



The Andrew Report

A review of the spread,
application and social impact
of ecobrick building techniques
six years on in the Cordillera
Administrative Region of the
Philippines

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and Russell Maier

a Global Ecobrick Alliance Report

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Illustration 1: Andrew and Ernesto Bondad outside of Antidao NHS in January 2018



Summary

In January 2018, Andrew Dieleman was able to visit, review and analyze various ecobrick cob and cement building pilot projects that had been made during the period of 2010-2012 in the Cordillera, Administrative Region (CAR) in the Northern Philippines. Andrew was able to interview many of the caretakers of the structures, as well as question the school teachers, principals, students and community leaders involved with the ongoing ecobrick projects in the region. The following report chronicles Andrew's observations and analysis of both the constructions and the current social status of ecobricking in the region. The report was compiled after an extensive debrief with Russell Maier in Bali, Indonesia. The report contains archival photos from five years ago, and photos from Andrew's expedition. The report closes with our general observations and recommendations for the principal parties involved in Ecobricking in CAR.

We feel that the global ecobricking movement has much to learn from the success and failures of the ecobrick spread in CAR—especially as the GEA prepares to introduce Ecobrick Earth Building in Indonesia and in the Southern Philippines. We hope that the hard work of a quarter million ecobrickers in CAR over the last half decade will inspire even more and better plastic transformation in the years ahead.



Illustration 2: An early article in the Mt. Province Exponent covering the making of “bottle bricks” with a high school in central Sabangan, before the word ‘ecobrick’ was applied.

History

From 2009 to 2014 the ecobricking movement began and spread in the Northern Philippines. After 2013, ecobricks had spread so widely in the school system that Churches, governments and schools were all making ecobricks on their own. Russell Maier, Irene Bakisan, and Pi Villaraza worked hard to develop the Vision Ecobrick Guide to discern and ensure best practices for ecobrick making. In 2011, realizing the urgent need for good building practices Russell mentored under Zelimir Strugar, a master mason and cob builder, who had been been building with cob for two decades in the Philippines. Learning from his cob techniques, Russell and Zeli teamed up with Mahitosh Eguia, a Filipino Cob builder from Maia Earth Village, Palawan. Together they developed the core methodology for building with cob and ecobricks-- the fundamentals of which remain the building methodology advocated by the Global Ecobrick Alliance. In 2013, with wide demand by communities for ways to use their ecobricks, the first version of an ecobrick construction guide was released online and through the Cordillera Department of Education to assist the spread of best practices. However, ecobricking was then so dispersed and successful, that schools had already begun to implement building and gardening projects on their own. The team of Russell, Mahi, Pi and Zelly were thus involved to varying degrees in a handful of builds, and in their techniques were applied in varying degrees in many others in subsequent generations of the ecobrick spread¹.

The full history of the start of the Northern Philippine ecobricking can be [found here on Spot.ph](#)

¹ In this report we used the term ‘generation’ to refer to the distance from the team’s methods-- for example, a first generation construction learned directly from Russell, whereas second and third generation builds were going on a trained builder, or just Facebook photos.



Sabangan, Mt. Province

Sir Ernesto's Ecobrick River House

Location: Sabangan, Mt. Province

Main Contacts: Ernesto Bondad

Denver Puyongan: jdpuYGONAN@gmail.com, 09285991607

Date Ecobricking begun: 2009

Andrew's visit: January 2017

Current Ecobrick Status: *Sir Ernesto continues to improve and expand the farm house with bottles. He sources ecobricks from the nearby Sabangan Elementary School which continues to make them and use them for their garden.*



Cementing Sabangan's first ever ecobrick wall in 2010.

In 2010 Russell and Councillor Ernesto Bondad conducted [the very first Mt. Province Ecobrick building experiments](#). The initiative was inspired by Sonja Prexler-Schwab, who had shared with Russell the technique developed with sand bottle bricks in Central America. The ecobricks that were made then from the plastic collected from river burn pits were used to build the very first ecobrick retaining walls at Sir Ernesto's farm house. The first walls were made with 100% concrete and ecobricks. Later, using the technique developed by Russell and Zelmir and Mahi (who all visited and helped build) the front wall of the farm house was made with ecobricks and cob

in 2011. Sir Ernesto continued building and expanding the house from 2011 onward using ecobricks made by the neighboring elementary school and also colored water filled plastic bottles.

Andrew's Observations on the River House:



Illustration 3: Outdoor cob work (which is protected by an overhanging roof) continues to endure and look fantastic.



Illustration 4: Elementary school ecobricking continues, however without education and guidance poor techniques result.

- Cob construction on outside looking like new
- Cob on inside looks unfinished
- Walls could be made thicker to protect bottles
- First one meter of wall (from ground up) was sustaining the most wear and tear
- Cob construction walls must be kept dry, near bottom, water through capillary action has allowed some 25 cm of white mold to develop on bottom
- Key is to have large overhanging roof to protect wall from the elements
- Outside Water filled bottles by the snake seem to reflect sunlight very well and have very little damage
- But where an air bubble is present it seems to catch sunlight for that spot was definitely quite damaged.
- A suggestion would be to tilt bottle slightly so air bubble goes away from the base when constructing. Also noted where dents exist that area catches more sunlight and accumulates more damage
- Sun exposed bottle caps seem to disintegrate faster than the PET plastic of the bottles.
- On the wall, almost all the caps had degraded and disintegrated off
- I estimate that caps only last 3 years
- All the town builders that I talked to observed that when bottles are facing the sunlight, the caps become brittle and break off

- Empty plastic bottles that were used for construction had more sun damage than ecobricks or water bricks.
- The bottles with water seem to last amazingly well - no air bubbles
- However, water filled bottles, once damaged were impossible to fix, became empty, or bubble filled.

Andrew's Farm House observations and suggestions:



Illustration 5: Bottle tops inside farm house are becoming brittle and breaking. These should have been covered or smaller bottles used.



Illustration 6: Bottles tinted with blue food coloring and gin continue to look great.

- I still think cob is the best visually and environmental to build house walls from but will take more time for the locals to switch from their love of cement.
- Cob making halted after Russell left Sabangan. Sir Ernesto continued construction with water filled bottles and ecobricks from the neighboring school. All further constructions and additions were done in cement.
- The primary school 100 meters from the farm house continues to make ecobricks. They use them for basic garden beds, or sell them to Sir Ernesto.
- The interior effects of the transparent bottles are still great. Amazingly, the blue tinted bottles have kept their color 100% after five years. The other colored bottles (red and yellow) slowly faded. The blue was achieved with MacKenzie brand food coloring, and 5% San Miguel gin added to

the water.

- Andrew also observed that water filled bottles had lasted, but colors, other than blue, had faded. Green Sprite bottles still had their color.
- Bottles filled with water, yet that had an air bubble, were experiencing fast photo-degradation around the air bubble. Most likely this was due to reflected UV rays from the water's surface, effectively doubling the photo-degradation.



Illustration 7: Note the air bubble in the green bottle. Close inspection showed that the indent was degrading fast due to reflected sunlight. Note also the blue bottle-- this bottle contains no air bubble and has endured. The other grey bottles once contained color water. The water has either escaped or the color faded. Somehow the blue food coloring has endured unfaded for five years!



Albago Nation Highschool (Sabangan)

Location: Upper Sabangan, Mt. Province

Main Contact: Denver Puyongan: jdpuYGONAN@gmail.com, 09285991607

Date Ecobricking begun: 2011

Andrew's visit: January 2017

Current Ecobrick Status: The school continues to ecobrick, and build walls with ecobricks. They are keen to begin with modules.

This high school was never visited by Russell for any ecobrick training or building consultation. It is a great example of the successful spread of ecobricking by word of mouth, and the potential pitfalls of unguided ecobricking and building. The school is also a good case study of ecobricking without proper plastic education.

Andrew's ANHS Field Notes

- The school was not aware of the ecobricks.org web site.
- I walked the teacher through the site, I also had a demo day demonstrating the new building with silicon, now they have a gun and enough silicone for a while...200 kids

..wasn't expecting that... also started them on a art class making wind chimes from old beer-bottle caps..but with only 3 caps due to last second gathering and no tools we improvised and sort of got it done... find that kids are more visual than gathering info from diagrams. .



Illustration 8: Ecobricks were being used extensively around the school for garden borders. The school has developed a technique to minimize the use of cement to build with the ecobricks. No cob is used. However, the bottoms of the bottle have full sun exposure. Wear and degradation can already be observed. Ecobricks will be destroyed in only a few years.



Illustration 10: We also observed the simplest (and most ill advised!) use of ecobricks to make garden borders. The teachers and students were not aware of the dangers of photo-degradation of the plastic. This shows the importance of coupling plastic education with ecobrick making.



Illustration 9: The school was using ecobricks to make extensive school benches. This was one of the best techniques that we observed: a solid, nice looking bench. It might even be possible, given the thin mortar, to remove the ecobricks when this construction is destroyed. Still however, the bottoms of the ecobricks have excessive exposure to the sun.



Illustration 11: Cob construction of the circle garden in the Balili Food Forest Playpark.

Balili Elementary

Location: Balili, Mt. Province

Main Contact: Junesay and Rebekah Bakala

Date Ecobricking begun: Early 2013

Andrew's visit: January 2018

Iteration Generation: First generation-- Russell personally supervised.

Current Ecobrick Status: The school continues to ecobrick. The Food Forest Play Park is still being used, the mango tree is growing tall!

Balil Elementary was Russell's most focused application of ecobrick techniques and cob construction. Russell resided in Bali in the Fall of 2013 and worked with Junesay Bakala, Rebekah Bakala, and the elementary students and their parents to rebuild the central school space into a pilot food forest play park. The construction used 500 -700 ecobricks. Herbs, berry plants and fruit trees were sourced and planted. The majority of the bench constructions followed the current ecobrick guidelines for cob construction now listed on Ecobricks.org. This site is thus of much interest to us to see how our methods have fared over the last five years. Right at the very end of his stay, Russell introduced ecobrick hexagon modules. The school is still using some of the various first modules ever made.



Illustration 12: Bottle tops exposed to sun have disintegrated. Bottle caps disintegrated first. Note cement cover up on ecobrick tops below.



Illustration 13: The majority of a hundred ecobricks that had been extracted from cob were largely in great shape. Only 10-20% showed damage to the tops. We suspect this was because they were protruding and sun exposed.



Illustration 15: In some places the cement render had fallen or most likely been broken away from the bench surface. In this case, some of the cob was beginning to erode and the exposed bottles, were beginning to fade and degrade.

Andrew's Balili Field Notes

- I updated them on Ecobricks.org website. They were not aware of it.
- Kids are using glass bottles for rock target practice as they have access from town road. Glass bottles used in this construction are mostly broken.
- Original ecobrick hexagon modules (4 years old) in grade 1 class are still in use as stools, but I did notice some of the silicone has detached and may fall apart soon.
- I showed teachers that roughening the area of the silicone joint with sand paper may help silicone to stick longer. (But may lead to overly permanent joints).
- Teachers in all the school's are still very excited to be involved with ecobricks.
- Teachers and students have realized that sun destroys their bottles quickly so they are covering bottles with concrete as budget allows (see photos)
- The school had to remove ecobrick tables to make way for a new septic tank. I would estimate 70 to 80 percent no damage, with the others damaged necks but still usable. These were in the cob construction with cemented outer skin around the bottle necks.
- All schools seem not to do cob because the kids find it too much work so cement is used, but more on this later.



Illustration 14: The food forest play park continues to be a nice green space for students to play and eat their lunch.



Sagada National High School

Location: Sagada, Mt. Province

Main Contact: [Binggirl Clemente](#) , private consultant

Date Ecobricking begun: 2011

Andrew's visit: January 2017

Current Ecobrick Status: The school continues to ecobrick, and build walls with ecobricks. They are keen to begin with modules. They are beginning use of a community shredder.

Sagada National highshool was one of the early adopters of ecobricking in Mt. Province. Because of its Sagada location it had indirect assistance from Russell and Irene Bakisan, and others trained by them to make ecobricks and build. The school began ecobricking before the mandate to use only clean plastic went out. Russell advised on the creation of the stair case. However, it is important to note that Russell never visited the school personally to guide with construction. All the applications at the school were improvised by the parents, teachers and students. All applications involved cement, no cob was used.



Illustration 16: Ecobrickens 'sunken' fully into wall and also protected from the sun by a roof. Great!

Andrew's SNHS Field Notes

- I feel that the flower from sunken bottles still look cool and a naturally occurring moss growing to partial cover them..blocking out most of the sun.

- Regarding the build up of methane gas in the bottles, I didn't take any apart, but bottle pressure wasn't noticed, nor moisture, unless bottle integrity wasn't good.



Illustration 17: "Over exposed 'crappy' looking wall"



Illustration 18: Using painted ecobricks to make a pixelated ecobrick and cement sign



Illustration 19: The community shredder

- All schools are excited about building furniture modules.
- More thought.. When sagada school was building retaining walls with wooden forms they found out bottles float in wet mix. They then made concrete thicker which helped but makes the wall crappy... Looking and thinking I almost feel that they should be focusing on making modules and time capsule them in soil and capped in cement.. A stage would be perfect.. But getting enough bottles they would need to borrow from other communities... Concrete emissions from setting aren't that great, and looking at short term planning the bottle walls may be moved further in time resulting in plastic being spread again...
- In Sagada there is a new plastic shredding program started by Bing Girl. Near the school in an old shed is a new plastic shredder that cuts the plastic in smaller pieces to make it easily for kids to fill ecobricks.
- The program was supported by Coca Cola, and involved importing the shredder from abroad.
- There is a small fee charged so that the community can take their clean and sorted material there and for ten pesos have three kilos shredded, thus getting the whole community on line rather than just placing the burden on school kids..
- Also they tried using plastic for pillows but found used plastic stinks
- Passed on some ideas to make it much cheaper by using a motorcycle as a power plant instead of an expensive electric motor, gearbox, control box, etc.

- Because there was no training or education involved with the bringing the shredder, no one really knows how to maintain or fix it. I observed that the small cable that they are using with it may draw too much voltage if ever used to full capacity. I estimate that this will reduce the life of the motor by 85%. Once it is burned out, no one will know how to fix it too.



Illustration 20: Shredded plastic can then be easily ecobricked.

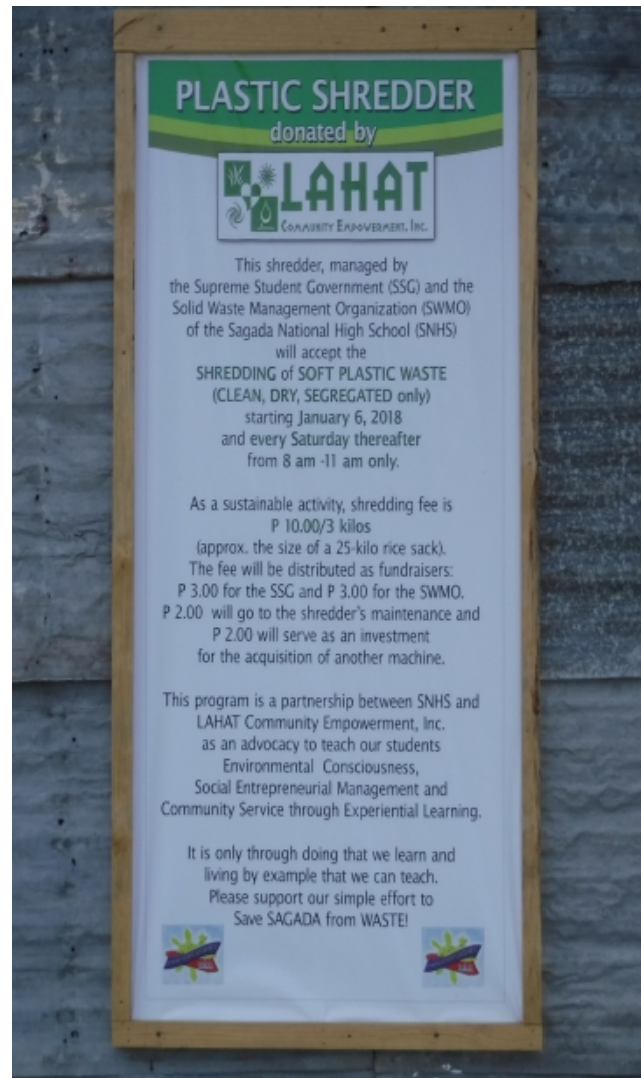
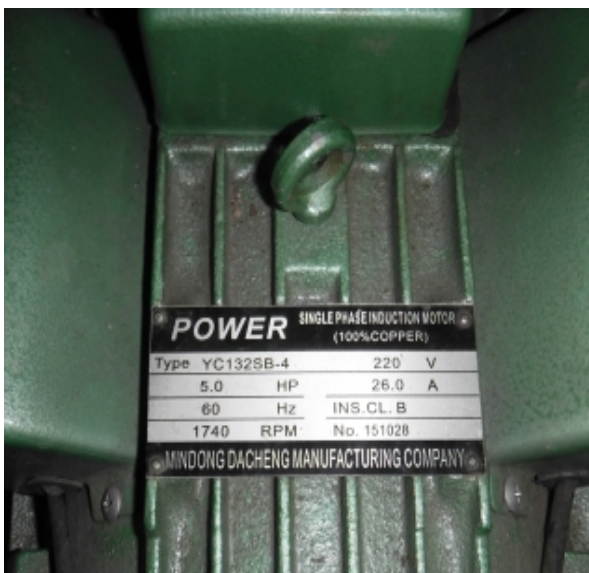


Illustration 21: The community shredder program



Illustration 22: A not so ideal use of ecobricks in Bali, Mt. Province. Caps show signs of fading and degradation. Ecobricks are fully stuck in cement and will not be able to be removed without being damaged.

Andrew's General Observations

- None of the schools were aware of the Ecobricks.org website.
- Schools also weren't aware of how to build ecobrick modules.
- Schools were very keen to make ecobrick modules as they see a very practical application.
- They also weren't aware of the GoBrik app.
- Students and teachers did not know how to navigate the ecobrick drop down menu on the website.
- All schools and locations were using cement to put their ecobricks to use, or burying them top down to make gardens
- Schools had not seen the Vision Ecobrick Construction Guide
- All locations had abandoned the use of cob to build with
- I observed that at all locations, exposed bottles were being slowly destroyed by the sun. In places where bottles were getting full exposure, the caps disintegrated first, then the the bottles would crumble to pieces.

- Teachers and students were becoming aware that bottles and ecobricks were being destroyed by the sun and were taking care to reduce exposure. In Sabangan, everyone seemed to now understand this from observation and experience over the last years.
- No methodology or indicators were introduced with ecobricking that can help us quantify whether there has been a reduction in plastic consumption individually, in households, and in communities. There is no way to analyze this now.
- Somehow, blue food coloring lasts forever!



Illustration 23: The Bali Elementary Food Forest Play Park: planted throughout with fruit, herbs and other edible plants. All the garden walls and benches were built with ecobricks.

GEA Recommendations

Sociological Recommendations

- The Department of Education should take the initiative see principals, teachers and staff trained to work with ecobricks. A CAR GEA Training of Trainer workshop would be ideal.
- By employing some of the certified GEA trainers from the network in Manila and Cebu they can learn from the innovations made in Indonesia and the rest of the world over the last five years.
- The Vision Ecobrick Construction guide should be printed and distributed to CAR schools to help supplement and guide their ongoing ecobricking.
- With the help of GEA trainers, module making can be introduced to the schools to help put new ecobricks to use.
- DepEd CAR should conduct its own report and analysis of ecobricking in its schools. This report could help us understand:
 - To what degree schools are still ecobricking?
 - To what extent ecobricking has impacted the consumption of plastic?

- In what way ecobricking has effected the consumption habits of students and communities?
- Has the net dumping and burning of plastic has been reduced?
- In what ways are ecobricks being used?
- How have schools transitioned ecobricking from a fad to a normalized routine and habit for schools and classes?
- The GEA should employ anthropologists and sociologists to thoroughly examine the ecobrick movement in CAR and its impact and the questions above. The rest of the world can learn much from what has happened here.
- Creation of ecobrick community banks. This would help bigger projects materialize and builds a network between schools and other community groups, for instance the student government groups. It would give students a chance to contribute and get help outside their village.
- DepEd CAR should explore using the new GEA GoBrik app as a way to track the ongoing creation of ecobricks.
- The GEA, DepEd CAR and other ecobrick movements should follow the progress of Sagada's adoption of a community shredder. A formal request for a progress report from Binggirl Clement should be made.
- The results of this centralized service for ecobrickers, could be replicated in other mature ecobrick communities using the open source Precious Plastic shredder machine plans. However, important questions need to be addressed:
 - Who owns and maintains the shredder?
 - Does the use of the shredder make things easier for ecobricking?
 - Does easier ecobricking decrease the incentive to reduce one's consumption of plastic?
 - What is the net effect on plastic consumption and disposal in the community?
- The GEA, Mahi, Zeli and Russell must re-examine the way that they introduce earth based ecobrick building technique. The dispersion and retention of cob building techniques in CAR was a failure. No one continued-- despite the benefits and long term endurance of cob over concrete which we see clearly five years on. We recommend that the earth building pedagogy be improved to allow for:
 - The empowerment of builders as trainers. This way, building projects result in the training of participants to train others.
 - The focus on tiny building projects such as bench and garden making. This way, the barriers to replication are minimized.
 - The simplification of the cob technique for bench making. For benches, custom ratios are not required.
 - A clear technique for the outer skin/render of the bench.

- The GEA Trainers and DepEd CAR should collaborate. It would be valuable for southern Filipino GEA trainers to make their way up to CAR and visit some of these constructions, to meet the makers and learn from them on their failures and successes.
- DepEd CAR can also greatly benefit from the from the formal trainings of certified Filipino GEA Trainers on new ecobrick techniques (i.e modules and lego). Ideally a full three day [Training of Trainer](#) session in Baguio for 40-50 DepEd CAR teachers would have a tremendous effect. The GEA should do what it can to aid this connection (this report is intended as a step in that direction).
- A method of tracking the net amount of plastic consumed on the individual, household and community level is needed. This way we can discern the impact of ecobricking over time on plastic consumption.
- Using ecobricks for Food Forest Play Parks remains one of the best possible uses for schools and community's of their ecobricks.



Illustration 24: Students in Cebu show off their ecobricks and ecobrick modules.

Construction Insights and Recommendation

- Ecobricks must be as covered as much as possible in all outdoor constructions
- DepEd CAR would benefit from the introduction of ecobrick modules to the schools there. This is a potential skill exchange opportunity between GEA Trainers in the South and schools in the North that have been building.
- “Water bottle bricks” are not ideal and lead to many long term aesthetic and construction problems, though when applied properly can last long and add color and light to walls.
- Split bamboo could potentially be used to cover the caps of protruding ecobricks, then could be held permanently in place with cob or cement render.
- Blue food coloring, mixed with a small amount of gin, is the best for retaining its color.
- Bottle caps degrade in the sun faster than bottles and should be covered
- No compromised ecobrick ‘flowers’ were observed on the facade of constructions. It seems that ecobricks that are completely covered except for the ‘flower’ endure and are fine.
- It may be possible to build fully cement ecobrick benches where the ecobricks can still be extracted upon destruction by using very little mortar. However, it still seems using cob is best.
- Given the increased photo-degradation seen in water-bottle bricks that had reflective air bubbles, the GEA needs to test whether silver lined ecobrick bottoms also have the effect of speeding up the bottle’s degradation.

Key Players

Andrew Dieleman

Andrew is a Canadian mechanical engineer. He lives in Nelson B.C, Canada. where he rebuilds machinery and enjoys clean nature and traveling. As an impartial, non-affiliated observer, his field notes and observations served as the basis for this report.

Bingirl Clement:

A resident of Sagada, Bingirl has been at the forefront of waste management initiatives in Sagada Mt. Province for the last decade. Her efforts in Sagada lead the way for the spread of ecobricks. She was instrumental in bringing the plastic shredder program mentioned in this report to Sagada.

Ernesto Bondad:

Sir Ernesto was a town councilor during Russell's time in Sabangan Mt. Province. He was one of the lead proponents of ecobricks in the community as a way to deal with the town's plastic crisis. The very first ecobricks were made at his farm house and used to help in its rebuilding.

Irene Bakisan:

Irene and Russell worked together at the early stage of the Filipino ecobrick movement to integrate ecobricks into the school system. Together, Russell and Irene composed the first version of the Vision Ecobrick Guide and saw it spring through the Mt. Province school system. Irene is currently the DepEd assistant superintendent of Apayao, Philippines.

Junesay and Rebekah Bakala:

Rebekah is the elementary school teacher of Balili Elementary, and one of the early and passionate advocates of ecobricks. Her husband Junesay, worked with Russell to build the first Ecobrick Food Forest Play park at the school, which remains today a showcase of optimum ecobrick application.

Mahitosh Eguia:

Mahitosh is an earth builder based in Cebu Philippines. He has worked with ecobricks since the beginning of the movement in the Philippines and with Russell in Nepal. Together they have developed earth building and bottle techniques. Mahi has built mud houses and structures around the Philippines.

Pi Villaraza:

Pi is a Filipino healer, who helped catalyze the ecobrick movement and connect the early earth building team together. He is based in Maia Earth Village, Palawan where his visions was instrumental in seeing the construction of numerous cob homes and structures for the community

Russell Maier

Russell is a regenerative designer and one of the principals of the ecobrick movement in South East Asia. He co-founded the GEA and continues to work on innovating ecobrick applications.

Zelimir Strugar:

A German born master mason, Zeli, moved to the Philippines over two decades ago. There he observed that cob building methods were an ideal structural solution for the Filipino climate. He began experimenting with cob, and his time tested Filipino constructions and techniques lay the foundation for ecobrick earth building methodology as expanded on by Russell, Mahi and Pi.