up new vistas of innovation and new road to scientific vision and scientific steadfastness in years to come.<sup>11</sup>

### Economic development of West Bengal, improved vision and the ultimate goals of success:

The cornerstones of economic growth in West Bengal or India is the concerted effort towards energy and environmental sustainability. The improved and the purposeful vision is towards greater scientific understanding of sustainability and scientific vision of progress in infrastructure. Civil society participation, improved vision towards successful economic growth and the ultimate aim of sustainability needs to be reframed and revamped.<sup>11</sup>

History of science and technology has witnessed immense upheavals and drastic changes over the years. Human civilization is under the umbrella of immense caution and improved vision. The path towards energy and environmental sustainability is surpassing vast and unimaginable frontiers. The progress and development of a developing country like India is faced with immense challenges at every sphere of progress. West Bengal as well as India is moving towards a future dimension of improved and cautious infrastructural development along with holistic sustainability. Inspite of immense natural resources, people's participation, effective planning and the urge for pragmatic planning was absent in West Bengal for many years. This resulted in stunted economic growth. The visionary fact, scientific judgement and willful and effective participation will surely usher in a new era of development in the field of sustainability.<sup>11</sup>

## The surge towards environmental sustainability in West Bengal:

Ecological balance, environmental sustainability and the vision to transform will go a long way in achieving environmental sustainability in West Bengal state of India. The issues which lie before environmental

sustainability are proper drinking water provision, alleviating global water shortage and a scientific vision groundwater remediation in West Bengal. The state of West Bengal is in the midst of immense progress in infrastructural development. The wide world of challenges needs to be restructured and revamped. The structure of human development along with holistic infrastructural development are the burning issues of the present generation. Man's as well as an engineer's vision in view of the state's development will go a long way in evolving newer visions and newer paths towards progress.<sup>11</sup>

Arsenic and groundwater remediation stands as a vexing issue which needs to be handled with vehement and rigorous approach. The challenges should be drastic and visionary in view of the progress of the state. Arsenic groundwater contamination in West Bengal stands today as the largest environmental disaster in South Asia. The concerns, the impact and future progress of human development is at a vicious situation. History of science and engineering is at a difficult stake as the world of environmental challenge looms large over the distant scientific horizon.<sup>11</sup>

Groundwater remediation issues stands as a vexing focal point in the path of progress and the avenue of development in the socio-economic structure of the state of West Bengal.<sup>5,6,7</sup> A man's as well as a scientist's vision needs to be re-bolstered and re-emboldened with willful participation of the civil society. Scientific progress can only be realized and envisioned if civil society vehemently participates in the economic development of the state. Success is beyond imagination with respect to experience of development in developed countries. In West Bengal, the parameters of economic growth lies in the hands of civil society and the organized citizens of the state. Success, vision and effective research pursuit all will go a long and effective way in the future dimensions of progress in West Bengal.

#### Vision of sustainability issues in India:

Sustainability issues in India are vast, varied and visionary. Global economic development and economic liberalization in India has led the country towards a newer vision and a newer holistic sustainable development.<sup>5,6,7</sup> The country is moving forward from developing country status towards developed country status. In such a crucial juncture, the country's history is vastly changing. Sustainable holistic development in India and in a similar trend West Bengal are experiencing inexpressible and indomitable economic growth. Such a situation experiences effective and successful sustainability issues.

Sustainability issues are in the forefront of immense conjecture and deep thought in the economic development of India. West Bengal is not lagging behind in the path towards scientific progress. The intense and vehement path of progress will soon usher in a new era of development in West Bengal with the march of science and technology. The vision of sustainability issues in India particularly in West Bengal needs to be restructured and reshaped. The poor Sustainability Index achieved and intensely attained by the State has brought immense introspection and concern. The challenges are immense and awesome. Future of the State is under immense and crucial juxtaposition of pessimism and blunder. Civil society needs to gear up to alleviate this serious concern of poor sustainability. Economic development is stunted in West Bengal for more than three decades.<sup>11</sup>

The challenge for the future is holistic economic growth, immense civil society participation and concerns of provision of minimum amenities like pure drinking water. Groundwater remediation is of immense concern and should be of imminent objective. History of civilization, economic advancement of civil society and scientific pursuit are the torchbearers of a greater vision of tomorrow. Industry, agriculture and infrastructural development should be the focal points for the planning of tomorrow.<sup>11</sup>

## Environmental sustainability and the issue of arsenic groundwater remediation in West Bengal:

The state of West Bengal is witnessing phenomenal economic growth and at the same time devastating ecological imbalance. Industrial scenario in West Bengal is moving steadfastly to a newer vision of tomorrow. The greatness and vision of human civilization is revisited at every step of progress.<sup>12</sup>

In such a crucial juncture, the water shortage problem of West Bengal needs to be vehemently and effectively addressed. Arsenic groundwater contamination in West Bengal is a serious and primordial issue in India. Environmental sustainability is at a difficult stake in today's modern day human civilization. Civil society has come forward and strived hard to alleviate common mass of this disastrous environmental disaster. It is the largest environmental disaster in South Asia.<sup>12</sup>

Adverse health effects of arsenic depend strongly on the dose and duration of the exposure. Specific dermatological effects are characteristics of chronic exposure to arsenic. Salient dermatological features are melanosis(pigmentation)and keratosis(rough, dry, papular skin lesions) both may be spotted or diffuse. Chronic exposure to arsenic may also cause reproductive, neurological, cardiovascular, respiratory, hepatic, haematological, and diabetic effects of humans. Ingestion of inorganic arsenic is an established cause of skin, bladder and lung cancer.<sup>8,9,10,11,12</sup>

# Groundwater arsenic pollution and its grave concern in West Bengal:

Groundwater arsenic pollution stands today as a major barrier towards environmental sustainability in West Bengal. History of human mankind today stands in the midst of devil and deep sea with much pessimism. Progress of human mankind is in a situation of disastrous stake. Here comes the deep and insightful concern of environmental sustainability. The world of challenges in groundwater remediation needs to be readdressed and re-envisioned.<sup>12</sup>

The contamination of groundwater by heavy metal, occurring from either natural soil sources or from anthropogenic sources is a matter of utmost concern to the future of human civilization. Public health engineering is at a devastating stake in today's world. The effort, planning and willful participation from the civil society are the forerunners to a new generation of scientific understanding and scientific vision. Remediation of contaminated water is of highest priority and of utmost concern since billions of people all over the world use it for drinking water purposes. Selection of a perfect and effective technology for contamination remediation at a particular site is one of the most challenging and enigmatic job due to extremely complex soil chemistry and aquifer characteristics and no thumb rule can be envisaged.<sup>12</sup>

Over the past two or three decades, occurrence of arsenic in drinking water has been recognized as a major public health concern in various parts of the world. West Bengal is devastatingly sitting at the tip of a disastrous iceberg. The human catastrophe due to the arsenic groundwater contamination of drinking water is absolutely disastrous and thought provoking in West Bengal scenario. With the discovery of newer sites in the recent past, the arsenic contamination scenario around the world, especially the Asian countries has changed considerably. Before 2000, there are five major incidents of arsenic contamination in groundwater in Asian countries; Bangladesh, West Bengal, India and sites in China. Between 2000 and 2005, arsenic-related groundwater contamination have emerged in different Asian countries , including sites in China, Mongolia , Nepal, Cambodia, Myanmar, Afghanistan, DPR Korea and Pakistan.<sup>8,9,10,11,12</sup>

# Mankind's prowess, sustainability issues and the march of science and technology:

Risk, concern and progress of science and technology are interlinked in the domain of holistic sustainable development. Mankind's prowess and advancement of science and engineering will go a long way in evolving new dimensions of sustainability research and new avenues of sustainability issues in decades to come. The scientific vision, scientific understanding and the immense scientific judgement in the path towards progress of science and technology will see a new light of the day if effective planning and strong decision making prevails in the state.

The holistic approach towards the progress of today's human civilization should be sustainability along with infrastructural development. During the economic liberalization period and its aftermath, economic and infrastructural development was at its zenith in India. But in the similar vein, sustainability whether it is energy or environment was severely neglected. Mankind's blunders were revealed with the ushering in of environmental catastrophes and disastrous planning. After the widely known initiative of Dr Gro Harlem Brundtland, Prime Minister of Norway, sustainability became a coinword and definitive vision for developed as well as developing countries of the world. Sustainability then was in the path of visionary progress in India. Economic liberalization went side by side with nurturing seeds of energy and environmental sustainability.

#### Vision of human mankind with respect to sustainability issues:

Vision of mankind with respect to sustainability issues are torchbearers towards a newer generation of hope and immense optimism. Man's as well as a scientist's vision needs to be restructured and re-envisioned in such a critical juncture. Energy and environmental sustainability are the focal points in the progress of human civilization. Power is one of the key infrastructures required for the development of a nation. Vision of human mankind in today's world is faced with utter danger. Explosion of infrastructural projects are the imminent disasters of future. West Bengal is also facing such situation. The vision and missionary objective of tomorrow

is to gain ground in the field of holistic sustainability along with immense concern of holistic infrastructural development. Man's as well as a scientist's emboldened vision will then be realized to the fullest.<sup>11</sup>

## History of human civilization, sustainable development and progress of engineering:

Successful sustainable development is the focal point in a nation's progress and for a developing country like India. Scientific cognizance, engineering marvels and future path of success all will go a long way in evolving new avenues of vision towards energy and environmental sustainability. The prudence and intellect in the progress of application of engineering to human society needs to be thoroughly readdressed and revamped. Infrastructural development in West Bengal should not be a deterrent to holistic sustainable development.<sup>11</sup>

# Infrastructural development in West Bengal, ecological imbalance and environmental sustainability:

Ecological imbalance and environmental disasters are a part and parcel of progress of human civilization. History of mankind and scientific vision needs a thorough revamping with the path of scientific and engineering success. Infrastructural development was boon to disaster and boon to immense blunder in the economic scenario of West Bengal in the last two governments. As sustainability issues saw the light of the day, history of development in West Bengal ushered in a new era of progress. The world of challenges was restructured and revamped and environmental and energy sustainability was re-envisioned.<sup>11</sup>

# Climate change and successful sustainable development in West Bengal:

Climate change along with successful sustainability are the forerunners to a newer vision and a newer target to holistic overall development of a nation. In such a crucial juncture, the challenges of scientific and engineering progress needs to be restructured with the view of successful sustainability. The challenges, difficulties and barriers are immense and varied. The improvement of power situation in the state of West Bengal and the progress of engineering are the torchbearers of a new dimension of successful sustainability. Mankind's prowess is immensely re-envisioned.<sup>8,9,10,11</sup>

# Sustainability research and future of scientific vision:

Future of scientific vision needs to be restructured with the passing of time and steadfast movement of progress from one decade to another. Sustainability research is of immense and primordial importance. Sustainability research will open up new vistas of scientific endeavour in years to come. The scientific challenges, the immense scientific vision and the urge to excel will surely be a torchbearer to the wide domain of successful sustainable development in West Bengal. Primordial issue and focal points needs to be scientifically and strongly addressed with the view of future vision and application of future strategy. West Bengal is endowed with immense natural wealth and immeasurable natural resources. The future needs to be restructured with the view of application of sustainability projects by the civil society.

## Scientific cognizance, issues of sustainability and strong scientific vision:

Scientific doctrine, scientific cognizance and strong scientific vision are the cornerstones of successful sustainable development of tomorrow. West Bengal and eastern India is endowed with vast natural wealth. The application of natural wealth in realizing successful sustainability stands today in a vexing situation. Scientific cognizance and economic development will go a long way in opening up new vistas of improved vision in the progress towards sustainability.<sup>11,12</sup>

# Future scientific understanding and future vision of sustainable development:

Future of human civilization is in deep disaster and in a devastating stake. Instinctive vision and effective planning will go a long way in achieving successful sustainability in a developing nation like India and its states. Prosperity of a nation and its holistic economic progress lies upon the effective decision making and sound infrastructural planning. Progress, vision and future targets of infrastructural development are the torchbearers of tomorrow. Economic progress of West Bengal lies intensely on its successful sustainable development.<sup>11,12</sup>

#### Future flow of visionary thoughts on sustainability:

Sustainability and progress of science and technology have an umbilical cord. Future vision of sustainability depends on many parameters. Economic development, indomitable scientific progress and provision of clean drinking water are the visionary parameters towards successful sustainability. The world of challenges need to be instilled in human progress and citizen's scientific endeavour. India will surely grow from a developing to a developed nation with the vision of successful sustainable development in energy and environmental scenario. Civilisation's progress and scientific pursuit will surpass drastic challenges if concerted effort from the civil society is envisaged and effective planning is envisioned in a developing nation like India.<sup>11,12</sup>

# **Conclusion:**

Energy and environmental sustainability are the coinwords of the present day human civilization. In today's India as well as West Bengal, economic liberalization along with infrastructural development ushered in a new era of sustainability.<sup>11</sup> A scientist's as well as an engineer's vision is restructured and reorganized with the passage of history and time. Ground water contamination along with scarcity of pure drinking water should be the focal points of sustainability planning. History of science and engineering is slowly and steadily opening up new ventures and newer vision towards an effective planning in West Bengal and India.<sup>11,12</sup>

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