The Rise of the Regenerative Ecobrick Movement

by

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"We envision a Transition from plastic in our Homes, Communities and Companies to an ever greener harmony with Earth's cycles."

- Global Ecobrick Alliance Vision

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Summary

Over the last 50 years, industrial attempts to manage waste plastic have been systemic failures. Industrial recycling has lead to the widespread export of western plastic to Asia where it has leaked loose into the biosphere. As the plastic has accumulated, the detrimental ecological impacts of its degradation have become clear. In Asia, where the brunt of the world's plastic has landed, communities have banded together and found a solution in ecobricking. Ecobricking first emerged in Asia in the Northern Philippines, in the land of the Igorot people. There, it was influenced by the Ayyew ethic of the Igorots, and the Filipino spiritual and permaculture movements to emphasized circular, localized, low-tech regenerative principles. The Filipiono ecobricking movement emerged with a focus on sequestration and plastic transition, was distinct from contemporaneous plastic movements that fell back on industrial recycling. As the movement spread to Indonesia, the Ayyew ethic evolved into a core set of regenerative principles offering a beacon towards deep petro-capital transition.

Petroleum, Capital & Plastic

The ubiquity of plastic in the lives of humans of all classes and cultures around the world is one of the hallmarks of our time. But, what exactly is this wonderfully useful, yet terribly troublesome material? Today there are thousands of different types of plastic, however, they all derive from the same place: under the earth. For the last fifty years crude petroleum (and lately natural gas) has been extracted and turned into gas energy sources-- gasoline, diesel, jet fuel, etc. Never before have humans had access to fuels with such high energy returns*. Post-industrial capitalism has boomed throughout the last century in direct correlation to our access to abundant fossil fuel resources. These fuels have fed the machines that power our economies that power our lives. Indeed, the availability of these fuels enables continued global economic growth[1]. But, there's a catch. In the process of refining crude oil between 4-13% of each barrel cannot be used for fuel production.[2]

This by-product happens to be the ideal feed-stock for polymer production. If you've ever wondered how plastic could be so cheap and abundant, well this is why. As countless billions of barrels of crude oil have been processed to fuel the economic growth of the last century, the production of plastic has been effectively subsidized. Since 1950 an estimated 8300 million metric tons (MT) of virgin plastics have been produced worldwide.[3] The relentless growth in yearly plastic production has exceeded all other manufactured materials, going from 2 MT produced in 1950 to 322 million MT in 2015[4]. This production trend has continued over the last decade in direct correlation to economic growth[5] . And it is continuing. According to the American Chemistry Council, since 2010 $186bn dollars has been invested in 318 new projects to fuel a 40% increase in plastic production over the next decade[6].

What to do with all the plastic?

To understand the emergence of ecobricks, it is essential to understand the full context from which the movement arises-- in particular the failure of the various industrial methods of plastic management, the routes they take plastic and the widespread societal desire to take effective action that has arisen. Landfilling, recycling, and the incineration of plastic are the three most common industrial solutions. However, over the last fifty years, it is now crystal clear that these efforts to manage end-of-life plastic have failed dramatically. The documentaries by David Attenbourough, the experience of countless beach walkers and divers are now backed up by research. It is estimated that of the plastic created since 1950, only 9% of which have been recycled, 12% were incinerated and 79% have accumulated in landfills or the natural environment[1].

Dumped, Land-filled, Littered, and Loose Plastic

The first and most common method of industrial plastic management is the large scale 'engineered sanitary landfill'. When we think of plastic being sent to a 'landfill', it is good to remember that all landfills were once fields, forests, rivers and thriving ecosystems. Almost all towns and cities have resorted to land-filling plastic in some form or another at some point in time. In Indonesia and the Philippines both engineered land fills and in informal dumpsites surround every major city. Whether the dumpsite has been engineered or not, the consequences are pretty much the same as littered plastic loose in the environment: the slow and steady degradation of plastic. As we will see later in the paper, loosely disposed plastic degrades into microplastics, toxins and green house gases (see Appendix fig.1 "A Millennium View of Plastic"). In South East Asia, land-filling (or dumping) is the most common means of managing plastic. In Indonesia, for example, an estimated 80% of plastic goes straight to informal or formal dumpsites.

Reuse. Reduce. Recycle?

In the face of the evident destruction and desolation caused by land-filling, a coalition of companies and the public sector in America pushed for collection programs in the 1950's. According to historian Bartlow J Elmore[7], the companies behind the campaign successfully framed waste as problem for

consumers rather than one for the companies that manufactured the items[8]. As a result for the last three decades, industry and government have encouraged and even legislated consumer recycling of plastic.[9] However, rather than reduce the amount of plastic flowing to the biosphere, the world has seen a dramatic growth in *both* the production and dumping of plastic[10] [1]. This is no coincidence.

The recycling industry, whether it is the municipal programs of Europe and Northamerica, the 'Bank Sampah' (Garbage Bank) system of Indonesia, or the scavengers of the Philippines, is effective in recovering high value plastics that can be processed and sold again for their material value. However, this is precisely the problem. Plastics enter the recycling system because of their high value, but they exit with a lower value. When processed, the grade of virgin plastic is almost impossible to maintain[11]. With each cycle, the grade decreases and value decreases proportionately. And so too does the likelihood of it being recycled the next time round. Eventually, all recycled plastic is "down-cycled," becoming of insufficient value to warrant the industrial effort and drops out of the recycling system. Perhaps it is put in a trash can rather than a recycling bin. Perhaps recyclers pass it by on the side of the road. Perhaps it simply falls off the conveyor belt and is swept away to the landfill. One such fate is inevitable. Unlike the three-arrow symbol would like us to believe, industrial recycling is not a closed circular process-- rather it is a a downward spiral resulting in all plastic eventually escaping into the biosphere.[12]

Western recycling companies, realizing that the challenge of meeting local environmental guidelines was near impossible, began to export in earnest their recyclable plastic to China for processing in the early 2000's-- thereby preventing it from going to landfill or being locally incinerated.[13] Up until 2016, China was importing half of all plastic waste intended for recylcling (7.35 million MT) from 43 different countries.[11] European countries lead in exporting (i.e. Germany, UK, Netherlands, France), contributing to 32% ($27.6 billion USD) of all plastic exports, followed by the US and Canada 14% of exports to China.

This worked for a while, but after over a decade of receiving recyclables, the environmental impact of this plastic began to add up. In 2010 China began to increase the stringency of its laws, leading to Operation Green Fence in 2013 to combat illegal plastic imports[14]. In 2017, a Chinese documentaries

'Plastic China' and "Beijing Besieged by Waste" covered the startling pollution of communities dedicated to recycling western plastic and ramped up the pressure on authorities to take action[15]. The documentary illustrated the systematic failures of recycling and the dire local ecological effects as no-longer-recyclable plastic begin to pill up and degrade. In 2018, Operation National Sword came into effect, and 99% of imports of plastics were banned. With no where else to send their plastic, western countries began to scramble for other locations to send their recyclable plastic. In 2018 the UK's waste exports to Malaysia tripled, and illegal exports have increased dramatic to Malaysia, Camobdia, Sri Lanka, Indonesia and the Philippines. From April 2019 onwards, local furor in these countries has grown and these government have begun returning containers to Western countries and raising regulatory requirements.[16] [17] [18] It is estimated that a cumulative 111 million MT of plastic will be displaced by the 2017 ban by 2030.[19]

Industrial Incineration

But what about industrial incineration? Since ancient times burning has been a means to deal with the unwanted residuals of human economy. In modern times, open burning has evolved to the controlled, industrialized incineration of municipal solid waste, often for the generation of electricity[20] [11]. Plastic burned in the open (i.e. in the ditch or a bond fire) still occurs in many counties, in particular rural parts of South East Asia, and is undoubtedly one of the worst scenarios for managing plastic. Such fires releases 2.9 Mt CO2e of green-house gases into air per Mt of plastic packaging.[21] Burned and incinerated PVC plastics have release especially toxic dioxins into the air, earth and water. However, whatever method of burning is used, toxic chemicals, heavy metals, ash and emission gases result depending on the temperature and presence of oxygen during combustion[22]

Industrial incineration has significantly improved burning efficiency, safety and decreased the amounts of problematic emissions into the atmosphere[23]. However, it also has dramatically increased the scale and amount of plastic being burned. At the scale of city and provincial incineration, these small amounts become significant. In particular the incineration process releases CO2. One ton of industrial incinerated plastic release a minimum of 0.9 Mt of net CO2e emissions, even after taking into account the electricity generated by the combustion process.[24] The growth in emissions from both industrial recycling and incineration are significant. A 2019 report by the independent Center for International

Law extrapolated current trends in incineration to show that by 2030 the incineration of plastic would be come one of the world's major sources of CO2 production.[25]

A Lowering of Ecological Consciousness

The emission consequences of vast amounts of CO2 in the transportation, processing, distribution and re-processing of plastic are cause for concern. However, the social consequences are even more troubling. As both industrial incineration and recycling require large infrastructure investments that require decades for a return on investment, *a dependence on plastic generation* is created, while disconnecting consumers from the ecological impacts of their discarded consumption. By posing as solutions to plastic, these industrialized processes lull consumers into the illusion that they can continue consuming, and everything is alright. In cities such as Singapore and Tokyo where incineration is implemented, citizen segregation of materials has dropped to near zero[26]. The unabated consummation, disposal, and creation of replacement plastic compounds, resulting in continuous growth curves over the last two decades, and the decades to come in CO2 emissions and plastic pollution.

Capital, Corporations and Consumption

But plastic recycling wasn't just being sent over to Asia for processing and disposal. Over the last two decades, plastics were being exported to South East Asia in another form: corporate products and packaging.

Large, western based multi-national corporations were using plastic to package, market and distribute their products in the growing Asian market. These companies leveraged the long-lasting, durable and water-fast properties of plastic to pack colorful, non-perishable, single-portion sized products. Without any obligations or costs for the management of the resulting plastic waste, these companies reaped tremendous profits. Meanwhile the plastic waste began to accumulated in communities, towns and cities across the global south-- in particular South East Asia.[27]

The Dangers of Plastic Degradation

For those living in communities where recycled plastic was imported for processing the toxic effects of loose degrading plastic were demonstrably clear. Likewise for those global south countries without the means to export their plastic somewhere else. Aside from being simple eyesores, plastic began to clog drains and waterways. When burned, the acrid smoke would linger. Villagers would observe animals dying in proximity to burn pits. In towns and cities dedicated to plastic recycling all sorts of health maladies began to proliferate.

Over the last decade, scientific research has begun to catch up. Increasingly, scientists are definitely demonstrating the many dangers arising from the degradation of plastic loose in the biosphere. Research has shown that the plastic softeners can leach into food and water[28] . Common plastic softeners such as Bisphenol A and Phalates emulate human estrogen and can cause damaging hormone imbalances in animals, fish and humans. Acetate cigarette filters loose in water, for example can effect the gender of entire fish populations.[29]

Villagers also observed that plastic would crumble into small pieces and "disappear". However, increasingly scientists are realizing that these particles persist, and are contaminating in another way. Through exposure to the sun's UV rays, plastics break-down (releasing plastic softeners) and crumble into micro-plastics. In particular, plastics with large surface areas (i.e. bags and films) are highly susceptible to photodegration, leading to the accumulation in the air, water, and earth of smaller and smaller particles.[30] The degradation process of plastic corresponds directly to the amount of surface area exposed and the length of exposure to UV rays.[31] When dumped and exposed to the sun, photo-oxidative degradation caused by ultraviolet radiation fragments plastic debris into smaller and smaller particles, know as microplastics[32] The photo-degradation process, in addition to creating micro-plastic, has also been shown to emit greenhouse gases, such as methane and ethylene.[33] When C02 and greenhouse gases enter the atmosphere they have been shown to disrupt global climate stability.

Research has also shown that micro-plastics can have possible direct ecotoxicological impacts, accumulate in food chains and cause economic damage because of food safety concerns.[34] Micro-plastics are increasingly found in bottled water, food and fish. The full effects of micro-plastics in our food supply is not yet known, but it doesn't bode well.[35]

A Vast Plastic Ignorance

Despite how plastic permeates the daily lives of peoples in almost all cultures and continents around the world, there exists an uncannily vast ignorance about what it is, where it comes from, and its dangers. Much of this ignorance has been directly orchestrated by large petroleum companies and their corporate clients[36]. The result of three decades of slick advertising and marketing has been to lull consumers into the unquestioned faith in the banality of plastic and that it is industrially solved through recycling and incineration[37]. As plastic is now something most of us have grown up with and lived with for decades, this industrial faith is now a part of modern life. In the West this translates into a widespread faith in recycling[38]. In South East Asia, plastic has steadily replaced organic materials that were once easily disposed and a vacuum in government education curriculae which at no point touch on the properties of plastic, nor its dangers.

The widespread local and global ignorance of plastic has led to some outrageous consequences. Many outright ludicous and poisonous commercial applications of plastic persist. From the continued usage of plastic as a material for single-use disposable items to the use of softplastics to contain hot liquids and foods. The ignorance of most consumers about the where there plastic ends up, has enabled the dumping and burning of plastic by governments and companies goes unquestioned. Alas, this lack of awareness has enabled consumers to keep on consuming-- but the increasing pollution, system failures, and health impacts have also created a growing thirst for knowledge and facts .

Enter Ecobricks

In 2010, the problems of plastic accumulation, plastic degradation and plastic ignorance were nowhere more evident than in the Northern Philippines. One of the most economically poor regions of the Philippines, the Cordilleras, is also one of the most sparsely populated. There, healthy ecosystems and the self-sufficient indigenous culture of the Igorot people continue to thrive. However, from 2000 onwards, more and more plastic products, plastic packing, and synthetic clothing from importers and manufacturers in southern Luzon have made their way into the North.

More and more, the clean air, clean water, thriving ecosystems and circular values began to contrast starkly with the accumulation of plastic-- clogged waterways, acrid burn pits, and dumpsite dead zones. The cultural contrasts were also vast. Often chips and soft-drinks from international corporations were seen for sale in small shops, with a backdrop of men and women working verdant rice terraces. The vibrant hand woven clothing of Igorots infused with tribal colors and motifs a massive inflcontrasted starkly with the flood of imported clothing (polyester clothing, foam shoes, nylon jackets) from Global North countries began to inundate villages in the early 2000's.

Faced with the abundance of incompatible plastic, the fierce Igorot fethic of hard work and repurposing (Ayyew) in the Igorot culture, lead to a thriving economy of 'upcycling' in the early 2000's. Plastics of all kinds were woven, knitted and crafted into all manner of useful creations. From bags, to mats, to household items an informal movement to reuse waste plastic thrived. Similar techniques and movements were growing in other parts of the world, where plastic was also accumulating. However, although these methods produced innovative and useful items, they did little to deal with the sheer volume of plastic accumulating in communities. Furthermore, when these upcycled products came to their end, there remained the challenge of discarding them remains as before.

But the plastic continued to accumulate. In 2012, the provincial government of Kalinga began to sue the down-stream town of Bontoc in the Northern Philippines. Bontoc's plastics were being dumped in the river, flowing downstream and contaminating the waters in Kalinga.[39] The legal campaign was successful, putting tremendous pressure on the city of Bontoc to resolve its plastic problem and to close its river dumpsite. Searching for solutions, the mayor settled upon a technique developed by Russell

Maier, Irene Bakisan and Ernesto Bondad in the nearby town of Sabangan. Inspired by the technique of Andreas Froese in South America[40], who since 2003 had been putting sand into plastic bottles to make bricks, they had begun packing plastic into bottles. The technique, first called 'bottle bricks', enabled the packing of large amounts of plastic into a bottle and presented a low cost, citizen powered solution for the Mayor. He and his staff begun to ecobrick and encouraged the people of Bontoc to follow suite.

The idea of packing plastics into bottles to make make 'bottle bricks' began to spread in earnest throughout the rest of the Northern Philippines. With no recycling collection, facilities or landfills in the region the solution immediately caught on. For schools and community groups, the hands on activity of ecobricking also presented an unprecedented entry point for plastic education. The first edition of the Vision Ecobrick Guide, focused first and foremost on the properties of plastic: its properties, benefits and dangers.

The Genesis of the Asian Ecobrick Movement and its Influences

As the early ecobrick technique began to spread in the Cordilleras, Russell and Irene deemed it important to develop guidelines to point those keen to participate in the right direction. In order to rejoin other movements around the world packing plastic into bottles, they adopted the term 'ecobrick' and initiated the development of the Vision Ecobrick Guide. Their work and the early direction of ecobrick was inspired by Pi Villaraza who was residing in the village of Sabangan at the time.

As president of the Asian Chapter of the Global Ecovillage Network (GENOA) and the principal of the Inner Dance movement that was sweeping South East Asia at the time, Pi had a dual influence on the budding ecobrick movement. Inner Dance's emphasis on individual spirituality and personal healing, inspired the Asian ecobrick movement's emphasis on *personal plastic responsibility*. As the founder of the MAIA Earth Village in Palawan, Philippines, Pi connected the growing ecobrick movement with earth builders and permaculture principles. This helped direct ecobricking away from the cement and structure focused construction applications of the American based Earth Ship movement. Instead, the

Asian Ecobrick movement moved towards non-structural community constructions (such as gardens and play parks) that embodied permaculture food forest gardening and use of earth building techniques.

As the ecobrick and inner dance movement intertwined Russell and Pi, resonated on maximizing the word of mouth, collaboration powered, spread of ecobricking. Since, 2005 Russell, through his fine art practice, had been developing a theory of *collaborative mandalic manifestation*[41]. As in the making of a collaborative mandala, Russell and Pi, consciously introduce the initial ecobricking techniques in such as way that anyone could ecobrick. The initial ecobrick method comprised simple, replicable tasks and an open invitation to participate.

Powered by these insights, more and more schools, towns and churches in the Cordilleras began to turn to ecobricking as a solution for their plastic. The incubating Igorot culture thus came to have a significant influence on all aspects of the movement. Irene Bakisan, director of the DepEd Indigenuous Studies program, was the first to draw a connection between the Igorot virtue of Ayyew and ecobricking. Representing the *concept of ever increasing, ever enriching, cycling* the Ayyew virtue represents a concept distinctly lacking in the Western concepts of waste management. In many ways, it is in fact the opposite dynamic of the downward spiral of industrial recycling. Instead, Irene envisioned ecobricks embodying the principle of indefinite repurposing, with ever increasing ecological value. As various branches of the Filipino ecobrick movement experimented with using cement in constructions, the Igorot influence helped steer the movement towards cradle-to-cradle, circular design principles. In other words, rather than putting ecobricks to use in ways that terminated the usage of the ecobrick (i.e. in one-time cement builds), the movement began developing applications that ensured that at the end of the construction, the ecobrick could be wholely extricated and put to use again. This direction lead to the development of Earth and Ecobrick building techniques as well as Ecobrick modules.

With the Ayyew ethic behind it, ecobricking was in a unique position to do something to plastic that was impossible within the Industrial paradigm. By leveraging the previously problematic properties of plastic (i.e. longevity, resiliency) ecobricking not only enabled the making of effective building blocks,

but enabled the securing of plastic from the biosphere. By packing a PET bottle packed solid, the net surface area of the plastic is reduced a thousandfold. This *terminal minimization of net surface area* means that the plastic is effectively and indefinitely kept safe from degrading into microplastics, toxins and greenhouse gases. By applying cradle-to-cradle building techniques, ecobricks could leverage the resilience of plastic and be reused over and over.[42] Most importantly though, ecobricks emobdied these principles, enabling those who worked with them a hands on introductory experience to regenerative principles.

The Spread in the Northern Philippines

In 2012 the Department of Education, based in Bontoc, introduced ecobricking to 263 of its schools in the region. As the movement spread it became clear that it was essential to further develop the Vision Ecobrick Guidebook to emphasize standardized principles and techniques for ecobricking. To do so they connected with other ecobrick leaders in South Africa, Central America and America to collaboratively develop version 2.0 of the guide, establish the Global Ecobrick Alliance and settle on the word 'ecobrick' to be used in the global movement. The Vision Ecobrick Guide was endorsed by the Alberto Muyato, the Undersecretary of Education Department of Education representing the Cordillera Administrative Region in 2012 and introduced to over 2000 of schools in 2013[43].

The Spread in Indonesia

In 2015 Russell Maier, moved to Bali Indonesia to test the relevance of Filipino Ecobrick insights in Indonesia. Russell's methodology of mandalic collaboration had been refined. He applied the newly developed principles of replicability, non-capital, and non-petroleum to the socialization of ecobricking in Indonesia. In particular, Russell introduced the new ecobrick module technique. Milstein modules had been developed near the end of Russell's time in the Philippines, and presented a simpler means of building with ecobricks rather earth building. Little capital was required and non-petroleum materials were used to enhance the replicability of the method.

Module making enhanced the usability and practicality of ecobricks. Instead of requiring hundreds of ecobricks, land and labour anyone could put together a dozen ecobricks and make a stool. Those

stools could be combined into tables. Tables could combined into beds, stages and more. In line with mandalic collaboration principles, the ease of module making enabled anyone sharing the intention of solving plastic, to make their own module and participate in a wider, shared cocreative process.

In 2015 the Vision Ecobrick Guide was translated by Nurkinanti Laraskusuma into Indonesian. In 2016, Russell Maier and Ani Himawati officially founded the GEA as a not-for profit Earth Enterprise with the mission of supporting the technological and philosophical infrastructure of the global ecobrick movement. In 2016 the ecobrick movement ignited in Yogyakarta Indonesia[44], with the introduction of an ecobrick trainer to trainer program design by Ani Himawati. With a network of two dozens trainers Ecobricks began to quickly began to spread throughout the city. Ani Himawati was instrumental in the development of the GEA training methodoly-- through the GEA over a dozen training of trainers have been deployed throughout the country, leading to the development of a network of 200 Indonesian trainers.

Using this methodology, the Indonesian movement has continued to spread exponentially throughout the country[45] through starter workshops, training of trainers, online trainer of trainers, and ecobrick convergences. Ecobrick workshops now occur on a daily basis throughout Indonesia. The mandalic process is fully realized now in Ecobrick Open Spaces and Convergences-- where dozens of collaborators bring their modules together to make an interactive community learning space.

The Spread to the UK

The unique character of the Asian ecobrick movement, with its focus on personal responsibility, has spread most recently to the UK. The ecobrick movement in the UK was ignited shortly after the airing of Blue Planet II in December 2017 and the Chinese ban of plastic imports on January 1st 2018. In January 2018 Mary Bacoo and Lucie Mann from the UK joined the GEA as trainers. Lucie started the Ecobricks UK Facebook page which took off in October 2018 as concurrent scandals around the UK recycling industry broke on the news and sent ecobricks viral. As awareness spread in the UK of the problems with plastic, the failure of recycling, and the export of UK plastics to South East Asia, hundreds of thousands have begun to search for plastic lifestyle alternatives. The first local GEA

Trainer of Trainers was organized by Lucie in July 2019. As of 2020, there are now over 30 GEA Trainers in the UK, and we estimate that over 500 thousand have attempted ecobricking while 75% of the population have now heared of the technique.

Current Demographics of the Ecobrick Movement

While there are no definitive statistics available on ecobricking, since 2017, the launch of the GoBrik app by the Global Ecobrick Alliance, provides a window on the movement. Although, the statistics available are limited to the users who have signed up to the application, we consider this good representation of the general demographics of the ecobrick movement. As of February 2020 and the publishing of this paper, 40,000 users have signed up to the app from 149 countries around the world. These users have logged over 62,000 ecobricks for a total of 21,000 Kg of secured plastic[46]. 70% of ecobrickers identify as female, 29% as male and 1% as other[47]. Meanwhile, the UK has recently overtaken the Philippines for the largest amount of ecobrickers representing 30% of ecobrickers, Indonesia at 20% and the Philippines at 25%[48]. Based on these number the GEA estimates that there are no upwards of 10 million active ecobrickers in 2020 and that over 30 million people have tried making ecobricks and over 200 million have come in contact with ecobricking.

Failures and Dead Ends

The rapid social spread hasn't always been smooth. Not all initiatives and projects have succeeded. Many were in fact disastrous failures-- leading to more consumerism, more pollution, the deflation of the social movement's enthusiasm, and ecobricking coming to a halt.

Early in the movement as schools adopted ecobricks a spike in local junk food consumption was observed as students sought out soft drink bottles and wrappers to make their ecobricks. In some places, ecobricks would be packed quickly and combined with organic material-- resulting in gassy, squishy bricks which could only be used once or twice. In other places cement would be used to build with the ecobrick-- but when the construction came to its end, the ecobricks were destroyed with the crumbled cement, releasing all their plastic. In other cases, people would make ecobricks then discreetly drop them off on their neighbours doorstep-- thereby avoiding taking personal responsibility

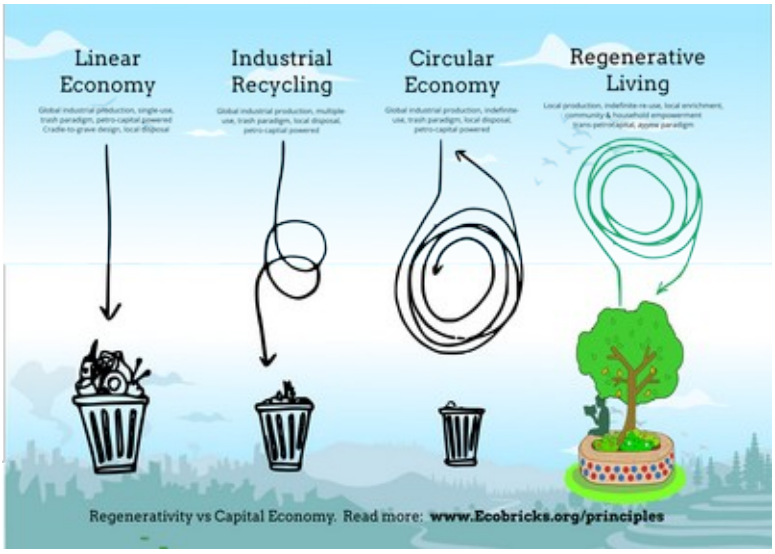
for their waste. In some community groups only one particular gender were assigned to make ecobricks-- thereby leaving the other half unthinking in their continued consumption. In some regions, methods of putting ecobricks to use have been attempted that require engineers and traditional building materials have been attempted-- however these methods failed to spread virally because of the impediments. In observing these failures, the principles that lead to effective empowerment and long-term plastic transition have gradually become clear to those leading local and global ecobrick projects.

The Mechanisms of the Movement

Without any government, corporate or NGO support, the Asian ecobrick movement has spread virally over the last decade from the Philippines, to Indonesia to the UK to the world. It is important to note that the birth in the Igorot Cordilleras, and its principled character, set it apart from other ecobrick, upcycling, and re-purposing movements. Asian ecobricking has spread precisely because the unique socio-ecological context of the Igortos compelled early ecobrickers to ensure that there were no financial, technological or skill impediments to adoption in remote villages and towns. The unique influence of Igorot, Permaculture, Filipino Earth Building and Inner Dance further enabled the movement to define itself as it navigated failures and pitfalls. We've isolate seven key principles that have come to define the ecobricking that has risen out of Asia as a regenerative movement.

Regenerative

The act of ecobricking acknowledges the harm that our plastic consumption has had on the biosphere, and will have if we don't do something. Regenerative design is defined by this initial analysis and the moving forward with an ongoing accounting of our impact. The way that ecobrickers log and record their plastic enables them to determine the exact



amount of plastic that they've removed from the environment. Ecobricking also leads to a mindfulness of the plastic one is consuming and disposing of. When one's consumption is compared to ones ecobricking it is possible to determine the difference between the two-- and mindfully close the gap. Ecobricking more plastic than one is consuming enables ecobrickers and ecobricking communities to step into "regenerative living", where one's impact is more greening than it is graying. It is important to note that *Regenerative Living* is definitely separate from the Sustainability paradigm.[49]

Circular Design

One of the first principles to emerge in the ecobricking movement is that of circular design-- or cradle to cradle design. In contrast to the vast majority of the products we use today that go from their birth in a factory, into our hands, to their grave– which is always someplace within the Earth's biosphere. Pollution is the result. Designs that fail to anticipate and plan for the end of a product are known as *cradle-to-grave*.

Early ecobrick design and methods-- such as building with concrete as a mortar, clearly indicated that it was important to do things different. For example, using concrete to build an ecobrick bench, might make an effective bench, but as concrete inevitably breaks apart in rough jagged chunks, there is no way to remove the ecobricks without damaging them. Learning from the way ecologies infinitely and perfectly cycle nutrients over and over, ecobricks aspire to a similar indefinitely cycling. In other words, ensuring to make and build with ecobricks using techniques that anticipate their next life cycle. Instead of the straight line of cradle-to-grave, we draw a circle. We make sure our ecobricks go from one "cradle" (usage/life/build/application) to the next, to the next with minimal energy and waste. This is known as *cradle-to-cradle* design. The *cradle-to-cradle* design principle underlies every ecobrick method that the GEA endorses. This way we ensure that every ecobrick remains a reusable building block. This circular design ethic also helps guide the way that we make ecobricks and the GEA recommended ecobricking techniques.

Transcaste

Ecobricking it turns out, unites rich and poor, east and west, young and old, men and women, and everyone in between. Early on in the movement, ecobricker leaders that the problem of plastic transcended traditional classes and castes, and so too did solving it. In fact, whereas traditional social movements have been focused on bettering the lot of a particular *people, in a particular place and time,* the ecobricking movement defined by its concern of how plastic effects *all people, our children, other species, and the children of others species*. Ask a UK teenager why they are ecobricking, and they may well say "for the turtles".

In our age of enduring gender roles and the increasing divide of rich and poor, we've come to realize this is a fundamental important and defining aspect of the movement. For lack of a term, we've coined the term *transcaste* as the principle is fundamental to the regenerative healing nature of the movement. This coming together across ancient divides enables us to not only rise above them but to supercharge our collaborations with both different variations of human energy.

Ayyew

As ecobricking has evolved it as stood further and further in contrast to traditional 'waste' management methods. In particular, the direct re-purposing of consumed plastic has alleviated the need to use the terms 'trash' or 'waste' which, when used, imply that value or usefulness of plastic has gone. Afterall, essential to making a solid, good quality ecobrick is clean, dry plastic-- giving plastic a definitive ongoing value. This transcension of the 'waste paradigm' is reinforced by the paradigm of the Igorot people from which the Asian movement arose in the Northern Philippines. The Igorots, like other indigenous people, pursue a virtue that they call 'Ayyew'.[50] In all their endeavours, Igorots aspire to live in ever greater harmony with the cycles of life around them. It is a virtue that acknowledges we can also we do better, and honours those who strive for the benefit of their ecological neighbourhood. In seeing the world as cycles that can be enhanced, nothing is perceived is useless or valueless. Indeed in the Igorot language, there is no word for 'trash', 'waste' or 'dumpsite'. The ayyew paradigm gives us a new way to look at plastic and put back into a productive cycle to benefit of everyone.

Local, non-capital, trans-petroleum

As we have noted earlier, ecobricks have thrived and spread to the extent that there were no financial, material or skill barriers involved in their adoption. The ecobricks movements that have succeeded in taking deep roots and inspiring local plastic transition, are those that have promoted methods with minimum barriers to participation. This too has revealed itself as a fundamental principle in regenerative empowerment. To the extent that designs and methods avoid capital, imported materials and petroleum powered machines the greater the adoption and independent empowerment of local ecobrickers and their communities.

Leading by Example – Personal Empowerment

Ecobricking methods that embody the mechanisms of local, non-capital and trans-petroleum are thus accessible, anyone can take personal responsibility for their plastic and run with ecobricking. Ecobrickers have watched as their neighbours have started packing bottles, then the next week their neighbours neighbours. Being so close to the transmission process ecobrick leaders have been able to observe the critical role of personal example in the effective transmission of ecobricking techniques and insights. Although words and theory are important, ecobrickers have observed that their own example-- the way they pack their ecobrick, the way they save and segregate their plastic, the applications of ecobricks in their home-- are the most potent factor in the social spread and replication of ecobricking. So much so, that even un-thought of elements in their ecobricking or way of life are replicated as ecobricking spreads. This phenomenon has encouraged ecobrick leader to rise a level in their awareness of every detail of their ecobricking and lifestyle. In contrast to other plastic management technologies that are do not allow personal start-to-end transformation (i.e. not everyone can have a recycling machine or incinerator in their home), it has become clear that 'leading by example' is one of the key factors, and principles, in the ecobrick movement. To the degree that one's example matches one words, the virality of one's ecobricking and plastic transition is super charged.

Replicable & Open Source

Every day thousands of tons of plastic flow loose into the biosphere. Meanwhile, the consumption of plastic and its production is increasing unabated. In order to be a deep solution to plastic, a regenerative solution must spread at a rate faster than industrial expansion and economic growth

rates. By designing with *local*, organic or upcycled materials we remove cost barriers to replication. By designing methods that are non-capital, low-skill, require no machines and minimal energy, we remove age, gender and geographical barriers to replication and empowerment. By making our designs *open source* and easily accessible on the web, we energize and accelerate replication. The full concept of social replicability is based on the philosophy of Collaborative Mandalic Manifestation by Russell Maier.

Ecobrickers from the beginning have sought to share resources and techniques freely with each other. The GEA has made free and open source principles of its dissemination of materials. On Ecobricks.org all the PDFs guidebooks and more pertaining to the movement can be accessed and downloaded freely per a BY-SA Creative Commons License. On GoBrik, likewise as much statistical information is freely available as well as open access to all Brikcoin and currency transactions on the platform. The GEA takes this further by striving to use only open source software, tools, and services.

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Advantages of Ecobricking

Ecobricking has allowed them to take personal responsibility for their plastic, to keep it out of the failing systems and thus their local biosphere, and instead put the plastic to use locally. The joy and pride from Ecobrickers who have made this transition is what propels the viral spread of Ecobricks around the world. As the movement spreads, it quickly became clear that ecobricks were far more than building blocks.

Plastic itself presented a solution to plastic[51]. Rather than creating more systems or more processing, why not just use all the PET bottles freely available and all the good will of indivuals and communities? The simplicity of ecobricking is of course in stark contrast to other forms of plastic management. Industrial recycling and incineration require massive capital investments by cities and are designed to minimize the participation and work of citizens. Ecobricking and brikcoins are in contrast accessible to anyone -- all that is required is hard work, a stick, a bottle, plastic and a smartphone[52].

And ecobricks can also be used by anyone, while brikcoins can be exchanged with anyone with a freely available GoBrik wallet account[53]. The applications of ecobricks range from simple stools using a dozen ecobricks, to gardens using hundreds, to structures using thousands[54]. Meanwhile, a marketplace of ecobrick exchanges is evolving both in local communities and on the GoBrik platform.[55]

Ecobricking, by design, does not require capital, and maximizes citizen participation. Ecobricking is fundamentally manual-- it cannot be done by machines and requires an individual's work -- a process of slow manual labour that challenges an individual to think twice about their plastic consumption.

It is here emerges the chief benefit of ecobricking: by enabling individuals to take personal responsibility for their plastic consumption, the manual process of ecobricking compels a direct interaction with one's consumed plastic. The meditative and communal aspect of ecobricking catalyzes the raising of *ecological consciousness*[56] Ecobrickers tend to pursue more information about waste disposal in their community, plastic, recycling and ecobricking topics*****. This leads to a steady decrease in the ecobricker's net plastic consumption*****.

As ecobricking spreads, so too does individual and collective questioning of the mechanism of plastic production and consumption. This continues to grow as awareness spreads of the dangers of plastic pollution and the failure of industrial recycling.

Ecobricks also create building blocks with a dual practical value. On the one hand they are useful for building. On the other, they secure plastic indefinitely. As the GEA encourages the use of ecobricks in earth constructions (gardens, parks, earthen walls[57]) as a mean to complete encase ecobricks from the main forms of potential degradation[58]. Ecobricks, especially in earthen construction, replicate nature's system of sequestration in which prehistoric carbon laden biomass was stored under the earth, keeping the hydrocarbons out of the atmosphere, stabilizing climate and gifting future eras. In the same way, ecobrick earthen construction enables us to indefinitely secure plastic and its hydrocarbons from becoming toxins, microplastics or from reaching the atmosphere as C02. The GEA estimates that for

each 1 Kg of ecobricked plastic, 3.1Kg of CO2 is sequestered.[59] This service of securing plastic has become known as *plastic sequestration*[60].

Keeping plastic out of the biosphere is something we can all agree is a good thing-- yet a value not recognized in the recycling industries pricing of plastic. In order to quantify the value of sequestered plastic, the GEA has developed a manual blockchain currency that is based on authenticated, ecobricked, sequestered plastic (AES Plastic)[61]. As of 2020 the GoBrik platform has recorded of over twenty tons of AES plastic, leading to the generation of over 150,000 brikcoins for two thousand participating ecobrickers.[62]

In Contrast to Development Programs

Unlike the Development programs and projects that are designed, operated and controlled by budget schemes, technical assistance structure, external facilitation, and top down monitoring and evaluation, the ecobrick movement is powered by collaboration. Ecobricking is designed to allow everyone to take personal responsibility of their plastic consumption, at the same time invite everybody to join and create community or to strengthen the existing communities and local initiatives. In contrast to development programmatic practices, that requires a lot of administrative works for the leaders and facilitators, it tends to make the process, outputs and outcomes to be away from the aim of the initial program. The allocated budget and provided technical assistance take away the opportunity for the people (which is usually defined as beneficiaries) to be empowered.

Traditional development programs are also observed to create dependence by their recipients. Ecobrick in the other hand, with the open source learning material, simple technology, no money, no machine, people both individual or group can create their own outputs and benefit from their ecobrick creation. Ecobrick practices in community level builds sense of community and encourage more community projects to happen, which are designed, owned and celebrated by people. Ecobricking is not only giving benefit to the people and their environment and the earth, this practice is positioning people as the actor and subject of the movement. The ecobrick community practices give opportunity to everyone, irrespective of their class or social standing, to take a lead and connect

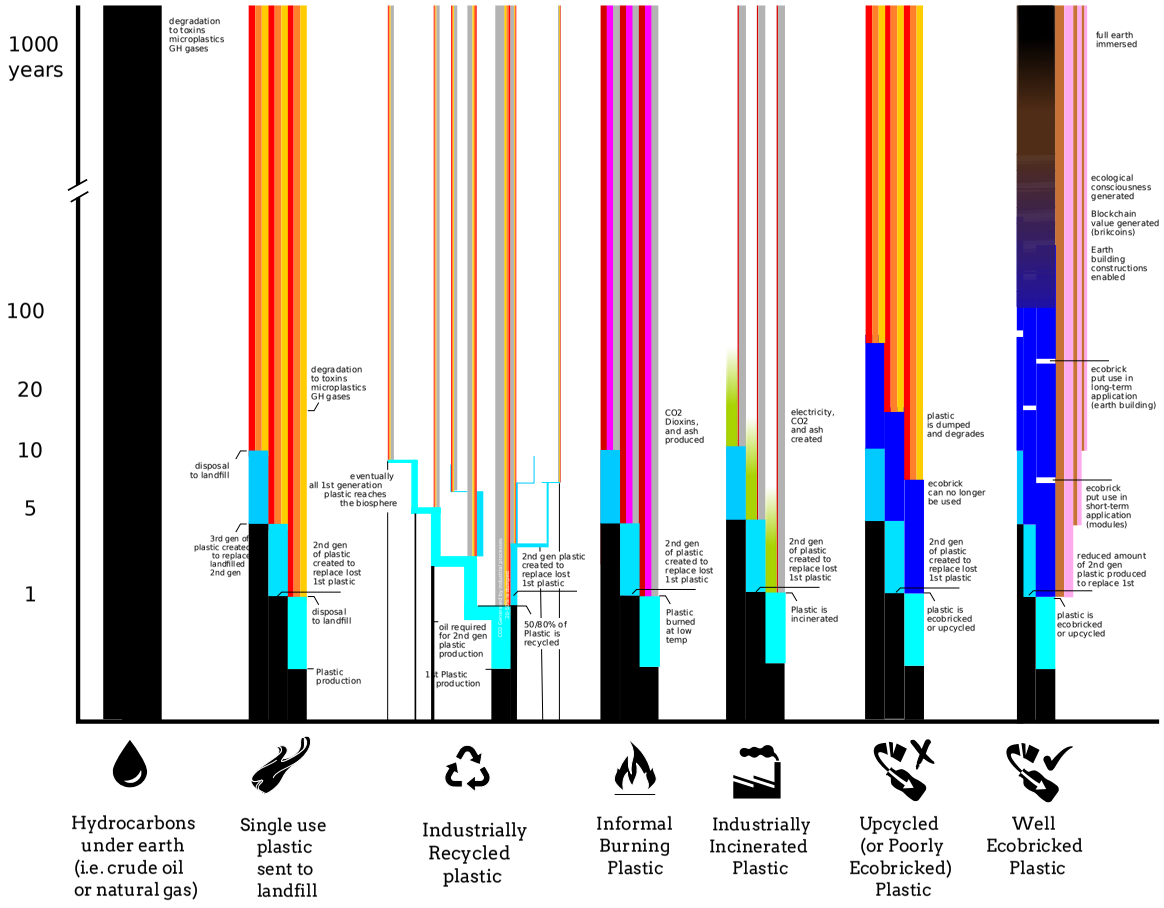
with their own networks and other ecobrick communities; in their city, region, province, country and global.

Conclusion

Ecobricks have become a means to take a stand against the overuse of plastic that is wrecking havoc on our communities, ecologies and cultures-- locally and globally. The rise of the Asian regenerative ecobrick movement encompasses important principles that enable ecobrickers to distinguish themselves from the traditional waste management paradigm. These regenerative principles point the way to a fundamentally different perspective on plastic. Plastic is not waste, nor trash the enemy. In fact, plastic is the gateway to local and global transition from dependence on the petro-captial economy. Transforming plastic can bring together our communities, build resiliency and empower households. The continued pursuit of the principles garnered from ecobricking, sure and steady turn our communities into regenerative powerhouses-- green vacuums reclaiming and securing plastic and CO2 out of global industrial systems to the local benefit of the commons. Through our hard work packing plastic, we can compliment the primordial earth process of securing carbon and toxins from the biosphere to the benefit of our children, and our fellow species children. As a building block, we can use it to build our greenest visions, moving back into ever greener harmony with the cycles of life.

A Millenium View of Plastic

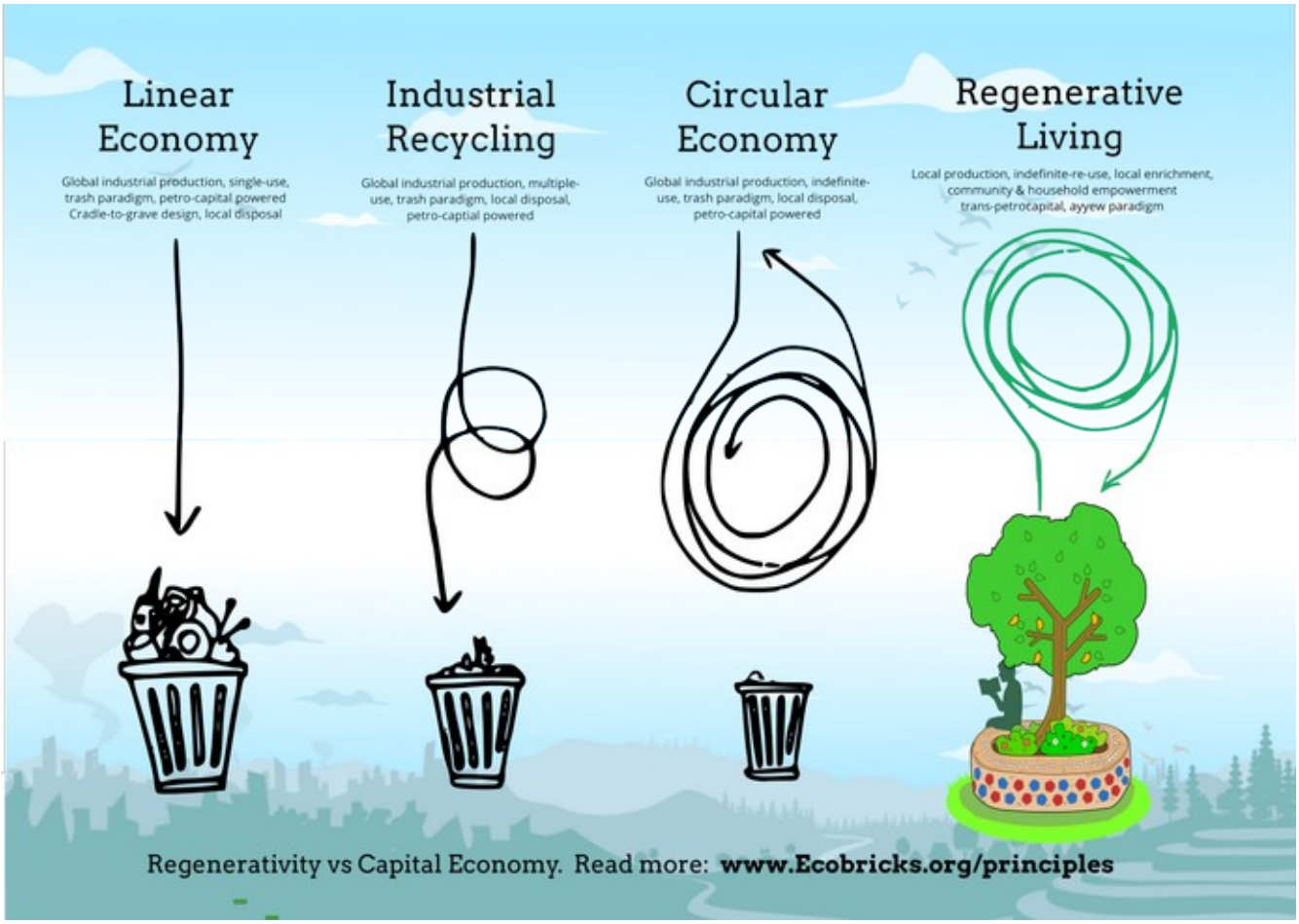
A comparison of plastic management routes over 1000 years



- Fossil fuels under the earth - no degration, no releases
- First generation of produced plastic - serving global industry
- 2nd generation of plastic produced -to replace consumption of 1st
- 3rd generation of plastic produced - to replace consumption of 2nd
- Microplastics generated from photodegradation
- Toxic ash from burning/incineration
- Ethylene, methane produced generated from photodegration
- Leached toxins (phlates, BPA, etc)
- CO2 generated (i.e. from burning, industrial, recycling, transportation, etc)
- Plastic put to local community use
- Dioxins released by low temp burning
- Electricity generated from incineration
- Consumer Ecological Consciousness raised
- Blockchain value generation (BRK)
- Plastic indefinitely secured through terminal reduction of net surface area and full earthen immersion.

zoom in to explore

This chart is developed by the Global Ecobrick Alliance. For full context and research see the GEA white paper The Rise of the Regenerative Ecobrick Movement at www.ecobricks.org/bandung


Linear Economy
Global industrial production, single-use, trash paradigm, petro-capital powered Cradle-to-grave design, local disposal
Industrial Recycling
Global industrial production, multiple-use, trash paradigm, local disposal, petro-captial powered
Circular Economy
Global industrial production, indefinite-use, trash paradigm, local disposal, petro-capital powered
Regenerative Living
Local production, indefinite-re-use, local enrichment, community & household empowerment trans-petrocapital, ayyew paradigm
Regenerativity vs Capital Economy. Read more: www.Ecobricks.org/principles

Glossary

Authentications: The conclusion of three validations on the GoBrik platform by independent ecobrickers who have not made and do not own, the logged ecobrick being reviewed. The authentication can either be positive ("authenticated") or negative ("rejected"). A successful authentication results in the creation of 1 BRK for each 100g of ecobricked plastic.

Brikcoin: A plastic offset token representing the sequestration of plastic by ecobricking. Each Brikcoin (BRK) represents the sequestration of 100g of plastic.

The BrikChain: A live, searchable and public repository of all transactions, blocks and authentications on the GoBrik platform connected to the creation and exchange of Brikcoin.

Collaborative Mandalic Manifestation: The full concept of social replicability, inclusiveness and accessibility is inspired by GEA founder, Russell Maier's philosophy of Collaborative Mandalic Manifestation (CMM). Russell first applied this methodology to his personal ecobricking and the seeding of the ecobrick viral social spread in the Northern Philippines.

Cradle-to-Cradle Design: The principle of planning for the end of a creation, its destruction and next life. Also know as *circular design*.

Ecobrick: A reusable building block created by the packing of used plastic to a set density into a PET bottle.

Ecobricker: Someone who makes ecobricks.

Ecobricking: The collective acts of collecting, segregating, packing, logging and storing an ecobrick, the life-style transformation that ensues and the pursuit of the movement's principles.

GoBrik: The platform created, maintained and developed by the Global Ecobrick alliance to log, store and authentic ecobricks and to maintain, manage and exchange Brikcoins and ecobricks. The platform is found on the URL https://gobrik.com and is also embedded into the Ecobricks.org site.

The Global Ecobrick Alliance (GEA): The GEA is an Earth Enterprise focused on solving plastic locally and globally by maintaining the physical, digital and intellectual infrastructure that serves the global ecobrick movement.

Mandalas: Mandalas are an ancient and sacred art that can be found in cultures and religions around the world. Mandalas harness circular geometry and symmetry to create a pattern filled with meaning, symbolism and intention. Their creative process enables one or more folks to come together and organically unfold consciousness raising co-creations.

Manual blockchain: A database system modeled after the block chain cryptography concept of 'proof of work', where computation work is replaced with human work and computational 'proof' is replaced with community validation and authentication. This concept is being pioneered by the GEA in the GoBrik platform.

Regenerative Living: Regenerative design acknowledges the harm that humans have had on the biosphere and aspires to shift processes and methods to heal, restore and strengthen the biosystems around us. In this way, we are careful to evaluate the net impact of everything we do to ensure that more plastic and CO2 are sequestered than released into the biosphere.

Transcaste: Pursuing *methods and concepts that transcend notions of how men and women, young and old, eastern and western, and everyone in between, should work and be.*

Trans-petrocapital: *The principle of designing methods to minimize participation in the capital economy (i.e. spending money) and the reliance on petroleum powered machines. Involves a consciousness of the correlation between money, capital and the petroleum that powers the capital-economy.*

Validations: The act of review by an ecobricker of a logged ecobrick on the GoBrik platform.

The Global Ecobrick Alliance

The GoBrik platform and its development are managed by the Global Ecobrick Alliance (GEA). The GEA is a not-for-profit 'Earth Enterprise'(EE) guided by our principles, publicly accessible Intention Map[63], core team and circulars. As an EE the GEA is structured to have no profit motive and a mission and vision focused on serving the Earth. In this way, the GEA is moving forward as an impartial third party catalyzing individual, community, company and national plastic transition.

Earth Enterprise

As an Earth Enterprise (EE) the GEA operates under clearly defined principles.[64] An Earth Enterprise is built on the concept of a 'social enterprise'-- where instead of a focus on social service, our service is to the Earth. The concept is inspired by the work of Mark Donovan developing the idea of an "Earth Corporation"[65] and the 'not for profit' (as opposed to a non-profit) concept by of the Post Growth Institute[66]. As an Earth Enterprise, the GEA operates on seven fundamental principles (see appendix 1) that ensure that our goals, operation our results are deeply in line with our principles, vision and mission in both the short and long-term as laid out in our GEA Earth Enterprise Intention Map.

The Authors

Russell Maier

Russell Maier is one of the founders of the Global Ecobrick Alliance and has spearheaded the spread of ecobricks in South East Asia. Russell's regenerative inventions, ideas and projects have been covered by the BBC, the Guardian, the Jarkata post and recently an hour long special on CNN Indonesia. With a perspective gleaned from integrating in some of the most politically and economically challenged cultures on the planet -- from refugee camps in Gaza, rainforests in Costa Rica, to four years living with the Igorots in the mountains of the Northern Philippines, Russell is passionate contributer to regenerative philosophy.

Ani Himawati

Ani Himawati is an Indonesian anthropologist who has worked simultaneously at the grass roots and executive level in the Community Driven Development (CDD) programs with I/NGOs, Government and Development Aid Agencies. For the last 15 years she has worked at the vanguard of community empowerment in cities, towns and remote villages all over Indonesia. Ani is one of the principals of the Global Ecobrick Alliance and has assisted in GEA Training of Trainers workshops all around South East Asia.

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