



P-ISSN: 2706-7483  
E-ISSN: 2706-7491  
IJGGE 2023; 5(1): 74-80  
Received: 26-01-2023  
Accepted: 28-02-2023

**Inzamamul Ahmed**  
Assistant Professor,  
Department of Education,  
Mahamaya Degree College,  
Bagribari, Kokrajhar (BTR),  
Assam, India

**Ananta Kumar Jena**  
Department of Education,  
Assam University, Silchar,  
Assam, India

**Corresponding Author:**  
**Inzamamul Ahmed**  
Assistant Professor,  
Department of Education,  
Mahamaya Degree College,  
Bagribari, Kokrajhar (BTR),  
Assam, India

## Using non-parametric Kruskal-Wallis H test for assessing mean differences in the opinion of environmental sustainability

**Inzamamul Ahmed and Ananta Kumar Jena**

**DOI:** <https://doi.org/10.22271/27067483.2023.v5.i1a.146>

### Abstract

A workshop in environmental sustainability was organized to develop the skills and competencies in mitigating climate change, adapting climate risk management, managing waste, adapting sustainable human settlements and using sustainable transport, and developing skills of reducing CO<sub>2</sub> emissions, and conserving energy and ecosystem, & educating people. The study aimed to compare current opinion of participants in environmental sustainability. After a short notification in the print medias and websites; students, teachers, and local people expressed their interested and joined in an environmental sustainability workshop organized in the Department of Education, Assam University, Silchar, India. Non-parametric Kruskal-Wallis H test used to assess the mean differences in the opinion of the participants in environmental sustainability. It resulted that the participants who were actively participated have no differences in their opinion in skills and competencies in mitigating climate change, adapting climate risk management, managing waste, adapting sustainable human settlements and using sustainable transport, and developing skills of reducing CO<sub>2</sub> emissions, and conserving energy and ecosystem, & educating people.

**Keywords:** Environmental sustainability, environmental issues, hands-on activity, sustainability

### Introduction

#### Importance of developing skills and competencies in environmental sustainability

Presently a-days maintainability in human settlement is become a key issue at state, national, and worldwide level worried with strategy and projects since a decade ago. Be that as it may, even now, different strategies, projects and some particular difficulties as of late utilized in the educational plan of ecological manageability in advanced education in India such as sustainable food policy, rain water harvesting, ecosystem and energy production, environmental friendly building construction and conservation of energy. That's why, MoU, collaboration, networking, and coordination are establishing among different national and international institutes for developing skills and competencies in environmental sustainability. Recently, UNESCO is assisting to the developing and underdeveloped countries to make changes through works to achieve skills and competencies in achieving the goals of sustainability. In fact, programmes and policies are developing and implementing to manage climate change, water treatment, water supply, rainwater harvesting, and actions in human settlements (Carter, Tyrrel, & Peter, 1999) <sup>[3]</sup>. However, activities like innovative gardening, composting, solid, and liquid waste management, sewage treatment, and tree plantation are encouraging among community people to develop skills and competencies in environmental sustainability (Chowdhury, 2014) <sup>[5]</sup>. As a whole we can say, hands on activities are the sum of programmes including; mass tree plantation, disinfection, treating the soil, making economical house, living agreeably inside environmental frameworks, building up a mindful, dependable mentality toward nature, and advancing a feeling of progression with others (Hilary, 2013) <sup>[11]</sup>. In addition, activities in domestic wastewater management and animal excreta treatment, composting peel of the fruits for nurturing kitchen garden or grasslands for cattle may have directly links with metabolism and wellbeing of human health (Schand & Capon, 2012) <sup>[21]</sup>. Nevertheless, man himself or herself is accountable for air, soil, water pollution (Atmodiwirjo, 2013) <sup>[1]</sup>, and most probably, the urban ecosystems are deteriorating day-by-day (Douglas, 2012) <sup>[7]</sup>, is

regulating on human health and well-being, interrelated with urban food systems. (Marsden & Sonnino, 2012<sup>[16]</sup>; Nagendra, Reyers, & Lavorel, 2013)<sup>[19]</sup>. In addition, human activity has potential impact on climate change and even in marine resources (Barange, Cheung, & Merino, 2010<sup>[2]</sup>; Macdonald, Anderson, Bardgett, & Singh, 2011<sup>[15]</sup>; McAlpine CA, Ryan JG, Seabrook L, Thomas S, Dargusch PJ, Syktus JI, *et al.*<sup>[17]</sup> those we must try to manage. Urban wastes could be used in the construction of beautiful statues, paper works, fine arts with unused plastics and cans, and with broken glass, tin, metals, or in paper curtains (Erb K, Haberl H, Jepsen MR, Kuemmerle T, Lindner M, Müller D, *et al.* 2013.<sup>[8]</sup> It is possible to reuse the unused electronic wastes like; rejected desktops, laptop batteries, mobiles, toner, inverter, air conditioners, televisions, phones, and different unused and rejected machines (Farmer J, Matthews R, Smith JU, Smith P, Singh BK. 2011).<sup>[10]</sup> In fact, individual conscience and direct hands on activities are essential to get benefit in the environment (Chapin, Knapp, Brinkman, Bronen, & Cochran, 2016)<sup>[4]</sup>. Activities include: covering unused lands in grasses, adapting house for human settlement, increasing reservoir capacity, implementing energy demand, coastal protection measures, reducing soil erosion, building more resilient house, installing effective and efficient agriculture and irrigation, establishing wildlife corridors and trying to reducing carbon emission (Erisman, Galloway, Seitzinger, Bleeker, & Butterbach-Bahl, 2011<sup>[9]</sup>; Messerli, Heinemann, Gige, Breu, & Schönweger, 2013)<sup>[18]</sup>. Sikor, Auld, Bebbington, Benjaminsen, Gentry, Hunsberger, Anne-MarieIzac, Margulis, Plieninger, Schroeder, & Upton, 2013 organized a mass tree plantation programme in wastelands and hillsides to maximize the land use intensity in global land governance to mitigate pollution. Literature found that there was a huge positive connection among the factors of ecological maintainability for example hands on understanding, network investment, perception, field visit, sight and sound, and show in eco-accommodating abilities to relieve environmental change and financial turn of events (Jena, 2011)<sup>[13]</sup>. Instructors, understudies, and network individuals may utilize mindfulness, transparency, and eco-accommodating (AOE) model to rehearse practical propensities (Jena, 2012)<sup>[12]</sup>. A community sanitation program was organized in Assam, India where teachers, students, and local people participated and tried to aware community people to how achieve environmental sustainability Jena, 2018<sup>[24]</sup> and how to change socio-ecological system (Takeuchi, Ichikawa, & Elmquist 2016)<sup>[23]</sup>. Question rose, is it possible to achieve 2030 agenda of environmental sustainability through active participation?

### **International efforts of developing skills and competencies in environmental sustainability**

Generally, national and worldwide investigations uncovered in that the significant reasons for ecological corruption are populace development, industrialization, changes in utilization examples, and neediness undermining existed among individuals and biological systems. That is the reason, the partners should settle on choices on the improvement of natural supportability at grass root levels particularly among understudies. Natural maintainability materials ought to be given to the understudies' to get in expanded degree of information, disposition, aptitudes, and investment to arrive at anticipated objectives of

manageability Orzali, 2009.<sup>[20]</sup> The global education agenda has emphasized on external aid and international support for sustainable development could help to get in economic growth in macro-economic environment. Current ways to deal with ecological maintainability neglect to give the necessary aptitudes, because of the conventional training structure while manageability requires a transformation in transit natural experts see and take care of ecological issues. It needs to grow new close to home, relational, cultural, and specialized aptitudes to get dynamic all through their expert lives and to be of an incentive in the journey for manageability. Yet at present, most university programs cover little in the way of environmental issues or sustainability integrated into management, design, engineering, marketing, and service. However, it needs for including sustainability in professional practices and education and engineering. Considering these, literature found that in Malaysian essential and optional school understudies' degree of Knowledge, demeanor, abilities, and cooperation expanded to arrive at expected ES level. Reasonable advancement activities are being set by higher instructive bodies and bosses and mindful to accomplish the capabilities, information and abilities for manageable improvement of their workers in Europe. It indicated that auxiliary school understudies had "significant level" of ecological mindfulness in the idea of supportable turn of events. School can and ought to advance the improvement of supportable ways of life that lead networks to be more pleasant and more capable and deferential with the earth and individuals. Indeed, maintainable ecological training must be help to build up the aptitudes and skills. In Brazil, Serbia, Latvia, South Africa, Spain, Syria, and UK, the idea of training for supportable advancement has not been adequately coordinated into the idea of change in advanced education foundations needs community oriented methodologies, and talk about how to upgrade their own controls, and multicultural vision of maintainability. A study assessed individual competences in designing sustainable buildings in Netherland and found that individual competences is well fit to the environment norms, but not all individual competences appeared during the process. Because linking information with action for effective social group responses to persistent issues of property needs transformation includes collective downside framing, a plurality of views, effective dialog processes, and neutral participation. Instruction and preparing as a vital aspect for moving the workforce and society as a rule toward a feasible living procedure, yet the connection between regulatory approach, administration and manageability is significant, in light of the fact that there is no advancement without initiative particularly in the social, human and social measurement. Be that as it may, relational abilities influence the capacity to direct the change towards manageability ranch creation affirmed the critical job of supportability information, assistance aptitudes and systems administration skills on the inclination to advance economical agribusiness. Be that as it may, dynamic association of understudies, educators, just as network individuals could make change in the public arena and ecological. Be that as it may, the examination showed that there stays a huge hole between youthful gifted people groups' goals to create aptitudes for maintainability and accessible learning openings, proposing an expanded degree for abilities for manageability activities later on. In the appearance of popular government in South

Africa in 1994, a changed radical law initiated at national level for directing natural manageability and featured troubles of accomplishing this by and by. In Sri Lanka, through maintainable formative projects, different social, financial, and natural issues were tackled. That is the reason, supportability training and commitment exercises, frameworks thinking, expectant capability and regularizing fitness and relational skill were thought of. Not just that mix of maintainability, proficient turn of events, and system building basic for creating aptitudes and capabilities in manageability (Pearce, Smith, Saxton and Soto, 2018). Likewise, proficient abilities in cultivating practices could assist the network with maintaining feasible rural strategy. Particularly, manageability in advanced education is commanded by reasonable 'greening the grounds' projects could be embraced. In Spanish colleges, natural maintainability educational plans was acquainted with rise the capabilities guide and substance of the topic and the points in the prospectuses any case, the Canadian metropolitan workers were the members shown abilities in critical thinking, featured in segments of the issue and recognizing the limitations, thinking aptitudes, hazard forecast, weakness examination, neighborhood information, arranging, and correspondence to transformation procedure to the ocean level ascent

#### **National efforts of developing skills and competencies in environmental sustainability**

India is troublesome by the nexus of natural corruption and monetary procedure in the midst of the strange beingness of need and extravagance in their multifaceted measurements. These difficulties are straightforwardly associated with the preservation and upkeep of the existence supporting frameworks like land, water, air, and organic assorted variety. In 1972, Prime Minister of India, Mrs. Indira Gandhi underscored, at the UN Conference on Human Environment at Stockholm, that the expulsion of destitution is a necessary piece of the objective of an ecological procedure for the world. The thoughts of interrelation, of a mutual planet, of world citizenship, and of 'spaceship earth' can't be confined to natural issues alone. They apply similarly to the common and between connected duties of ecological assurance and human turn of events. In 1986, the Govt. of India endorsed the significance of showing natural instruction all through the nation to make consciousness of maintainable practices in horticulture. Be that as it may, provincial townspeople couldn't create enough food to meet their yearly need because of expanded populace development diminished in the limit of land use strategy training need to present such issues in national educational plan. The administration would have liked to utilize air encouraging projects in schools and networks as a section to broaden mindfulness concerning the earth, and gives the information and aptitudes to answer to natural issues. Land use improvement program could reinforce to augmenting the utilization of no man's land and slopes. In any case, aptitudes improvement in natural maintainability is a difficult undertaking. Cooperation between educators, environmentalists, and network individuals empowered the improvement toward the expanded comprehension of thoughts through reasonable aptitudes advancement, thought investigation of understudies. Along these lines, reasonable and compelling trainings for practical instruction is a basic objective of late educator training. In a broad preparing; 600

learner, 35,000 understudies of 318 schools in Uttaranchal state took an interest and attempted to build up the abilities, and capabilities of maintainability of condition. The administration intends to expand the quantity of taking an interest understudies and schools all through the locale to create positive network activities towards the earth. Shared blend of these three spaces, for example, social, monetary, and natural measurements could assist with forming the general public's connection with the biosphere. Members of an examination; built up the information, disposition, abilities, basic reasoning, values direction and promise to work for a superior world for all, presently and later on. By and by, accomplishing the objectives of manageable advancement in the UN Decade of Education for Sustainable Development is a troublesome activity for the vast majority of the state administration of India particularly, in Puducherry area and Cuddalore locale of Tamil Nadu. Be that as it may, a sum of 240 understudies were chosen from four schools, of which 60 understudies from every four school were chosen dependent on their advantage, inspiration and duty and took an interest in a creative educational plan on natural instruction for feasible turn of events (EESD). In an examination, it came about that the test understudies accomplished significantly higher in execution, perspectives, aptitudes, and conduct on air, water, abilities in protection and strong waste.

#### **Aim and Hypothesis**

A workshop was organized in the environmental sustainability to develop the skills and competencies and compare the comparative opinion of the participants in climate change, climate risk management, waste management, adaptation and human settlements, transport and CO<sub>2</sub> emissions, energy and ecosystem, & in educating people. It was assumed that participants who attended environmental sustainability program have no differences in skills and competencies in climate change, climate risk management, waste management, adaptation and human settlements, transport and CO<sub>2</sub> emissions, energy and ecosystem, & educating people.

#### **Methodology**

Participatory empirical research design used to assess developmental skills and competencies of the participants who attend a seven-day workshop in environmental sustainability. After the notification in the print medias, and in the websites; students (n=35), teachers (n=10), and local people (n=36) expressed their interest to attend the workshop in environmental sustainability organized in the Department of Education, Assam University, Silchar, India. The purpose of the programme was to develop skills and competencies and to find out the sustainable solutions to mitigate climate change and socio-economic development and to achieve 2030 agendas of UNESCO in environmental sustainability (see table 1). In this seven days workshop, the issues of climate change, climate risk managements, waste management, adaptations and human settlements, transport and CO<sub>2</sub> emissions and energy & ecosystem and sustainable solution, policy decisions, and action plans are prepared and practiced. In climate risk management, participants acquired the skills and competencies on innovation in agricultural harvestings, saving life of cattle, and human being from higher mean temperatures, and from more hot days, and more heat waves, cyclones, and storms, and from decreased



relative humidity. In sustainable transport and CO<sub>2</sub> emission concepts, participants understood why to use environmental friendly vehicles, hybrid-electric vehicles, liquid petroleum gas, and compressed natural gas used in vehicle and pneumatic tyres. In addition, they installed solar energy panel, radiators, CFL light bulbs, and used air conditioners in closed room to minimize heat waste. They realized the vulnerability of human settlement, and tried to learn how to adapt ecosystem-based solution, eco-buildings, and how to control river water movement for maximum irrigation. Especially, banana peels, apple cores, grape stacks, and vegetable peels they grinded and dried in the sun and prepared bio-manure and used these in their kitchen garden. In addition, students, teachers, and community people

planted 250 saplings in the hillsides and wastelands of university campus, and in the local market complex. Participants took tea and soft drink without using plastic straw, and requested the local people to use recycle bins to dispose waste paper, plastic & waste metal. They aware people to work in for economic development and poverty reduction through agriculture and organic farming; established wildlife corridors and took actions in human settlements, controls on degradation of infrastructure, controls on outbreaks of plant, animal or human diseases, and adapted the action plan to secure life from decreased in precipitation, increased severity of drought, and decreased relative humidity.

**Table 1:** Themes and sub-concepts used in the programme

| Themes   | Subthemes  |   |
|--|--|---|
| Theme: Climate Change<br>Major Resource persons (n=2)<br>Participants: 81                      | A worldwide temperature alteration, higher mean temperatures, higher most extreme temperatures, more hot days and more warmth waves, expanded force of typhoons and storms and expanded mean ocean level   | Decline in precipitation, expanded seriousness of dry season, diminished relative stickiness    |
| Theme: Climate Risk Management<br>Major Resource person (n=1)                                  | Develop new yields, movement of individuals route from high hazard regions and change area of new lodging advancement, controls on flooding because of tempests and elevated tides   | Controls on corruption of framework, controls on flare-ups of plant, creature or human maladies |
| Theme: Waste management<br>Major Resource persons(n=2)<br>Participants:81                      | Waste water, biodegradable waste, food waste, electronic waste, heat waste management, sewage treatment  | Industrial waste, solid waste management, liquid waste  |
| Theme: Adaptation and Human settlements<br>Major Resource persons (n=2) Participants:81        | Transformation activities in human settlements, increment repository limit, execute vitality request, beach front insurance measures, manufacture stronger lodging, introduce more effective water system frameworks, make natural life hallways | Ecosystem-based adaptation provides one solution. Dynamic adaptation                            |
| Theme: Transport and CO <sub>2</sub> emissions<br>Major Resource persons (n=2) Participants:81 | naturally cordial vehicles module mixture electric vehicles mixture electric vehicles headlamps with light Obstruction of pneumatic tires  | Liquid Petroleum Gas or Compressed Natural Gas used vehicle<br>Reduction of the Rolling         |
| Theme: Energy & ecosystem<br>Major Resource persons (n=2)<br>Participants:81                   | Solar energy<br>Renewable and none renewable energy  | Radiators, CFL light bulb, Air conditioners   |

**Assessment of opinion in environmental sustainability**

An opinion cum observation schedule was developed and used to assess the opinion of the participants in environmental sustainability. The scale has seven-statement form of items covering six dimensions of sustainability (e.g. *climate change, climate risk management, waste management, adaptation and human settlements, transport, and CO<sub>2</sub> emissions, energy & ecosystem*). The tool has five point options (viz. *absolutely, frequently, may be, whenever necessary, & not at all*) and 5,4,3,2 & 1 marks respectively used to assess the skills, competencies and practice levels of environmental sustainability. The content validity ratio and split-half reliability was 80 & 84 and maximum 10-12 minutes needs to response the items. Non-parametric *Kruskal-Wallis H Test* used to analyze the observation cum opinion schedule of the participants.

**Analysis and results**

Table 1 shows the highest mean rank (46.00) of teachers than students (45.70) and local people (35.04), and the

*Kruskal-Wallis* (3.129  $p>.001$ ) where, the Chi-Square approximation, corrected for the existence of ties in the ranks of the data indicated no significant difference in observed data. Hence, the null hypothesis was accepted and it resulted that there was no significant difference in the opinion of the participants towards the skills and competencies in climate Change. In the *Kruskal-Wallis Test* (4.765  $p>.001$ ) indicated no significant difference in the opinion and the null hypothesis was accepted. It resulted that there was no significant difference in the participants’ opinion in the developmental skills and competencies on climate risk management. Table 2 depicts the lowest mean rank (36.65) of local people than the teachers and students’ rank (42.76 & 36.65) while the *Kruskal-Wallis Test* (3.465  $p>.001$ ) indicated no significant difference in the participants’ observed data for individual assignment; resulted that trained participants of environmental sustainability have no differences in skills and competencies in waste management.

**Table 2:** Kruskal-Wallis Test in skills and competencies in climate change, climate risk management, waste management, adaptation and human settlements, transport and CO<sub>2</sub> emissions, energy and ecosystem, & educating people.

| Group               | N          | Mean Rank of skills and competencies in climate change                           |
|---------------------|------------|--|
| Teachers            | 10         | 42.70  |
| Students            | 35         | 45.39  |
| Local People        | 36         | 36.26  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 3.129      |  |
| DF                  | 2          |  |
| p                   | .209 >.001 | (Chi-Square approximation)   |
| Group               | n          | Mean Rank of kills and competencies in climate risk management                   |
| Teachers            | 10         | 46.00  |
| Students            | 35         | 45.70  |
| Local People        | 36         | 35.04  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 4.765      |  |
| DF                  | 2          |  |
| P                   | .092 >.001 | (Chi-Square approximation)   |
| Group               | N          | Mean Rank of skills and competencies in waste management                         |
| Teachers            | 10         | 50.50  |
| Students            | 35         | 42.76  |
| Local People        | 36         | 36.65  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 3.465      |  |
| DF                  | 2          |  |
| P                   | .177 >.001 | (Chi-Square approximation)   |
| Group               | N          | Mean Rank of skills and competencies in adaptation and human settlements         |
| Teachers            | 10         | 47.30  |
| Students            | 35         | 43.44  |
| Local People        | 36         | 36.88  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 2.530      |  |
| DF                  | 2          |  |
| P                   | .282 >.001 | (Chi-Square approximation)   |
| Group               | N          | Mean Rank of skills and competencies in transport, and CO <sub>2</sub> emissions |
| Teachers            | 10         | 46.00  |
| Students            | 35         | 45.70  |
| Local People        | 36         | 35.04  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 4.765      |  |
| DF                  | 2          |  |
| P                   | .092 >.001 | (Chi-Square approximation)   |
| Group               | N          | Mean Rank of skills and competencies in energy and ecosystem                     |
| Teachers            | 10         | 50.10  |
| Students            | 35         | 43.76  |
| Local People        | 36         | 35.79  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 4.281      |  |
| DF                  | 2          |  |
| P                   | .118 >.001 | (Chi-Square approximation)   |
| Group               | N          | Mean Rank of skills and competencies in educating people                         |
| Teachers            | 10         | 49.70  |
| Students            | 35         | 43.44  |
| Local People        | 36         | 36.21  |
| Total               | 81         |  |
| Kruskal-Wallis Test | 3.722      |  |
| DF                  | 2          |  |
| P                   | .156 >.001 | (Chi-Square approximation)   |

Table 1 indicated that there is no differences in opinion of the participants in the developmental skills and competencies in adaptation and human settlements. Because the Kruskal-Wallis H Test for the observed data (2.530  $p < .001$ ) was not significant. Hence, the null hypothesis was accepted. Table 2 shows teachers and students have the highest mean rank (46.00 & 45.00) an indication of high mean rank in the observed data than the local people

(35.04). Kruskal-Wallis H Test (4.765  $p < .001$ ) indicated no significant difference in participants' opinion in skills and competencies in transport and CO<sub>2</sub> emissions. Table 2 shows the teachers have highest mean rank (50.10) than students and local people (35.79), and the Kruskal-Wallis Test was (4.281  $p > .001$ ) indicated no significant difference in participants' observed data for individual assignment. Hence, the null hypothesis was accepted and resulted that

trained participants of environmental sustainability have no differences in skills and competencies in energy and ecosystem. Table 2 shows Kruskal-Wallis H Test (3.722  $p > .001$ ) indicated no significant difference among the teachers, students and local people in skills and competencies on environmental sustainability in educating people. Hence, the null hypothesis was accepted.

### **Finding and discussion**

Author claimed that students, teachers, and the local people have no differences in their opinion in skills and competencies in achieving the goals of environmental sustainability. Especially, there was no significant difference in the skills and competencies in the concept of global warming, higher mean temperatures, higher most extreme temperatures, more hot days and more warmth waves, expanded power of tornadoes and storms and expanded mean ocean level, decline in precipitation, expanded seriousness of dry season, diminished relative moistness in environmental change. That as well as there was no distinction in the abilities and skills on atmosphere change administration. They developed and develop new harvests, attempted to move and aided in relocation of individuals route from high-hazard zones and recommended the administration to change area of new lodging advancement, and built up early climate estimating focus to controlling flooding because of tempests and elevated tides. After attending the workshop, the skills and competencies in waste management really upgraded and even found no differences among students, teachers, and the community people. Participants are so competent to manage the wastewater, sewage treatment, kitchen waste and other solid waste, food waste, electronic waste, heat waste, managing industrial waste, solid waste, and liquid waste, also they are skilled in minimizing the use of plastics, and polythene. The students, teachers, and the local people advised local people to use reusable cup, plate, glass, and permanent bags during lunch, dinner, and marketing. However, they worked on preparing compost, planting tree, reducing, and reusing the waste materials for keeping the circumstances clean and green. In addition, participants acquired skills and competencies in adaptation and human settlements includes adaptation of actions in human settlements, implement energy demand, developed coastal protection measures, build more resilient housing, increased the reservoir capacity, installed more efficient irrigation systems, created wildlife corridors and realized ecosystem-based adaptation could be a solution for human settlement. Teachers, students, and local people planted saplings in their garden and used bio-compost prepared in the kitchen wastes, reused old furniture, electrical appliances, and motivated local people to donate old clothes to the recycling group. Participants tried to understand the concept of insulation of building, and they used creeper and climber plants to cover the buildings and used radiators in their house to reflect the sunlight for keeping cool to the house, instead of using air-conditioners. However, few of them used air-conditioners but usually kept the doors and windows closed, when heat or air conditioning is on. They developed the skills and competencies in transport, and CO<sub>2</sub> by using environmentally friendly vehicles and plug-in hybrid-electric vehicles with resistance of pneumatic tyres. They used Liquid Petroleum Gas or Compressed Natural Gas in vehicle. They thought to opt for public transport could reduce transport costs as well as carbon emissions have a

great impact on the air quality of our cities. If every person use their personal vehicle then the discharged of gas produce by the internal combustion of the vehicle engines will affect on the environment, along with human health and these gases causes' greenhouse emissions affect the climate change. Participants also developed their skills and competencies in energy and ecosystem by using CLF light bulb and promised to save energy, by installing solar panels in their home and shopping complexes, and tried to unplugging the electric appliances while not in use. In addition, they used renewable energy efficient appliances like water radiators, indoor regulators, heat siphons, cooling, and clothes washers those expend most extreme vitality. The members instructed and educated the partners about the dangers regarding environmental change, those served to mindful about the expected effects of environmental change, and about environmental change measures. Universe of network, scientists, and partners should direct research to improve the comprehension of connection between environmental changes and hazard the executives those virus help to improve information on connection among over a wide span of time varieties in atmosphere. Maintainable horticulture, eco-cultivating, precipitation water reaping, and waterway water control for agribusiness cold assistance to improve economy, social and natural frameworks. Neighborhood individuals should attempt to improve their insight into the likelihood of recurrence and extent of changes to extraordinary atmosphere occasions and other atmosphere factors under environmental change those could help them to understand the relationship between frequency and magnitude of extreme weather and individual risk management.

### **Conclusion**

If we critically analyze the activities conducted throughout the workshop, we could guess how local people involved in making decisions and took action for protecting the world. They particularly emphasized in capability building for human settlement and waste management. In this study, participants put effort in waste management, plastic management; and planed policies in reducing CO<sub>2</sub> emissions for balancing energy and ecosystem. The sustainable development goals of UNESCO are only the blueprint to achieve a better and more sustainable future for all. But UNESCO alone is not sufficient to face the global challenges related to poverty, inequality, climate change, environmental degradation, along with terrorism, war and injustice. Those we could mitigate through hands on activities, individual conscience, direct participation in skill development training, workshop, orientation, seminar, and mass tree plantation in wastelands and hillsides. In addition, stakeholders should give emphasize in establishing sustainable industries, adapting eco friendly agricultural policies, advising people to establish climate friendly buildings, subsidies in purchasing electric vehicles or encouraging people to use public transport systems those can somehow help to achieve the goals of sustainability. Government, NGOs, stakeholders, and community people should prepare the action plan on sustainability to implement in urbanization, industrial areas, agricultural land, and remote villages. Without any organizational or collaborative effort, carbon management plan, biodiversity plan, sustainable food policy, sustainable procurement policy, thermal comfort policy, sustainable construction policy, conservation of energy and global food security policy; the goals of 2030 sustainability may not be achieved.

Not only that, at least 75% people to be regularly commuting to work in sustainable modes and people should try to reduce the per capita carbon emissions by using environmental friendly vehicles, hybrid-electric vehicles by using in liquid petroleum gas, and compressed natural gas vehicle, and by using pneumatic tyres. Of course, we should encourage people to work for economic development and poverty reduction through animal husbandry, agriculture, organic farming for happy and peaceful settlements. Because, economic growth is only can achieve through sustainable jobs promote equality in the society. We should try to practice of donating what we don't use, and should try to avoid throwing remains food as if trying to offer the remaining food to the man and woman who have insufficient food to consume in our community. Adequate food policy and sustainable agricultural practice and programme could motivate people to think about modern agriculture, food grain preservation, and for preparing good seeds for high harvesting. Nevertheless, to reduce unemployment; sustainable employment guaranty schemes need to be implemented to maintain internal peace and harmony in the society.

### References

1. Atmodiwirjo P. School ground as environmental learning resources: Teachers' and pupils' perspectives on its potentials, uses and accessibility. *International Electronic Journal of Environmental Education*. 2013;3(2):101-119.
2. Barange M, Cheung WWL, Merino G. Modelling the potential impacts of climate change and human activities on the sustainability of marine resources. *Current Opinion in Environmental Sustainability*. 2010;2(5-6):326-333.
3. Carter CR, Tyrrel FS, Peter H. Impact and sustainability of community water supply and sanitation programmes in developing countries. *Journal of the Chartered Institution of Water and Environmental Management*. 1999;13:292-296.
4. Chapin FS, Knapp CN, Brinkman TJ, Bronen R, Cochran P. Community-empowered adaptation for self-reliance. *Current Opinion in Environmental Sustainability*. 2016;19:67-75.
5. Chowdhury T. Nature of Environmental Education in Bangladesh: A School Level Assessment with Reference to the National Curriculum. *International Electronic Journal of Environmental Education*. 2014;4(1):53-60.
6. Dawson JJC, Smith P. Integrative management to mitigate diffuse pollution in multi-functional landscapes. *Current Opinion in Environmental Sustainability*. 2010;2(5-6):375-382.
7. Douglas I. Urban ecology and urban ecosystems: understanding the links to human health and well-being. *Current Opinion in Environmental Sustainability*. 2012;4(4):385-392.
8. Erb K, Haberl H, Jepsen MR, Kuemmerle T, Lindner M, Müller D, *et al.* A conceptual framework for analysing and measuring land-use intensity. *Current Opinion in Environmental Sustainability*. 2013;5(5):464-470.
9. Erisman JW, Galloway J, Seitzinger S, Bleeker A, Butterbach-Bahl K. Reactive nitrogen in the environment and its effect on climate change. *Current Opinion in Environmental Sustainability*. 2011;3(5):281-290.
10. Farmer J, Matthews R, Smith JU, Smith P, Singh BK. Assessing existing peat land models for their applicability for modelling greenhouse gas emissions from tropical peat soils. *Current Opinion in Environmental Sustainability*. 2011;3(5):339-349.
11. Hilary I. Cultivating artistic approaches to environmental learning: Exploring eco-art education in elementary classrooms. *International Electronic Journal of Environmental Education*. 2013;3(2):129-145.
12. Jena AK. Awareness, Openness and Eco-friendly (AOE) Model Teaches Pre-service Teachers on How to be Eco-friendly. *International Electronic Journal of Environmental Education*. 2012;2(2):103-117.
13. Jena AK. Hands on experience, community participation, observation, field visit, multimedia and demonstration are the predictors of environmental awareness: A hierarchical multiple regression analysis. *International Journal of Environment and Sustainable Development*. 2011;10(3):302-321.
14. Mohammed Aatur Rahman. Ecosystem management is the key to reduce climate impacts and food security. *Int J Res Agron* 2021;4(2):41-49.
15. Macdonald CA, Anderson IC, Bardgett RD, Singh BK. Role of nitrogen in carbon mitigation in forest ecosystems. *Current Opinion in Environmental Sustainability*. 2011;3(5):303-310.
16. Marsden T, Sonnino R. Human health and wellbeing and the sustainability of urban-regional food systems. *Current Opinion in Environmental Sustainability*. 2012;4(4):427-430.
17. McAlpine CA, Ryan JG, Seabrook L, Thomas S, Dargusch PJ, Syktus JI, *et al.* More than CO<sub>2</sub>: a broader paradigm for managing climate change and variability to avoid ecosystem collapse. *Current Opinion in Environmental Sustainability*. 2010;2(5-6):334-346.
18. Messerli P, Heinimann A, Gige M, Breu T, Schönweger O. From 'land grabbing' to sustainable investments in land: potential contributions by land change science. *Current Opinion in Environmental Sustainability*. 2013;5(5):528-534.
19. Nagendra H, Reyers B, Lavorel S. Impacts of land change on biodiversity: making the link to ecosystem services. *Current Opinion in Environmental Sustainability*. 2013;5(5):503-508.
20. Orzali JO. Connecting Students to Sustainability through Hands-on Learning in the High School Science Classroom. Published Ph.D. thesis, Harvard University; c2009.
21. Schand H, Capon A. Cities as social-ecological systems: linking metabolism, wellbeing and human health. *Current Opinion in Environmental Sustainability*. 2012;4(4):375-377.
22. Sikor T, Auld G, Bebbington AJ, Benjaminsen TA, Gentry BS, Hunsberger C, *et al.* Global land governance: From territory to flow? *Current Opinion in Environmental Sustainability*. 2013;5(5):522-527.
23. Takeuchi K, Ichikawa K, Elmquist T. Satoyama landscape as social-ecological system: Historical changes and future perspective. *Current Opinion in Environmental Sustainability*. 2016;19:30-39.
24. Jena AK. Effects of Community Sanitation Program on the Awareness of Environmental Sustainability in Assam, India. *International Quarterly of Community Health Education*. 2018;39(1):51-61.