Community-Based Mosquito Vector Prevention Model

A Conceptual Approach to Mitigating the Risk of Mosquito Threats Thru Community Empowerment and Education

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ABSTRACT

The Philippines is exposed to risks of mosquito-borne diseases such as Dengue, Malaria, Zika, Chikungunya, Japanese Encephalitis, and Filariasis. Dengue and Malaria are major public health concern in the Philippines and is endemic in all regions of the country with seasonal outbreaks occurring during the wet season, while other incidences of other mosquito- borne diseases are mostly confined to certain areas in the country. Although there are 279 known species, subspecies and varieties of mosquitoes in the Philippines, three (3) are mostly widely known for their medical importance as vectors of deadly diseases — these are: these are Culex sp. (Filariasis), Anopheles sp. (Malaria) and Aedes sp.(Dengue). All three (3) specie of mosquitoes are covered and targeted by the *GLOBE Mosquito Protocol.*

Despite significant advances and accomplishments in the global fight against mosquito borne diseases, mosquitos remain as the most deadliest animal in the world, killing more than 725,000 people worldwide every year, and infecting hundreds of millions of people (WHO, 2017). Third world countries like the Philippines is most vulnerable to such risk. In 2017, the US Centre for Disease Control and Prevention (CDC) listed the Philippines as among Areas *"With Risk of Zika Infection"* — such advisory remains today.

This paper is the first of a series of "*community engagement*" and *"action research"* project being conducted by faculty and students of Batasan Hills National High School in Quezon City, Philippines, whose aim is to develop a practicable, sustainable and scalable *Community Based Mosquito Vector Prevention Model* that can be adopted by local communities, with the *GLOBE protocols* at its core.

INTRODUCTION

Perennially, Mosquito vectors such as the Aedes Aegypti, Anopheles, and Culex are considered public health enemy number one in the Philippines. Each year, mosquito borne diseases infect hundreds of thousand Filipinos. In 2018, the Department of Health (DOH) reported a total of 215,190 Dengue cases with 1,083 deaths; 6,680 Malaria infections; and 57 Zika cases. Despite advances in immunization and prevention against mosquito borne diseases which saw the number of cases of Malaria infection reduced by 92%[1] such approach seem helpless in containing the threat and incidence of dengue. As a result of Dengue's interminable and incessant threat in the country, Dengue is regarded as the most important viral vector borne disease for the Philippines.

Due to the sheer size/ number of Dengue cases in the Philippines the impact to communities can be significant which may include loss of life, increased medical and health expenditure, loss of income, school and work absenteeism, reduced productivity, and others.

On May 2018, the GLOBE program launched one of its newest protocols, the GLOBE Zika Education and Prevention project, whose objective is to enlist thousands of students, teachers and community leaders to collect data on mosquitoes for a global mapping project. Although the program was originally and intentionally developed to curb and prevent the spread of Zika virus, it is equally applicable and effective in preventing other mosquito borne diseases such as Dengue, Malaria, Chikungunya and others. The GLOBE Zika program aims to empower local communities with the tools and knowledge to reduce and mitigate the threat and impact of mosquito vectors through education.

The global fight against mosquito borne diseases has not only resulted to a number of medical and scientific breakthroughs in the treatment and prevention of such diseases, it also gave birth to a number of community intervention models that leverage on the socio-cultural and institutional infrastructures of communities, driven by their collective aspirations to live a healthy, harmonious and productive life.

[1] Baseline data, 2005 figures

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DATA COLLECTION

The Area – Barangay Batasan Hills, Quezon City

Quezon City is the largest city of Metropolitan Manila both in terms of population and area. With a land area of 161.13 sq. Km., it is more than four times the size of Manila, and its population of nearly three million people comprise 24% of Metropolitan Manila. It is also considered as the most densely populated city in the Philippines.

Although Quezon City reported only one case of Zika infection in 2017, the city, particularly Barangay Batasan Hills (Batasan Hills Community), has been a perinneal *"hot zone"* for Dengue – one of 47 hot zones in the country identified by the Department of Health.

METHODOLOGY

To ensure compliance with GLOBE Mosquito protocols, the following steps were strictly observed and employed in collecting the data:

1. Identification of Mosquito Habitats
2. Sample Count
3. Identification of Larvae Type
4. Elimination of Sample

Prior to collecting data, *"Barangay Officials[2]"* were briefed about the project, its objectives and expected outputs. They were also shown the GLOBE Database and taught how to access and retrieve data on Mosquitos, and how the Database could be used in the community's *"Anti-Dengue Campaign."*

Using cluster sampling techniques fifteen (15) sites were randomly selected from a cluster of 30. Over the course of three (3) days, and with the help of some *"Barangay Officials,"* Thirty (30) mosquito data were collected and uploaded to the GLOBE database. All samples were identified as *"Aedes Aegypti"* a principal mosquito vector of dengue. This validates the seasonal outbreak of Dengue in the area. The specie also carries the Zika and Chikungunya viruses.

Table 1
Summary of Data

Site Id	School Name	Sample Source	Site Name	Mosquito Type	Data Count	Elevation
147554	Batasan Hills National High School	Artificial Container	Kaunlaran st.,Batasan Hills Q.C.	*Aedes aegypti*	1	340.3
136490	Batasan Hills National High School	Pond	Batasan Hills, IBP Road	*Aedes aegypti*	1	60.8
136550	Batasan Hills National High School	Drum	243 Batasan Hills, Q.C.	*Aedes aegypti*	2	50.7
136551	Batasan Hills National High School	Old Wheel	47 Bayanihan St., Talanay A, Batasan Hills, Q.C	*Aedes aegypti*	1	53.7
136540	Batasan Hills National High School	Coconut Husk	85 Sto. Nino, Batasan Hills, Q.C	*Aedes aegypti*	1	53.7
136488	Batasan Hills National High School	Bottle containers	54 Cotabato St. Batasan Hills, Q.C	*Aedes aegypti*	4	52.3
136530	Batasan Hills National High School	Kitchen Sink	25 Kalayaan C, Batasan Hills, Q.C	*Aedes aegypti*	2	78.2
147565	Batasan Hills National High School	Artificial Container	105 Jp Rizal St. Bagong Silangan, Q.C	*Aedes aegypti*	2	91.6
147570	Batasan Hills National High School	Canal	135 Chopin St. Ideal Subd.Fairview, Q.C	*Aedes aegypti*	2	93.6
147747	Batasan Hills National High School	Old bottle containers	9A-1C Isuzu St. Amado Compound, Banaba, San Mateo Rizal	*Aedes aegypti*	1	93.3
147678	Batasan Hills National High School	Drum	#49 Sampaloc Street Talanay A. Barangay Batasan Hills Quezon City.	*Aedes aegypti*	2	86.8
147748	Batasan Hills National High School	Old Cans	47 Bayanihan St., Lakatan Ext, Talanay A Batasan Hills, Q.C	*Aedes aegypti*	1	92.3
147569	Batasan Hills National High School	Tree holes	Saret St. Batasan Hills,Q.C.	*Aedes aegypti*	4	91.8
147572	Batasan Hills National High School	Holes in the Kitchen Sink	#40 Dama de Noche St. Payatas A Quezon City	*Aedes aegypti*	3	94.7

[2] Barangay is a village or suburb, and is considered as the smallest administrative unit in Philippine political structure

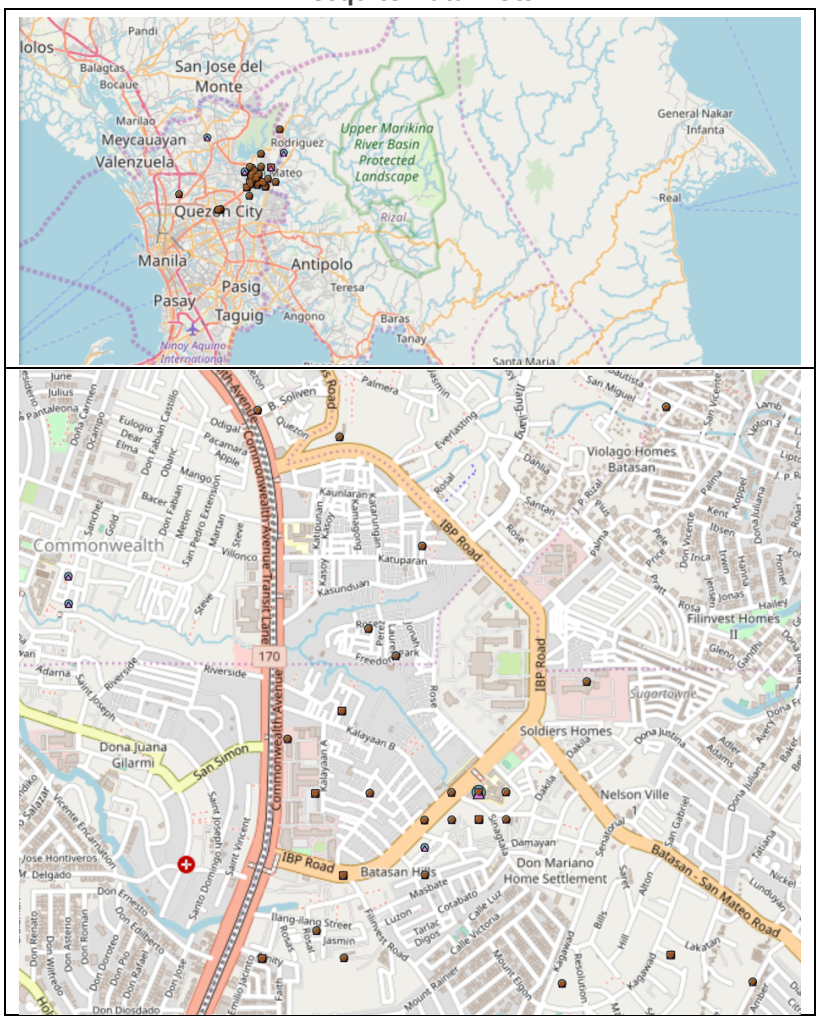
148001	Batasan Hills National High School	Plant Pot	Banaba,San Mateo Rizal	*Aedes aegypti*	3	88.7

Source: Modified from GLOBE Advance Data Tool (ADT)

ACTION RESEARCH

Sites containing high concentration of mosquito larvae (i.e. more than 10 per 220ml of water) were tagged in the map, and reported to Barangay Health Officials thru the Barangay Captain for proper action and elimination of mosquito threat.

Figure 1
Mosquito Data Plots



The idea of setting up a Community-Based approach in combatting Mosquito threats suits well in high risks communities like *"Barangay Batasan"* where dengue is endemic. But, its successful implementation

depends on the placement of key institutional structures such as communication lines, organizational structures, and administrative relationships with government and non-government organizations, that would empower the community to quickly and effectively respond to mosquito threats.

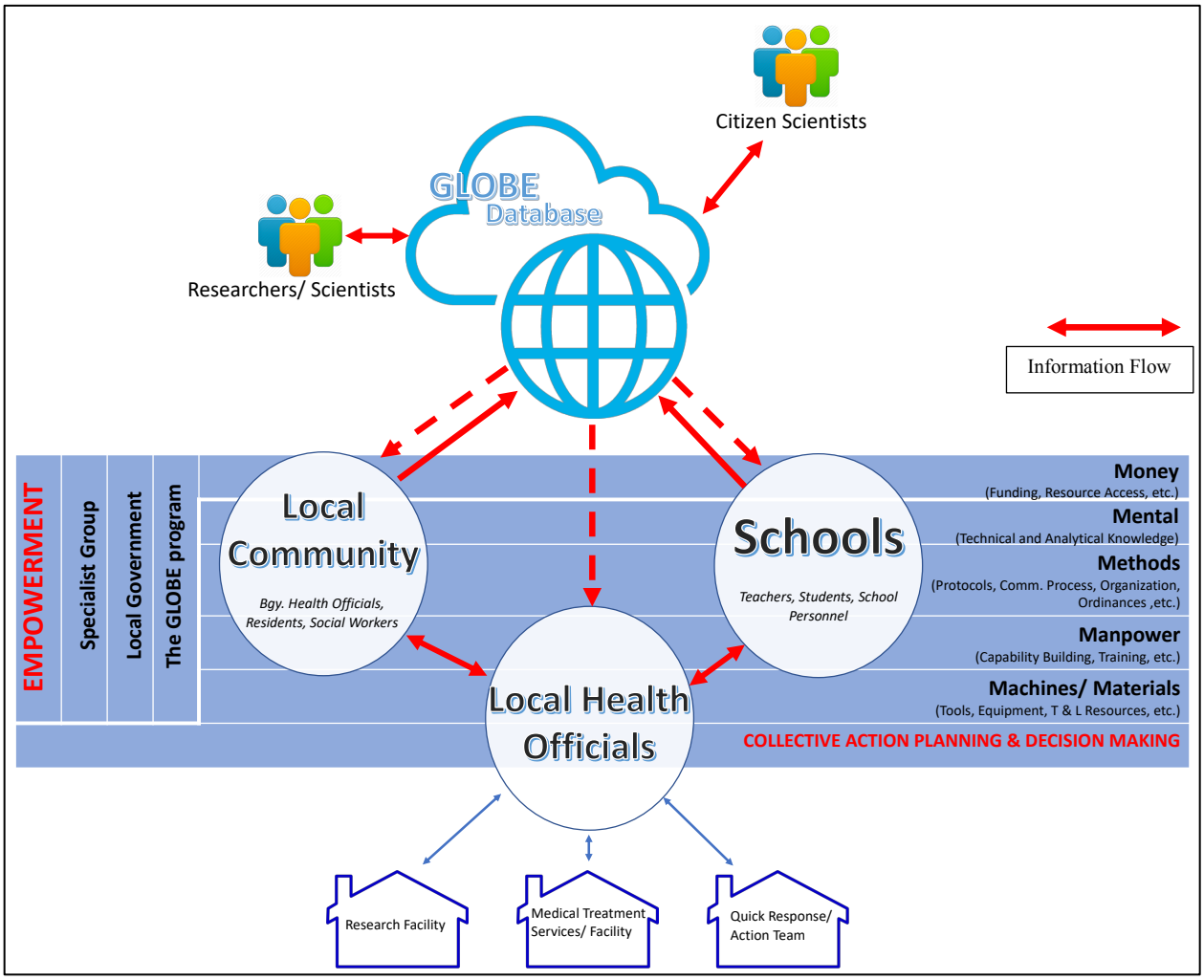
Community empowerment refers to the process of enabling communities to take control of matters concerning the welfare of its residents. But, true empowerment comes only when community leaders are provided with the necessary knowledge, skills, resources, and technology to make decision as well as to address a problem.

CONCEPTUAL FRAMEWORK

Three (3) main actors have been identified in the proposed Community Based Framework – Local Community, Schools, and Local Health Officials. Community Leaders and Teachers are the primary driver of this approach. They will be trained and certified in G*LOBE Mosquito and Allied Protocols* and shall be primarily responsible in regularly populating the GLOBE Database with real time information. They are also expected to be proficient in the Data Entry, Data Visualization, and Data Retrieval features of the GLOBE Database System; and communicate those information to Community Health Officers for further action.

Local Health Officials will likewise be trained to access/ retrieve data from the *"GLOBE Database System"* in order to pinpoint not only the exact location of problem areas but also to determine the appropriate response or intervention required. On certain occasions, particularly when the local health office is either ill-equipped or lack the technical knowledge to address the situation, local health officials may refer the problem to *"specialists"* for proper action.

Fig. 2
Conceptual Framework



The key components of an effective Community Based Approach are as follows:

Components	Description
Community Advocacy, Social Mobilization, and Local Governance	Embedding the GLOBE Mosquito Protocol in designing a community-led mosquito policy and action plans
Community Empowerment	Enabling communities with the tools, resources and knowledge to address problems including but not limited to: Legislative and enforcement support, organizational and governance structure, finances and access to resources, infrastructure, and technology.

Integrated, Multilateral, and Multisectoral Approach	Particularly in third world countries, the problem of mosquitos is a *"Complex"* one, requiring the collaboration and cooperation of various civil sectors, and integration of different disciplines to solve, or even understand. The idea is to bring together a diverse group to establish pertinent policies, and draw-up relevant action plans.
Evidence Based Decision Making	Using information communications technology and database systems (e.g. GLOBE Database) to draw, convey, and transmit relevant information.
Capacity Building	Provision of essential financial, infrastructure and human resources to manage local action plans and strategies on the basis of a situational analysis.

FURTHER STUDY

Due to lack of time and resources, the research group is unable to fully *"test"* and *"validate"* the effectiveness of the aforementioned Community Based Model. With proper funding, it is the intention of the group to further enhance this model by testing it in actual communities. If given the opportunity, part of the grant for the IVSS, shall be used to fund further research on this subject.