# Framework to Develop Low Carbon Society among School Community

**FatinAliah Phang, Jaysuman Puspanathan, AermaNurazalina Musa, MohdMunir Baharom, Nor FarahwahidahAb Rahman, Mahyuddin Arsat and Nina Diana Nawi**

***Abstract:*** ***Various efforts have been taken to develop a Low Carbon Society in Iskandar Malaysia. These efforts need to be coordinated to ensure high efficiency and effectiveness. This paper discusses the preliminary work to produce an action plan for low carbon education in the state of Johor where the region of Islander Malaysia is a part of it. This qualitative study of efforts starting in 2011 has generated a framework to explain how Low Carbon Society can be developed from among the school community. This includes the directive measure from the authorities, getting buy-in from the stakeholders through engagement and briefing, initiating low carbon efforts, giving recognition, making formative assessment through research and appointing champions. This framework will be useful for other similar community to develop a Low Carbon Society.***

***Index terms : Low Carbon Society, Policy, Environmental Education, Community Engagement***

## I. INTRODUCTION:

Iskandar Malaysiais a regional economic area [1]located at southern part of Johor state. Iskandar Regional Development Authority (IRDA) is the federal government agency that draws the policy and strategy to develop Iskandar Malaysia. In 2013, the "Low Carbon Society Blueprint for Iskandar Malaysia 2025" was published[2]. In the blueprint, 12 actions were drawn under triple bottom pillars: Green Economy, Green Community, and Green Environment. Underthe Green Community are Low Carbon Lifestyle action, and Community Engagement & Consensus Building action. There are five sub-actions under the first action which are Awareness through Education, Smart Working Style, Promote Energy Efficiency, Promote "Smart Travel Choice", and Stock-taking for Low Carbon Lifestyle. The first sub-action is to enhance school children awareness through various programs drawn in the blueprint such as LCS education across curriculum, school clubs for LCS & 3R (Reduce, Reuse, Recycle) programs, Children Eco-life Challenge project, interschool 3R project competitions, 3R measures at schools, LCS measures at schools, collaboration with relevant government agencies & NGOs, and students to collect reusable & recyclable wastes from home and neighborhood[2]. Clearly, a lot of effort is needed to develop LCS among school community to realise this sub-action.

## II. LITERATURE REVIEW:

A low carbon society aims to minimise carbon mission in all sectors, shift to a simpler and quality life and coexistence with nature3.Education is considered the fundamental to embed the above concept into the society. The key role for education is to inspire the belief that everyone has the equal power and responsibility to bring along positive change on a global scale[4]. Education is the primary agent of transformation towards sustainable development, fosters the values, behaviour and lifestyles required for a sustainable future. Malaysian government is actively involved in various activities towards the contribution of the low carbon society in order to create an economically, socially sustainable society. Recently, the Science Advisor of the Prime Minister launched a book entitled "Rising to the Challenge: Malaysia's contribution to the SDGs"[5]. In the book, many exemplary activities are related to school students such as Iskandar Malaysia Ecolife Challenge[6]. This shows that education plays an important role in preparing individuals in the society to handle current environmental problems and preventing future ones.

Many international bodies and agencies agreed that education is a key in addressing environmental issues[7]-[9] and urged that environmental education should be incorporated into school curriculum[10],[11].

Calls to teach Sustainable Development Goals among school students are also made by various international communities such as British Council which mentioned that school students are the next generation who will have to solve the global problems[12].

**Revised Manuscript Received on December 22, 2018.**

**FatinAliah Phang**,Corresponding author: Fellow, Centre for Engineering Education, UniversitiTeknologi Malaysia (UTM), Skudai, Johor, Malaysia. Email: p-fatin@utm.my,

**Jaysuman Puspanathan**,School of Medical Engineering & Health Sciences, Faculty of Engineering, UniversitiTeknologi Malaysia (UTM), Skudai, Johor, Malaysia. Email: jaysuman@utm.my

**AermaNurazalina Musa**, State Department of Education, Ministry of Education, Johor Bahru, Johor, Malaysia. Email: aerma.musa@moe.gov.my, munir.baharom@moe.gov.my

**Nor FarahwahidahAb Rahman**, Johor School of Education, Faculty of Social Sciences and Humanities, UniversitiTeknologi Malaysia (UTM), ***Skudai, Johor, Malaysia. Email: nfwahidah@utm.my, mahyuddin@utm.my, ninadiana@utm.my***

Gough and Scott13 suggested that there is a need for restructuring the reward systems to encourage the teaching and administration that enhance education for LCS, promote interschool work, and provide training to educators. By doing so, the educators will be able to instil LCS awareness in the teaching and examinations. A few models have been introduced to look at how to develop a community that have environmental awareness at schools. Phang14 proposed a model to inculcate low carbon awareness through school as shown in Figure 1. The model is developed based on the researchers' experience in conducting various activities and programs at schools to inculcate low carbon awareness among school students, teachers and parents. The model is quite comprehensive and encompasses a wide range of stakeholders. However, it is seen as a model that is suitable for non-formal and informal education. It does not suggest any specific strategy or framework to insert low carbon education in formal education. Palmer and Neal[15] ]suggested a model for environmental education as shown in Figure 2. The model is quite holistic and it targets individual development, however the model does not suggest any specific implementation guidelines for implementation. Some researchers used the model to produce their teaching and learning materials[16-19].

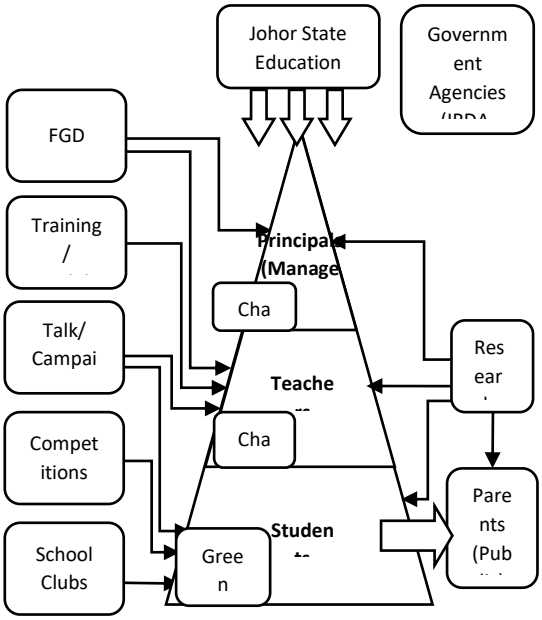


**Figure 1: A successful model to inculcate low carbon awareness through schools14**

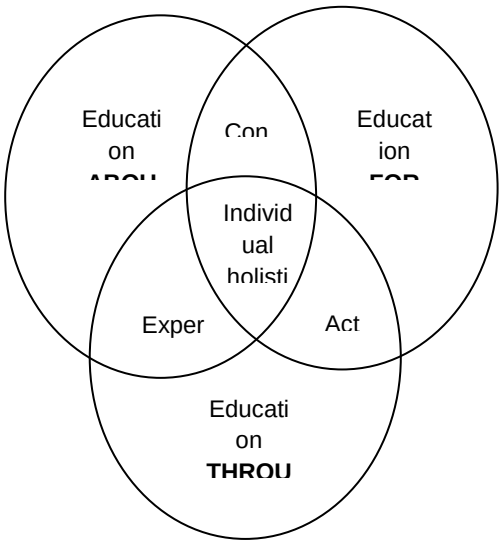


**Figure 2: Framework for environmental education15**

In 2017, the Johor state government launched the Johor Sustainable Policy 2017 - 202120. There are five strategic thrusts in the policy which are preserve natural heritage, instill smart living style, green economy, improve governance, and empower communities. Looking closely into the policy, there is no specific strategy or policy for education for sustainable development. How to educate school students and the public is not clearly stated in the policy. There is a need to produce an action plan to supplement and support the policy. This paper discusses an early effort to produce an action plan for low carbon education for Johor schools, for both formal and informal education. The result of a Focused Group Discussion (FGD) is reported.

## III. FOCUSED GROUP DISCUSSION:

After literature review was conducted, a FGD was organized to collect the barriers to implement low carbon education at schools and recommendations by various stakeholders on how to inculcate the awareness among school communities. The FGD was attended by 68 participants from various agencies. The breakdown of the participants is as shown in Table 1.

**Table 1: Participants of the FGD based on the agency**

| Agency / Sector | Number of participants |
|---|---|
| State and district education officers | 10 |
| Primary school teachers who are active in environmental projects | 10 |
| Secondary school teachers who are active in environmental projects | 7 |
| NGOs representatives | 7 |
| Local authorities | 6 |
| Governmental agencies related to environment | 9 |
| Corporations | 6 |
| Academia | 13 |
| Total | 68 |

The participants represent a wide range of representatives who are directly involved in environmental activities at schools. They were divided into 6 groups where each group has at least a representative from one agency or sector as detailed out in Table 1. Each group was guided by a facilitator from among the academia or researchers and a graduate student was assigned as scribes. All the groups' discussions were audio recorded. The FGD started with a briefing of the Johor Sustainable Policy 2017 - 2021 followed by the purpose of the FGD. In the first FGD, the participants were asked to list the issues and barriers faced in educating school students on low carbon awareness specifically and environmental awareness in general. This was followed by FGD on the various activities, projects and programs organized or participated by the participants. Finally, they discussed the recommendations to improve the implementation of environmental education in Johor schools. This paper presents the data of the issues and recommendations.

## IV. DATA ANALYSIS AND DISCUSSION:

The reports of the scribes and the audio recordings were gathered for qualitative analysis using Miles & Huberman's[21] qualitative data analysis method. There are three stages in the analysis method which are data reduction, data display, and conclusion drawing and verification. From the analysis of the issues and barriers faced in educating school students on low carbon awareness specifically and environmental awareness in general, there are six main issues as shown in Table 2.

**Table 2: Issues and barriers faced in educating school students on low carbon awareness specifically and environmental awareness in general**

| Issues | Description |
|---|---|
| 1. No support from the top management of schools | Top management of schools who do not have awareness on low carbon usually do not support or understand the amount of works teachers and students have to undertake. It hinders the efforts, demotivates and creates difficulties for teachers. |
| 2. Environment education across curriculum was not implemented | Although environment education should be taught as an element across curriculum, teachers who do not have the awareness, resources and training never teach it or skip the topics |
| 3. Lack of coordination | Various agencies approach schools and education departments to conduct programs at schools. There was not coordination at certain levels. Some schools receive a lot of programs and it is burdening while some schools never have the chance to experience such programs. |
| 4. Lack of funding | Schools do not have designated funding or were not given specific funding to run environmental programs at schools |
| 5. Lack of expertise | Schools do not have or know any experts that can help advice the schools to run environmental programs or projects |
| 6. Less impactful programs | Some programs are not related to the learning of the students such as STEM or 21st century skills, merely touch-and-go programs. Some programs do not get any media publicity. This makes schools reluctant to participate. |

The first issue may be solved using the model suggested by Phang14. Top-down and bottom-up approaches can be used to bring awareness and persuade the top management of schools. Champions in low carbon society can also be developed among the top management so they will support the initiatives. While the second issue could be solved with specific training and resources given to teachers. Curriculum mapping is also a way forward to let the teachers aware of the topics that are potential to insert environment issues in the teaching. For the third issue, the Johor State Education Department must play a more active role in coordinating various environmental programs so schools are not overloaded with too many programs. From a study by Wong& Phang[22], from a total of [23] schools in Johor, 233 programs related to low carbon and sustainable development were organized and participated over 5 years.

Funding is always an issue to run any programs. Collaboration with industry, governmental agencies or international bodies related to SDG may help solve this problem. For the fifth issue, many participants do not realize that Iskandar Malaysia is a Regional Centre of Expertise on Education for Sustainable Education or in short RCE recognized by the United Nations University[23]. There is a network of expertise in the region of Iskandar Malaysia and there are 168 RCEs globally for any RCE to get connected and learn from each other. Schools can sought advice from RCEs and expert at UniversitiTeknologi Malaysia which is the only research university in Johor. Finally for the last issue, the Johor State Education Department must ensure that the programs that it approved to be operated at schools must enhance students' learning of the 21st century skills [24]. Therefore, a framework to develop low carbon society among school community can be summarized in Figure 3.

As aforementioned, low carbon awareness should be inserted into school curriculum actively. To do this, curriculum mapping must be carried out to let the teachers and schools know in which topics and subjects the theme can be taught to the students. After that, training must be given to the teachers through capacity building effort. At the same time, any low carbon related programs that needs to be run in the school formal curriculum must be related to the mapping and the 21st century skills such as communication, collaboration, critical thinking, creative thinking, lifelong learning, adaptability, curiosity, persistent and others[24]. Problem-based Learning (PBL) for Low Carbon Society[25] may be a good program to be inculcated in the formal curriculum as many studies have shown that PBL can instil the 21st century skills among students[26],[27]. For the co-curriculum, one school should have one theme as a focus so the schools do not have to take part in all the programs. This can help shape the schools into one deep and focused expertise. At the management, schools must appoint a special

unit that is linked to the Parent-Teacher Association or PIBG of the schools. This can ensure good management of programs and sustainable funding for the programs. School programs must also be assessed so that the impact can be reported. This will give confident to the management to continue to support the initiatives. A competition such as the one reported by Wong& Phang[22] is a good example to make meaningful assessment for the schools by external stakeholders. Finally, all the four components cannot be operated successfully without a long term plan for capacity building. Training and briefing need to be conducted at various levels to disseminate any action plan to help empower schools to develop Low Carbon Society.

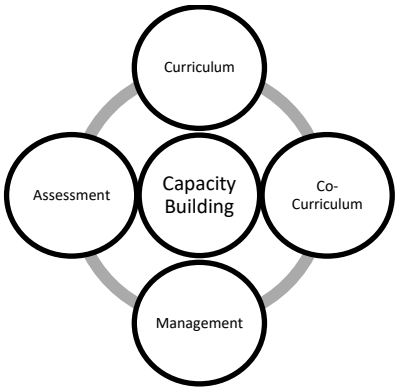


**Figure 3: Framework for developing low carbon society among school community**

## V. CONCLUSION:

It is hoped that this framework can be the basis to draft an action plan for developing low carbon society among school community in Johor to realize both the "Low Carbon Society Blueprint for Iskandar Malaysia 2025" and "Johor Sustainable Policy 2017-2021". School community may be easier to develop a Low Carbon Society due to its structure and governance. However, a workable framework is needed to empower schools, especially teachers who are the backbones of the success of any implementation of education policy.

## ACKNOWLEDGMENTS:

The authors would like to thank UniversitiTeknologi Malaysia (UTM) for supporting this project through UTMSHINE Flagship Grant vot no. Q.J130000.2431.03G77 andR.J130000.7353.4B369.

## REFERENCES:

1. KhazanahNasional. Comprehensive Development Plan for South Johor Economic Region 2006-2025, KhazanahNasional, Kuala Lumpur, Malaysia. 2006.
2. UTM-Low Carbon Asia Research Centre, 2013, Low Carbon Society Blueprint for Iskandar Malaysia 2025, 2nd ed., UTM-Low Carbon Asia Research Centre, Johor, Malaysia.
3. UTM-Low Carbon Asia Research Centre. Low Carbon Society Blueprint for Iskandar Malaysia 2025 – Summary for Policymakers, UTM-Low Carbon Asia Research Centre, Johor, Malaysia.2014.
4. UNESCO. United Nations decade of education for sustainable development 2005 - 2014. 2005. < http://unesdoc.unesco.org/images/0014/001416/141629e.pdf> accessed 14.05.2018.
5. Mokhtar M., Lee K.E &Sivapalan S. Rising to the Challenge: Malaysia's Contribution to the SDGs, Malaysia, UKM Press.2017
6. Phang F.A., Wong W.Y., Ho C.S&Musa A.N. Achieving Low Carbon Society through Primary School Ecolife Challenge in Iskandar Malaysia, Chemical Engineering Transaction 2017, 56(1), 415-420.
7. Phang, F. A., Wong, W. Y., Ho, C. S., Fujino, J., AermaNurazalina Musa, &Suda, M. Iskandar Malaysia Ecolife Challenge: Low carbon education for teachers and students, Clean Technologies and Environmental Policy, 2016, 18(8), 2525-2532.
8. Sterling S. Higher Education, sustainablility, and the role of systemic learning, Chapter in: P. Blaze-Corcoran, A. Wals, (eds.), Higher Education and the Challenge of Sustainability: Problematics, Promise and Practice, Dordrecht, Kluwer, 49-70. 2004.
9. Protocol, K. United Nations framework convention on climate change. Kyoto Protocol, Kyoto 19, 1997.
10. UNESCO-UNEP. Intergovernmental Conference on Environmental Education, Tbilisi, USSR, Final Report, UNESCO, Paris, France.1978.
11. Berry P.S. Planet Earth, Chapter In: S.M. Carson (Ed.), Environmental Education: Principles and Practice, London, Edward Arnold, 1978, 43-62.
12. Reynolds J. How to teach the UN's development goals, and why?. 2016. <https://www.britishcouncil.org/voices-magazine/why-teach-uns-development-goals-and-how> accessed 15.05.2018.
13. Gough S.&Scott W. Higher Education and Sustainable Development: Paradox and possibility, New York, Routledge. 2007
14. Phang F.A., Wong W.Y., Ho C.S., Suda M.&Fujino J. A Successful Model to Inculcate Low Carbon Awareness among School Students and Teachers, Journal of Advanced Research Design, 2015, 12(1), 21-34.
15. Jeronen E., Jeronen J &Raustia H. Environmental Education in Finland – A Case Study of Environmental Education in Nature Schools, International Journal of Environmental and Science Education, 2009, 4(1), 1-23.
16. Bouzeineddine S.F. The Integration and the Impact of Environmental Education in School Curriculum, Master Dissertation, Lebanese American University, Lebanon. 2012.
17. Zakaria M.F.B &Phang F.A. The effectiveness of inculcating education for sustainable development (ESD) in physics learning module, Man in India, 2016, 96(1), 325-335.
18. UPENJ. DasarKelestarianNegeri Johor 2017-2021, UPENJ, IskandarPuteri, Malaysia. 2016.
19. Miles M.B & Huberman M.A. Qualitative data analysis: An expanded sourcebook, Thousand Oaks, Sage. 1994.
20. Wong W.Y., PhangF.A., Ho C.S & Musa A.N. Sustainable and low carbon practices at schools in Iskandar Malaysia, Chemical Engineering Transactions, 2017, 56, 313-318.
21. Smith K.,Stamberger J &Shiota K. RCE Structure and Governance Survey: An Analysis of Results and Recommendations. 2016. <UNU https://www.rcenetwork.org/portal/sites/default/files/RCE%20Structure%20and%20Governance%20Survey%20no%20chart_2.compressed.pdf> accessed 15.05.2018.
22. WEF. New Vision for Education: Unlocking the Potential of Technology, WEF, Switzerland. 2015.
23. Phang F.A., Nawi N.D., Mohd-Yusof K., Abd-Aziz A & Musa A.N. Cooperative Problem-Based Learning to Develop 21st Century Skills among Secondary School Students through STEM Education, IEEE Xplore, World Engineering Education Forum 2017, Kuala Lumpur, 13-16 Nov 2017, p.405-409.
24. Mohd-Yusof K., Sadikin A.N., Phang F.A & Abdul-Aziz A. Instilling Professional Skills and Sustainable Development through Problem-Based Learning (PBL) among First Year Engineering Students, International Journal of Engineering Education, 2016, 32, 333-347.
25. Helmi S.A., Mohd-Yusof K &Phang F.A. Enhancement of team-based problem slving skills in engineering students through cooperative problem-based learning, International Journal of Engineering Education, 2016, 32(6), 2401-2414.