



SMU439

MIRACLE MANGROVES: FUNDING OF GREEN SHIELDS IN THE BAY OF BENGAL

The long, 12-seater tide boat ground softly into the pebbly sands of the west bank of the river, and Dr. Arne Fjørtoft disembarked carefully and began his short walk through the tall palms. A tall but slightly stooping Norwegian of 83 years, Fjørtoft walked with a sturdy cane, treading deliberately through the beach grass to the guesthouse of the Thor Heyerdahl Climate Park, Myanmar. It was November 10th, 2016, and the monsoon season had given way to cool, dry breezes that rippled across the Togye River pouring peacefully into the Bay of Bengal. Settling into a simple chair overlooking the majestic sweep of sea, Fjørtoft turned his mind from the immediate work of planting mangroves to the vastly more complex set of moving parts that occupied his role as Founder and Secretary General of Worldview International Foundation (Worldview).

In 2012, Fjørtoft had secured funding from the Letten Foundation in Norway for a three-year research project in Myanmar on mangrove restoration. While his initial project description was simply to start planting mangrove trees for carbon sequestration, the project was subsequently redesigned as a research project to align with new rules that the Letten Foundation had to follow. After a very successful research project with 42 papers written and clear proof of concept not only of the carbon sequestration capacity of trees, but also many additional ecosystem service improvements such as steadying the shore and the creation of new habitats for small and large species, Fjørtoft decided to embark on a two and a half year journey to scale the operation within and beyond Myanmar. For this however, he needed funding.

Between 2014 and 2016, Fjørtoft spent thousands of hours on planes, calls and meetings, writing emails, letters, and proposals, all towards the goal of securing an accredited agency to enable his team to draw funds from governments or international funding agencies. By the fall of 2016, his efforts had produced only costs, except for the occasional funding from private companies. Worldview knew more about restoring mangrove forests than anyone in the world, but the organisation was struggling to pay its planters and afford seedlings for next season. Fjørtoft recognised that securing donor money or other sources of funding was a trying process requiring patience, yet he asked himself, "What am I doing wrong?" Money was running out, and it was time to take action.

Fjørtoft's heart swelled with a familiar sense of urgency, to secure the future of the Worldview mission, to sustain the local community, and empower the next expansion of Worldview's world-

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leading mangrove reforestation efforts. After four years of search and learning, it was time to make a bold decision. Could Worldview divert its scarce resources and commit to the complex pursuit of Verified Carbon Standard certification for its nearly two million mangroves? Should he take another stab at obtaining funding from one of the big donor agencies like Green Climate Fund? Landing such a big grant would enable Worldview to scale its activities beyond Myanmar and to start forming partnership all around the Bay of Bengal, in India, Bangladesh, and Sri Lanka. But were they ready for an operation at a much larger scale? Also, WIF had not really excelled in landing the big institutional money so far...

He recollected Einstein's infamous quote about the definition of insanity, 'Insanity is doing the same thing over and over again and expecting different results'; and wondered - should he in fact consider a radically different approach? Two men he had never met were soon landing at Yangon airport with an idea that, as outlandish as it seemed, was also appealing: a cryptocurrency to finance mangrove trees, democratise mangrove funding, and link Worldview to an untapped world of impact investors.

Fjørtoft puzzled over his task: how to sustain Worldview's efforts of planting mangroves whose benefits were shared by everyone, but depended on the support of individuals and organisations who could reap only a small fraction of the returns - a quintessential free-rider problem in the provision of public goods.

Worldview, Dr. Arne Fjørtoft, and the Miracle Mangrove

In 1979, at the dawn of the communication revolution, Fjørtoft had founded Worldview to accelerate a digital revolution and its potential to empower disadvantaged communities and promote democracy in the developing world. In its early years, Worldview enjoyed steady funding from the Norwegian government, and, through its success, diversified its funding sources to over 100 different donors. But three decades later, the media revolution had matured into cell phones and online networks, and what was once pioneering knowledge had been largely replaced by social media.

In the meantime, Fjørtoft had turned his attention to the environmental and social challenges of poor communities in the Bay of Bengal region. He learned that all across the region, mangrove forests were being destroyed due to a relentless onslaught of overexploitation, oil spills, plastics pollution, and the relentless march of coastal development; and deforestation played a key role in coastal villagers' vulnerability to the sea.

Fjørtoft recollected,

In 2004, over 30,000 people died in the Indian Ocean Tsunami. In the aftermath, picking up the pieces, we realised regions with mangroves suffered much lower losses of life.

This realisation was reinforced in May 2008 when Cyclone Nargis struck western Myanmar with enormous force, killing over 138,000 people and devastating the rice fields - yet again largely sparing those few communities whose mangrove forest had been preserved.

As he continued to study, Fjørtoft's interest grew to learn the remarkable power of mangroves in sapping carbon out of the air (refer to **Exhibit 1** – Miracle Mangroves). He explained,

We have more than 400 million particles [of CO₂] per million in the atmosphere. We have crossed a red line. We can solve this via technology, at US\$600 per ton, or plant mangroves, and sequester carbon at US\$1 per ton!

Two years later, in 2010, Worldview resolved to pivot its full energies to work on climate change, sea level rise, and the challenges of sustainable development in the South East Asia.

With the relaxation of military rule in Myanmar in 2012, Fjørtoft received an unexpected invitation from the new government, and used the visit to articulate a mission of mangrove reforestation. Fjørtoft partnered with the government of Patheingyi State, Patheingyi University and Myeik University to initiate a 3-year research project on mangrove restoration funded by the Letten Foundation in Norway. The task was to develop best practices for restoring 1800 acres of degraded and deforested mangroves in the Ayeyarwady Delta, and the first nursery would lie in the community of Magyi and the coastal township of Schwethaungyan (refer **Exhibit 2** – Maps). He recollected,

The military regime had closed down many universities and moved them out of the city to avoid student demonstrations. So, when we started here in Patheingyi, it was a shock as many of the faculty did not have any internet connection, and the libraries were more or less exhausted. So we helped the universities upgrade, with computers and books, and we got scholarships for 42 students to research the flora and fauna, and the quality of water. Thus we built a very good basis of understanding for what we went into.

Fjørtoft and his team drew many important lessons from the research effort. He learned about the interlinkage of community economies and forest health. Transient charcoal dealers promised villagers ready incomes to violate legal bans, cut down the mangroves, bake their wood in primitive kilns, and sell the charcoal.¹ He shared,

We learned that if we don't educate people, and if we don't give them jobs and standards, they may fall back to the last resort of surviving, cutting trees.

Fjørtoft recruited an expert forester to formalise training and planting protocols. He elaborated,

We did some headhunting, and found three candidates. Two were desk people who worked as consultants with international institutions; I knew they would never go to the field, they would want to sit in an air-conditioned office and write papers. The third man was a practical person, who had worked with the Forest Department for 30 years. This was the person we needed. Win Muang loved to help people, and he had all the good qualities— he was practical, a good leader, and loved working in the mangroves. I have been doing development since 1967, and never had I had such good staff.

Fjørtoft had long understood the importance of teamwork and innovation, and now marvelled at new techniques being developed by Worldview's chief forester. Changes in species mix, land preparation, patching, and weeding promised radical improvements to long-term survivability. He elucidated,

Early on we did test planting, but it was not very successful. The first survival rate we had was 50%. I was very disappointed. Later I was told this was absolutely normal. Today, we are achieving verified survival rates of over 86.4%! We have learned to seek biodiversity, not monoculture, with fourteen species. You get much better results with many different families together in the same area, to be strong, to avoid all kind of pests, and to stimulate each other. When it comes to planting trees, and to nature, Win Muang is supreme. He is a Magic Man.

¹ The high-carbon density that make mangroves superior for sequestering carbon results in high volumes of hydrocarbons when turned to charcoal relative to other trees. Much of the illegal trade crosses the borders to China and Thailand, where dealers access lucrative international markets. For further details, refer <https://www.alibaba.com/countrysearch/TH/mangrove-charcoal.html>.

With an improving base of expertise, Worldview set out to engage with a wide group of local stakeholders to secure land and build nurseries (refer to **Exhibit 3** – Community Engagement) which aligned with new priorities on climate change projects in Myanmar. Worldview elected a new board chaired by U Aye Lwin, retired Foreign Service officer and prior Director General of ASEAN, with invaluable contacts in the region. They then set out to coordinate the formation of local Environment and Mangrove Conservation Committees (EMCCs), which drew technical support from Worldview, Patheingyi University and Myeik University with Dr. Ranil Senanayake as Director of Research and Development. EMCCs then solicited an expanding series of state land grants from the local government and began training and recruiting villagers to work through the monsoon planting mangroves and the dry season cleaning, clearing, and caring for the restored forests (refer to **Exhibit 4** – Mangrove Planting through the Seasons, Western Myanmar).

A Tightrope of Loans, Luck, Orchids and Overheads

Fjortoft had a deep desire to ensure Worldview had the resources to prepare for the forthcoming year's planting, and thus obtaining sufficient funding was almost always on the top of his mind. He explained,

Ours is a cycle. If we don't start the nurseries in time, and if we don't plant the trees in the nursery in time, it will all be spoilt. Mangroves have a very sensitive nature. The seedlings are living plants, living beings, and they have their own way of doing things and we have to respect that. If not, they will not grow up. We are their custodians. They are our babies.

Fjortoft's task was made somewhat easier by Worldview's very lean cost profile. He personally eschewed extraneous travel and first-world salaries, taking only a small annual advance on his own official salary. He also enforced minimal overheads. The team kept a small office in Yangon and a guesthouse at Heyerdahl that doubled as a headquarters. The dry season team included only four full time nursery gardeners, three boatmen, and a small office staff. Yet this team would swell to more than 100+ villagers to work full time through the monsoon planting, patching, and weeding.

To transition from a research organisation to a mass-scale reforestation operation, Fjortoft cast a wide net for support. He secured a loan from friends in Norway in late 2014; US\$200,000 at an interest rate of 2% above LIBOR. To supplement the loan, Fjortoft drew on savings from Worldview's reserve accounts, knowing well this last backstop would give out before long. He clarified,

Funds from Letten Foundation were drying up; and I knew that if we don't continue doing research we would not get more. Of course if we wanted a comfortable life, we could stop at research, but most research just ends up in a file cabinet somewhere in a storeroom. It is lost to reality. We had to be more useful than that!

The combination of loans and own funding kept Worldview planting through the end of 2015, and enabled Fjortoft to move ahead with the expansion of the nursery and collecting of propagules for planting in 2015. In the knee-deep muds of the tropical wetlands, the team would plant some 600,000 baby mangroves in 2015 (refer to **Exhibit 5** – Mangrove Planting Timeline 2014 - 2016). Yet, given the scale of climate change, those trees would be but a drop in the ocean.

Fjortoft knew that within the global non-profit system, the majority of donor funds moved through accredited agencies such as the various United Nations bodies and other major international organisations. These provided on-the-ground projects like the Heyerdahl Climate Park with administrative support, banking, and auditing, and absorbed between approximately 9%-14% of

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funds. Fjertoft set out to secure critical funding, but seemed to run into a succession of frustrating failures. He recollected,

First I went to Sweden, and met the foreign minister, a friend of mine. She was very positive, and said that she did not have a budget but would help to find the money. So she introduced me to the minister of environment from another party and they were very happy and said it would be easy to fund – but we should find a UN agency as it was easier to go through the UN as compared to bilateral funding.

So I went to the UNDP [United Nations Development Program], and they were interested and friendly, and they hired a consultant to come to Myanmar. He was a very productive person and stayed for two months, and wrote a very good report. But when I sent it to Sweden, I got back a reply that they had changed their focus on Myanmar, and could now only fund democracy, women's projects, and peace. But ours was an environmental project. Of course if I had known that, I would have written a women's project for mangroves, but I didn't know that and so we lost out - and that is my fault.

Meanwhile, Worldview was also wrapping up a project collecting the seeds of over 400 species of tropical orchids for storage in the Svalbard Seed Vault, the world's largest secure seed storage located in Norway. As luck would have it, when Fjertoft presented the results of the project at a UN conference in July 2015, he caught the eye of the eye of a lean Norwegian, Svein Rasmussen, CIO Star-Board, who emerged to save the day. Rasmussen recollected,

When I first saw Fjertoft, at 80, how he was inspiring others and so much enjoying what he is doing, I realised that there is no such thing as retirement. Working for a cause, we get a whole new lease on life.

Rasmussen had planted 70,000 mangroves in Thailand with very little success, and he leapt at Fjertoft's invitation to visit Schwethaungyan. Impressed at the skill and success at Heyerdahl, Svein committed his firm to fund a million mangroves over the next ten years, and began wiring funds in November 2015. The money kept Worldview planting into 2016, but Fjertoft knew that he would need fresh sources of funding, and soon, to realise his goal of planting millions of mangroves within five years (refer to **Exhibit 6** – Financial Position) & (**Exhibit 7** – Detailed Planting and Operations Budget: 2016).

Fjertoft needed a pivot, and began outreach efforts targeting an alternative funding source, the Green Climate Fund. He explained,

The Green Climate Fund, according to the UN, is the premier funding source in the world for climate projects. But for all their projects, you still need an accredited agency. So after we gave up with UNDP in 2015, we tried the WWF [Worldwide Wildlife Foundation], because they had offices here in Myanmar, but they said they needed to send the project to America. And time passed, and then finally we got word back, "Sorry, but we are understaffed here, and we don't have the capacity now to take on your project." So this too failed.

Worldview then turned to the World Food Program (WFP), which had a strong presence in Myanmar, and over the next six months, it developed a new proposal for US\$10 million for the Green Climate Fund. WFP would serve as the accredited agency for the project purposed to plant mangroves to support food security, and 20% of the funds would go to WFP for consultation, reporting, and administration. But at the eleventh hour, this opportunity too started to slip away. Fjertoft recollected,

Just when we were ready to send out the final proposal to the GCF, the team at WFP said they had to get approval from Rome. And so they sent a top bureaucrat, and he was the most uptight bureaucrat I have ever met in my life. I got very upset because he had such an attitude it was impossible to discuss! And he got a little bit upset with me too. He said, "We can't jump into projects like this, we first need to have full research, and a robust study on the climate situation in Myanmar." He saw it only from a bureaucratic perspective, all the rules and regulations, but we know the climate situation in Myanmar, it is one of the most vulnerable countries in the world. We needed to be planting trees!

The Market for Carbon Credits and the Quest for Certification

From the earliest days of working in Myanmar, Fjærtøft knew that carbon sequestration² taking place in the mangroves constituted immense value. He had pushed for climate policies in Norway as early as 1985, and had observed the evolution of the European cap and trade system and other carbon regimes around the world with keen interest. While global carbon markets were still struggling to coalesce into a single marketplace, they were however largely organised around a common, tradable 'currency'—the carbon credit. By the end of 2016, nearly 14% of global emissions fell under some type of carbon-pricing system, up from barely 5% only half a decade earlier. These regimes, and the commitments they motivated for companies to offset their emissions, promised major funding for carbon projects, but required the navigation of a complex ecosystem of validation and registration organisations (refer to **Exhibit 8** – Global Carbon Markets).

So, while Win Muang and the forestry team geared up to plant, Fjærtøft moved to assess how much carbon the trees would sequester. An initial estimate from Raintrust Sustainable Ventures analysis showed adult mangroves locked up a ton of carbon dioxide equivalent (CO₂E) each over 25 years; a fourth in the standing tree, and three quarters in the roots and soil. Yet Fjærtøft's initial optimism was quickly tempered.

To obtain carbon credits for the world's carbon markets, Worldview would need to be registered in an official registry. For the most lucrative "compliance" markets, where firms bought credits to fulfil legal requirements, a handful of gatekeeping organisations registered projects and awarded credits. In Europe, Switzerland-based Gold Standard charged high fees, estimated at over US\$400,000, similar to that charged by its U.S. counterpart, American Carbon Registry. Fjærtøft's back-of-the-envelope calculations indicated that at a price of US\$8 per tonne, Worldview would need to plant 2.5 million mangroves over 500 hectares to recover the registration costs alone, leaving nothing for employment, planting, or livelihoods. He feared the gatekeepers had simply costed him out of the compliance market.

Verified Carbon Standard

A solution surfaced in early 2016. Another organisation in Washington DC, the Verified Carbon Standard (VCS), registered projects for the 'voluntary carbon market'. These credits traded at a discount, perhaps at US\$6 per tonne, but VCS had experience in forestry, charged lower prices, and signalled interest. VCS further explained that a project could only be registered and issue carbon credits based on a formal 'Validation' and subsequent 'Verification' by an Independent Certifier, an established third-party auditor with expertise in assessing the real-world impacts of carbon projects.

² Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide. It is one method of reducing the amount of carbon dioxide in the atmosphere with the goal of reducing global climate change. For further details, refer <https://www.usgs.gov/faqs/what-carbon-sequestration>.

Yet, these Certifiers regularly required projects to engage an additional tier of organisations—project developer Consultants—to work directly with organisations to navigate the requirements for documentation and verification (**Exhibit 9** – Carbon Credit Supply Chain).

To get the ball rolling, Fjørtoft invited a leading consultant to survey Worldview's operation. After several meetings, the consultant proposed a partnership to seek funding from Norway for expanded planting, supporting the VCS registration process, and serving as a Broker for Worldview's carbon credits. With Norwegian funding, the consultant estimated they could sell 75% of 150,000 annual credits at US\$5 per ton for US\$600,000 in cash flow.

In return, the consultant would require US\$18,000 for helping secure funds, due diligence, and a site visit, US\$60,000 plus expenses for developing the Project Note and Project Document, US\$5,000 for travel, US\$35,000 to pay an independent Certifier, and a US\$60,000 bonus from the first carbon credit sales. Thereafter, the consultant would assume brokerage of the Worldview credits in exchange for 35% of all carbon credit sale revenue. If Norway did not give funding, Worldview would owe a compensation of US\$20,000 against future credit sales. Looking over the deal in April, Fjørtoft was shocked at the apparent rapacity of his counterparty. He took a hard look at his budget and weighed the probabilities of success. Could Worldview realise mass-scale planting if saddled with such costs?

Staving off exhaustion, Fjørtoft flew to Bangkok to meet with the UNEP REDD+³ team. Developed within the UN Framework Convention on Climate Change, the REDD+ programme placed a concrete value on the ability of forests to sequester carbon and fight climate change. It also gave incentives for developing countries to protect and restore forested lands and pursue low-carbon paths to sustainable development. But as Fjørtoft examined the administration of the REDD+ programme, he learned the process was far from fast and could well entail a political risk. He explained,

The REDD+ team was a very friendly group of people from the FAO, UNDP and UNEP. It was a five-year project, with a budget of US\$26 million... You don't need to study for five years, spending all that money for nothing. Most of these things are just symbolic gestures. It is just reports and rules, and no one is committed to delivering any practical results.

When Fjørtoft shared his disillusionment with a longtime friend, Dr. Marc Morivel of Prime Carbon, his friend recommended he connect directly with RINA, an Italian Certifier with a reputation as an honest broker with a full-time staff in India. RINA indicated the VCS process could be much faster than REDD+, and also simpler and cheaper as it did not involve a consultant. For US\$65,000, the RINA team would guide Worldview through the Certification process, but Worldview would need to take full responsibility for the Project Note and Project Document. Moreover, Fjørtoft would manage the entire marketing and sale of future carbon credits himself.

At Worldview, beyond Chairman Aye Lwin, Fjørtoft and his outside network, the core team possessed minimal international experience. Besides, the VCS registry contained no projects from Myanmar, and the protocols showed little consensus on the sequestration ability of degraded or deforested mangrove land like that in western Myanmar. A UK group proposed to help Worldview develop such a methodology from scratch, but that work too would carry significant cost and significant uncertainty (**Exhibit 10** – Certification Proposal).

Above and beyond, one thing was clear. Registration would carry significant, upfront costs, with no guarantee of success, and would do nothing, at least not directly, to solve Fjørtoft's problem of securing major donor funding. Thus, pursuing registration promised to divert Fjørtoft's attention

3 United Nations, Reducing Emissions from Deforestation and Forest Degradation, <http://www.un-redd.org/>, accessed May 2018.

from securing philanthropic support, cracking the riddle of the accredited agency, and also securing funds from the Green Climate Fund or the Scandinavian governments.

The Good Life, a Global Cryptocurrency, and a New Risk

While Fjærtøft confronted hard questions regarding registration as a certified carbon project, he travelled to Bangkok to meet with his contacts at the UN and other stakeholders. On the trip, he met with Alan Laubsch, a passionate environmentalist with a career in risk analytics and international finance. Laubsch worked for a Swiss fintech firm called Lykke, and was pioneering a zero-fee exchange for digital currencies. Commenting on Lykke, Laubsch said,

Lykke means 'the good life' in Danish. The founder, Richard Olson, had a vision to build a sustainable, global marketplace for all assets, powered by blockchain⁴. At Lykke, we believe that there will be a move towards zero in the price for the exchange of all assets, to enable a global marketplace where all assets can be tokenized and traded in a zero-less environment.

Laubsch listened to Fjærtøft explain his mission for mangroves, and his difficulties in securing sustainable financial support. He had an idea to digitise the value of Worldview's mangroves with a new form of natural capital currency. Referencing work by Lord Nicholas Stern⁵ and others⁶, Laubsch explained his motivation,

This is an incredibly important time in our history as a species, when earth's natural capital, which sustains human financial capital, is at risk. Natural capital gives us free ecosystem services of US\$150 trillion every year. This far exceeds global GDP of US\$80 trillion. But there are now about US\$8 trillion every year in negative externalities that deplete natural capital. We need to urgently address these losses, because if we don't, there will no longer be a sustainable financial market. If our life support systems, in the climate, the soils, and the oceans, are not valued by our economy, we could be losing up to 5% of GDP per annum, and looking at the collapse of civilization.

The two men established a strong bond. Laubsch was a rebel with a cause and that resonated with Fjærtøft. Laubsch explained to Fjærtøft that he was ready and able to partner with Worldview to develop the new currency, marketed from Switzerland, which would represent mangroves in the Heyerdahl Park. One TREE coin would represent a single mangrove tree and be backed by the carbon credits to be issued against the carbon sequestration of the trees themselves. Laubsch proposed an initial issuance of 1,000,000 coins, at one dollar per coin, and proposed that 90% of the proceeds would flow directly to Heyerdahl while Lykke would retain 10% to ensure liquidity on its exchange (refer to **Exhibit 11** – Lykke TREE Proposal) & (refer to **Exhibit 12** – HCP TREE Coin Spec Sheet). He further reasoned,

If we monetise mangroves in a TREE coin, we can provide companies with an opportunity to diversify and decarbonise their portfolios, to invest directly in natural capital. This becomes an

⁴ Drescher (2017). Blockchain basics. Sections 2 – 3 of Introduction: http://iran-lms.com/images/images/Books/PDF/Blockchain-Basics_-_A-Non-Technical-Introduction-in-25-Steps-Apress-2017.pdf, accessed May 2018.

⁵ Stern, N., Stern review report on the economics of climate change, Executive Summary, (2006). http://www.wwf.se/source.php/1169157/Stern%20Report_Exec%20Summary.pdf, accessed May 2018.

⁶ Ida Kubiszewski Robert Costanza, Sharolyn Anderson, Paul Sutton, The future value of ecosystem services: Global scenarios and national implications, Ecosystem Services, Elsevier, June 2017, http://www.eld-initiative.org/fileadmin/Dateien/pdf/2017_J_Kubiszewski_ESscenarios.pdf; Robert Costanza, Rudolf de Groot, Paul Sutton, Sander van der Ploeg, Sharolyn J. Anderson, Ida Kubiszewski, Stephen Farber, R. Kerry Turner, Changes in the global value of ecosystem services, Global Environmental Change, Elsevier, 2014, <https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/article-costanza-et-al.pdf>, accessed May 2018.

insurance portfolio for my entire portfolio, while being good for the rest of the world. With a TREE coin, and a global and transparent system for valuing mangroves, we can develop a global system to make it easier for people around the world to restore mangroves, monitor their health, and verify positive impact. TREE coins can be the first of a series of 'currencies of purpose' that incentivise good investments in natural capital.

To launch the currency, Laubsch and his team would need to visit the Heyerdahl Park, and were happy to cover their own expenses. They would develop marketing material leveraging Worldview's work, and launch the coin from Switzerland as early as the start of 2017. Laubsch seemed like a man after Fjærtøft's own heart, passionate about nature, articulate, and sincere. Yet the TREE coin sounded like a claim against carbon credits, and Worldview owned neither the mangroves nor the land, and Fjærtøft had long promised to send at least 50% of all proceeds of future carbon credits directly to the people.

Decision Time

As Laubsch was landing in Yangon, Fjærtøft took stock of the situation and weighed his options. Worldview had planted almost 2,000,000 mangroves since making the pivot from a research organisation to one directly engaged in large-scale restoration. The village tracts had space for another million seedlings and propagules to plant in 2017, while Fjærtøft had fumes in the bank.

The TREE coin promised critical working capital, but 'crypto' was new and untested. Fjærtøft wondered, if Worldview started work with Lykke, would it scare off critical UN stakeholders, or instead show donors that it was innovative and savvy? And what were the risks of tying Worldview's name to a digital currency on the far side of the world? If the TREE coin could produce quick cash flow from untapped sources, would Fjærtøft be able to rely on it to do so year after year, counting on the new income to support each year's successive plantings? And most importantly, if Worldview could overcome the hurdles of VCS Registration, would TREE get in the way, or could the two systems coexist, with VCS credits supporting TREE investors with secure returns?

One thing was for sure, whatever Fjærtøft did, he would need to focus on the details. He reiterated emphatically,

Management is the key. If you don't have good management, even with lots of money, you will fail. And you need a team. If you don't have a team, you will be so frustrated because no one person can do everything. It's not possible. It's too complex. It is true you must have leadership capacity to put things together, but you can't do everything yourself. You must get people stimulated and inspired.

What should Fjærtøft do? Engage with VCS and dive into Registration? Or wait for a breakthrough of direct funding with UNEP and the Green Climate Fund? Or, should Worldview partner with Lykke and launch a digital token?

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EXHIBIT 1: MIRACLE MANGROVES

Mangroves sequester enormous amounts of carbon, up to ten times more than that of a terrestrial tree. Mangroves create a natural barrier to coastal flooding, and produce a living architecture for marine food webs.



*Dr. Fjertoft
Secretary General WIF*



*Svein Rasmussen
Chief Innovation Officer
Starboard Corporation*



Mangroves in the Thor Heyerdahl Park



*Win Muang
Head of Forestry WIF*

Source: The Blue Carbon Initiative, Mitigating Climate Change Through Coastal Ecosystem Management, <http://thebluecarboninitiative.org/>, accessed February 2018.

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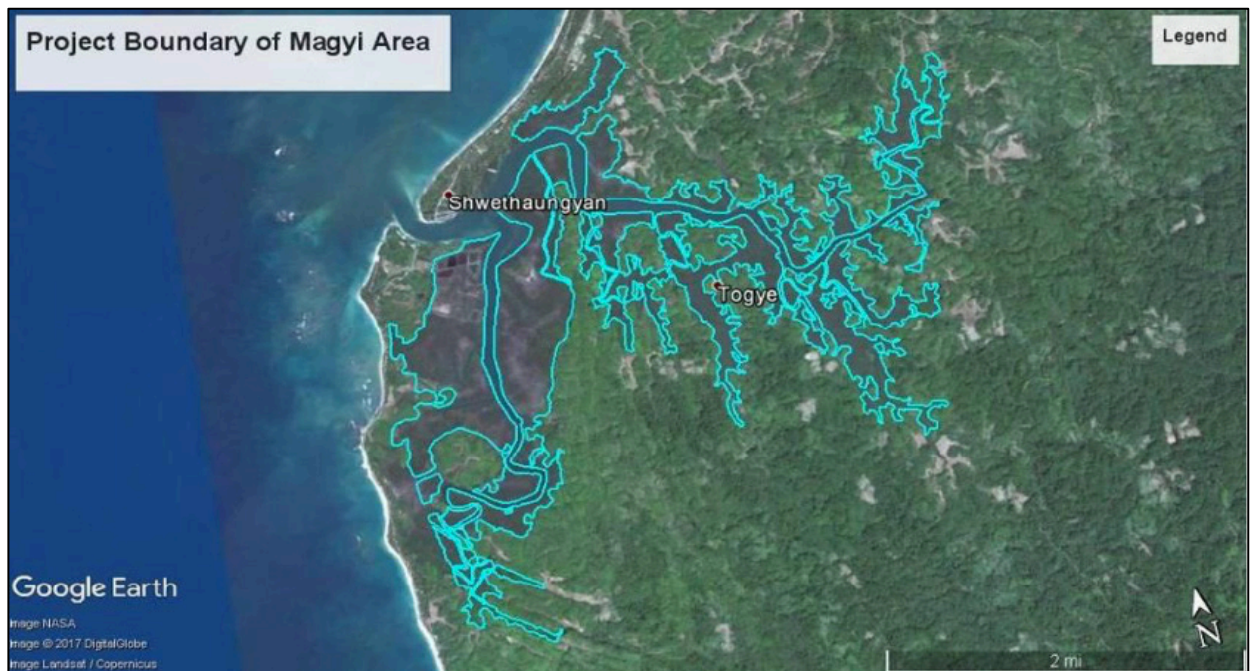
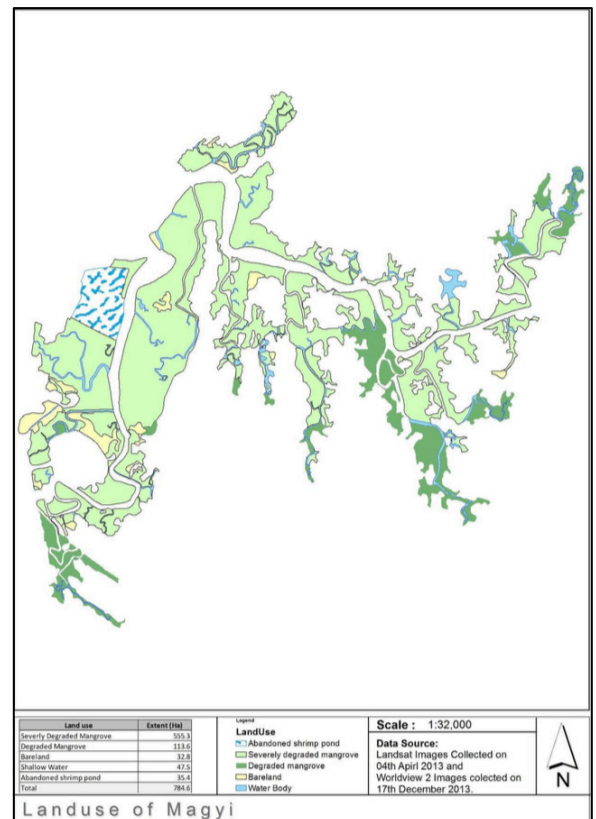
Source: Tata Group (August 2009) "Continuous and Intuitive Innovation: The Tata Experience", <http://www.tata.com/media/Speeches/inside.aspx> (accessed 11 January 2012).

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EXHIBIT 2: MAPS

Heyerdahl Climate Park, Magyi Area, Patheingyi State, Myanmar



Source: Worldview International Foundation

EXHIBIT 3: COMMUNITY ENGAGEMENT

Worldview organised field meetings around village tracts for stakeholders to debate, set, and legitimate project objectives, discuss ecosystem and carbon-credit benefits, devise livelihood projects, and nominate leaders to recruit for the nurseries and planting.



Pathein University

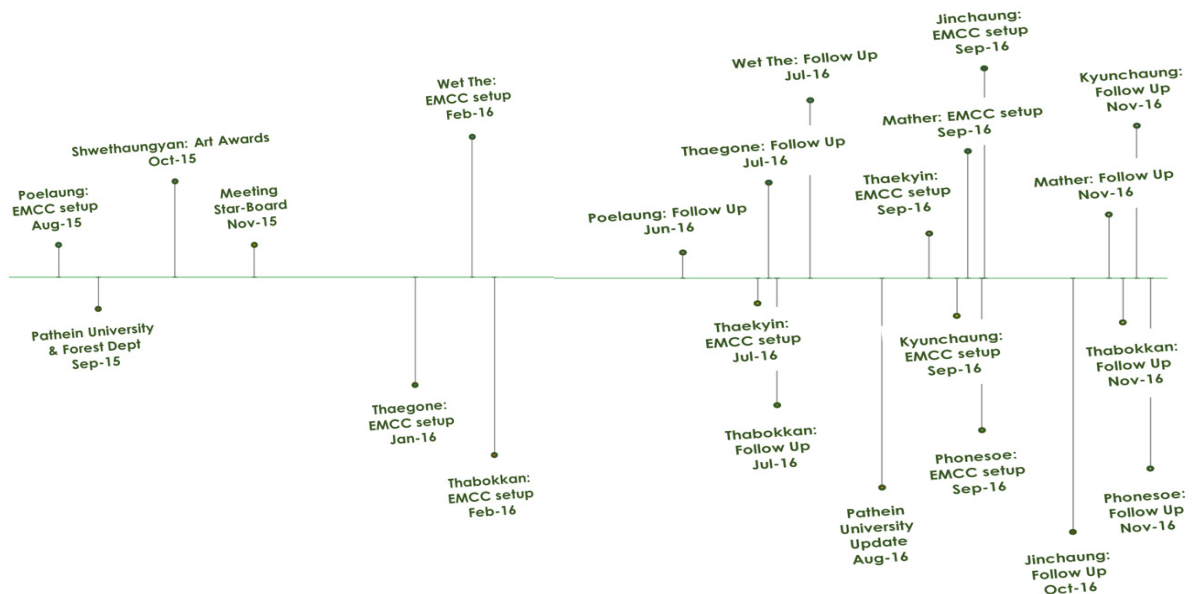


Magyi EMCC



Pathein Forest Department

Timeline of major stakeholder meetings during the case period



Heyerdahl Project Planning



Schwethaungyan Art Programs



Source: Author

EXHIBIT 4: MANGROVE PLANTING THROUGH THE SEASONS, WESTERN MYANMAR



Nursery w/ Tidal Irrigation

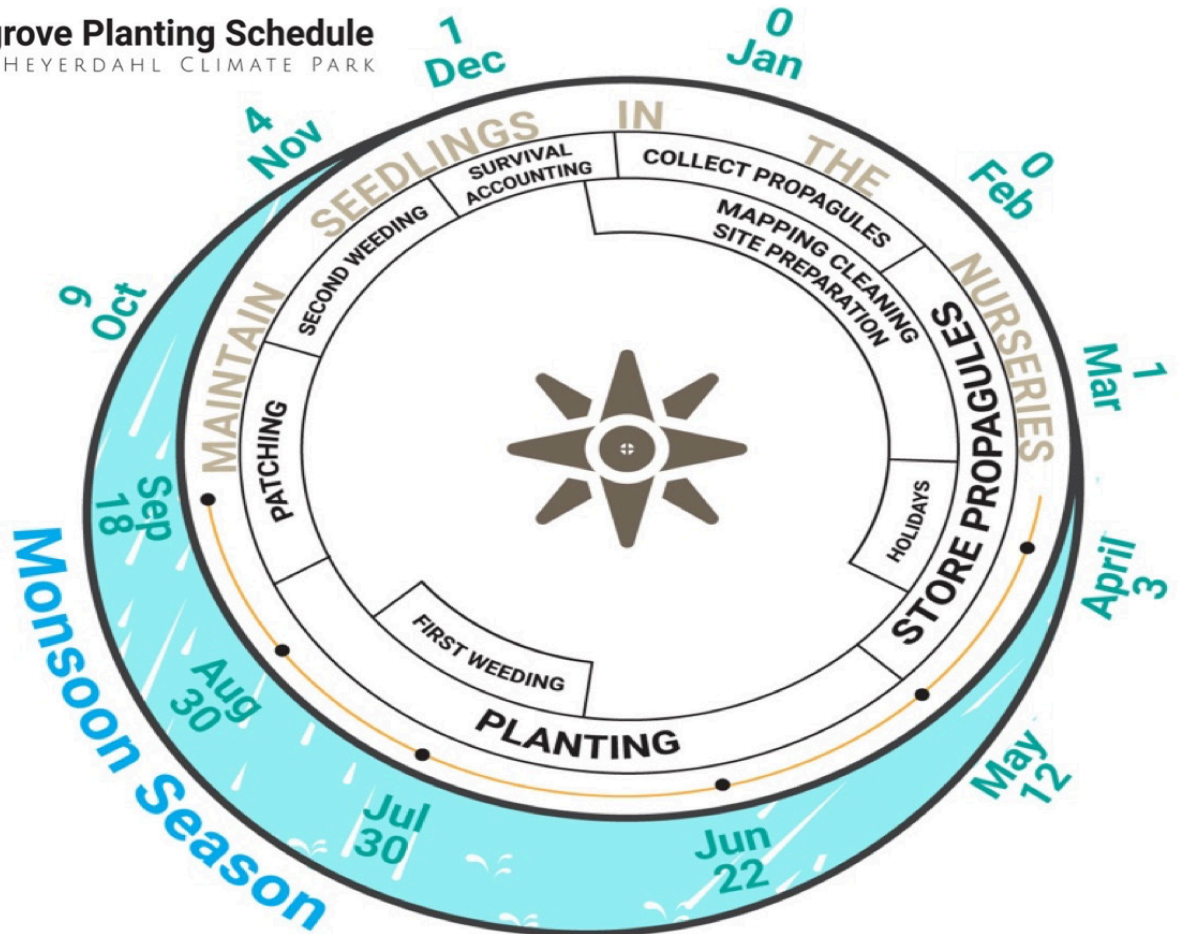


Field Training



Importing Propagules

Mangrove Planting Schedule
THOR HEYERDAHL CLIMATE PARK



Note: Outer ring reports average monthly rainfall (2005-2015).



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Preparing Propagules

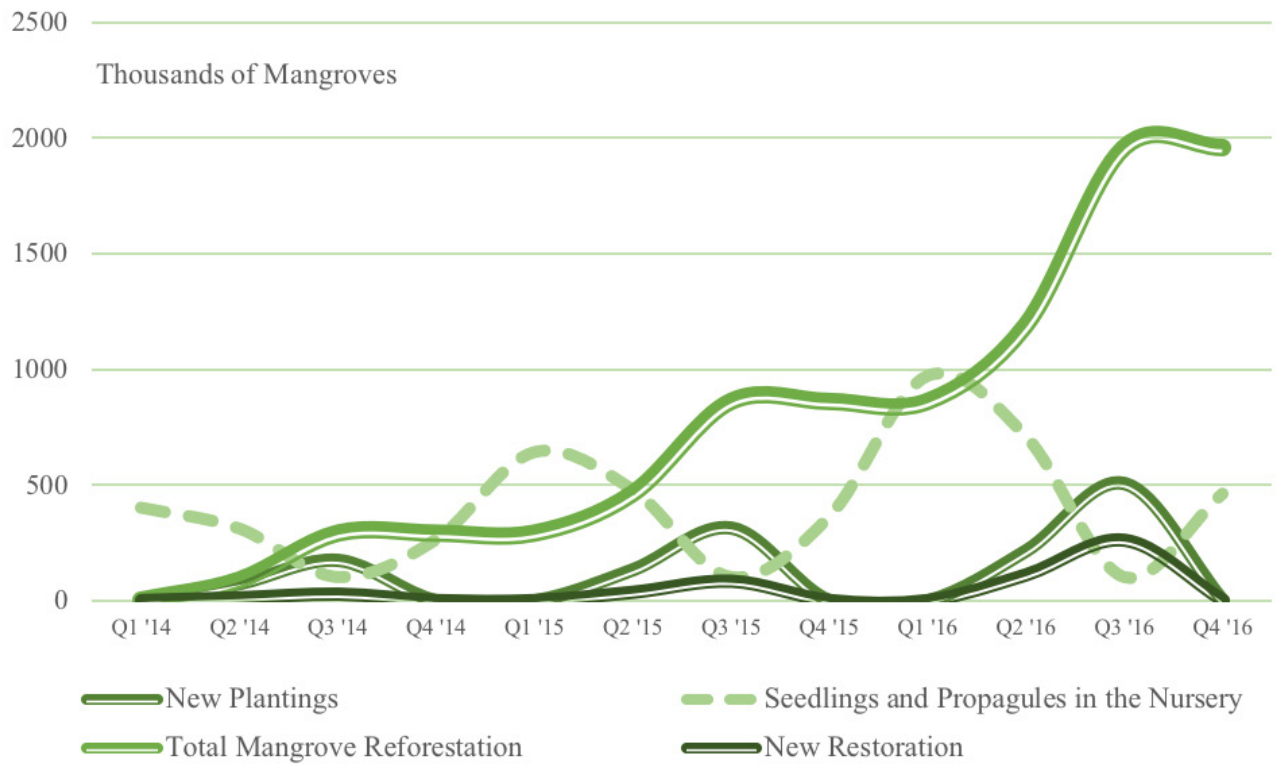
Mature Seedlings

Planting

Source: Author, Worldview International Foundation, Meteorological Department of Myanmar.

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EXHIBIT 5: MANGROVE PLANTING TIMELINE 2014 - 2016

Period	New Forest (Ha)	New Plantings	Restored Forest (Ha)	New Restoration	Nursery Seedlings and Propagules	Total Mangrove Reforestation
Q1 '14	0	0	0	0	400000	0
Q2 '14	15	75000	6	12000	310000	87000
Q3 '14	35	175000	14	28000	100000	290000
Q4 '14	0	0	0	0	262000	290000
Q1 '15	0	0	0	0	640000	290000
Q2 '15	27	135000	18	36000	478000	461000
Q3 '15	63	315000	42	84000	100000	860000
Q4 '15	0	0	0	0	361000	860000
Q1 '16	0	0	0	0	970000	860000
Q2 '16	43.5	217500	56.1	112200	709000	1189700
Q3 '16	101.5	507500	130.9	261800	100000	1959000
Q4 '16	0	0	0	0	460000	1959000

Source: Worldview International Foundation

EXHIBIT 6: FINANCIAL POSITION, DECEMBER 2016

WORLDVIEW INTERNATIONAL FOUNDATION (WIF)		
STATEMENT OF FINANCIAL POSITION AS AT 31ST DECEMBER 2016		
	Sch	Amount USD
ASSETS		
Non - Current Assets less Depreciation		
Property, Plant & Equipment	1	33,644.50
CURRENT ASSETS		
Planting/Regenerated Mangrove Trees of 1,959,000 at Thor Heyerdahl Climate Park in 2015 & 2016 @USD1/Plant		1,959,000.00
600,000 plants in Nursery at Magyi in 2016 @ USD 0.25/Plant		150,000.00
Planting Mangrove Trees of 250,000 at Pyindayae in 2016 @ USD 1/Plant		250,000.00
		15,000.00
60,000 plants in Nursery at Pyindayae in 2016 @ USD 0.25/plant		500.00
Deposit for Payment gate		7,480.78
Cash & Bank Balances	2	<u>2,415,625.28</u>
Total Assets		2,415,625.28
FUNDS AND LIABILITIES		
FUNDS		
Brought Forward Accumulated Fund from July 2012 to March 2015	3	1,714,375.75
Fund received for the Year from April 2015 to December 2016		723,630.17
Expenditure over Income		(337,338.07)
Total Funds		<u>2,100,667.85</u>
CURRENT LIABILITIES		
Creditors & Payables		
A/S Brodr Michaelsen		133,886.66
Bio 8		76,863.10
Tor Bratli		12,215.46
Accrued Salary to Dr Arne Fjortoft		75,000.00
Accrued Expenses to U Aye Lwin		7,000.00
Accrued Interest to A/S Brodr Michaelsen and Bio8		9,992.21
Total Current Liabilities		<u>314,957.43</u>
Total Capital and Liabilities		<u>2,415,625.28</u>

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WORLDVIEW INTERNATIONAL FOUNDATION (WIF)**CASH FLOW STATEMENT FOR THE PERIOD FROM APRIL 2015 TO DECEMBER 2016**

	April-2015 to December-2015	January-2016 to December- 2016	Total
	USD	USD	USD
CASH INFLOWS			
Income from Letten Foundation in contribution for Worldview for establishment of Thor Heyerdahl Climate Park	147,100.00		147,100.00
WIF contribution in Cash (Norway)	102,500.00	52,685.00	155,185.00
Contribution from Arne Fjortoft		34,000.00	34,000.00
Income from Tree Planting			
Ice-World		9,000.00	9,000.00
Pegasus helicopter AS	4,000.00		4,000.00
Starboard	10,000.00	71,500.00	81,500.00
Various Donation	1,647.64		1,647.64
Loan from A/S Brodr Michaelson	27,944.21	105,942.45	133,886.66
Loan from Bio 8		76,863.10	76,863.10
Loan Tor bratli	12,215.46		12,215.46
Royal Norwegian Ministry of Foreign Affairs for Orchid Seeds Collection Project	291,197.53		291,197.53
TOTAL CASH INFLOWS	596,604.84	349,990.55	946,595.39
CASH OUTFLOWS			
Cost of Planting Mangrove Trees/Nurseries in Thor Heyerdahl Climate Park from April 2015 to December 2016			
Planting Mangrove trees in Thor Heyerdahl Climate Park from April 2015 to December 2016			679,006.44
Orchid Seeds Collection Project			290,985.66
Refund balance cash of project to donor			211.87
TOTAL CASH OUTFLOWS			970,203.97
CHANGE IN CASH			(23,608.58)
Balance at the beginning			31,089.36
Balance at the end			7,480.78

Source: Worldview International Foundation

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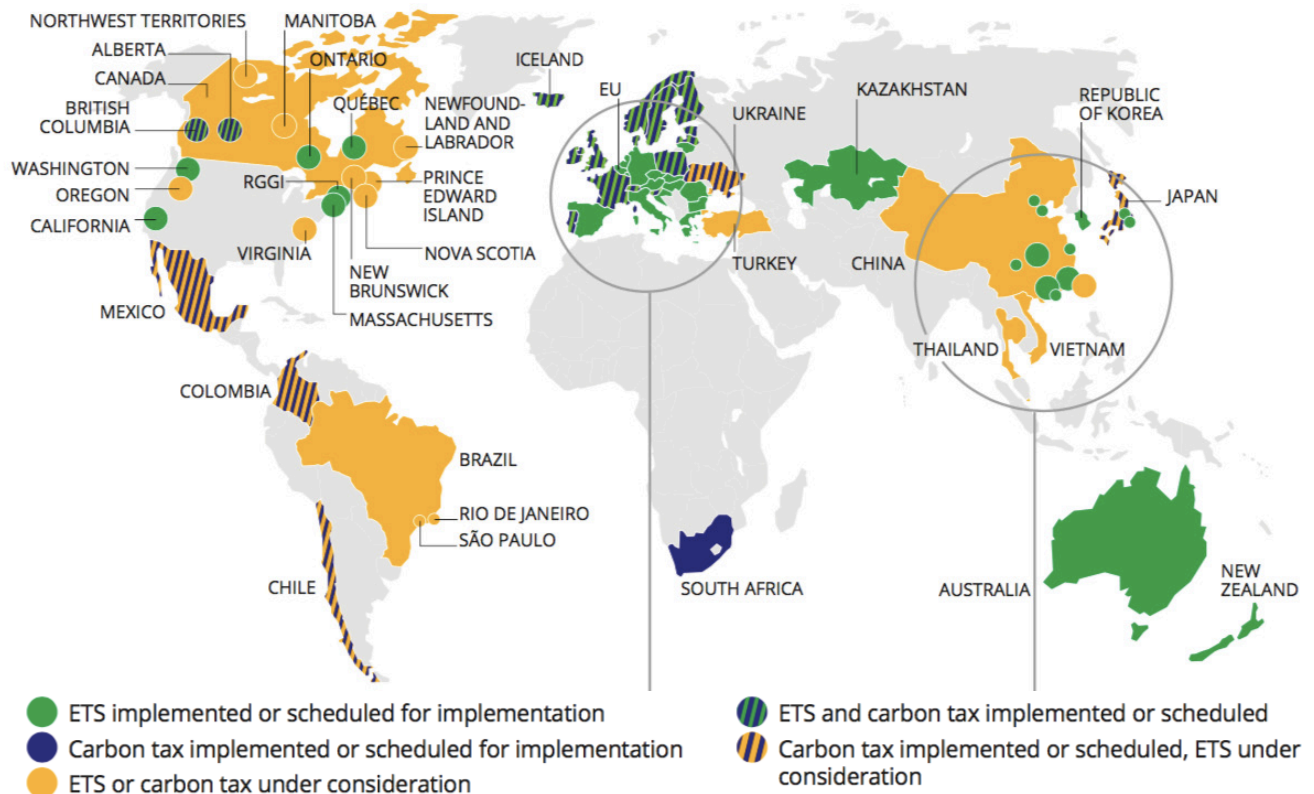
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EXHIBIT 7: DETAILED PLANTING AND OPERATIONS BUDGET (USD): 2016

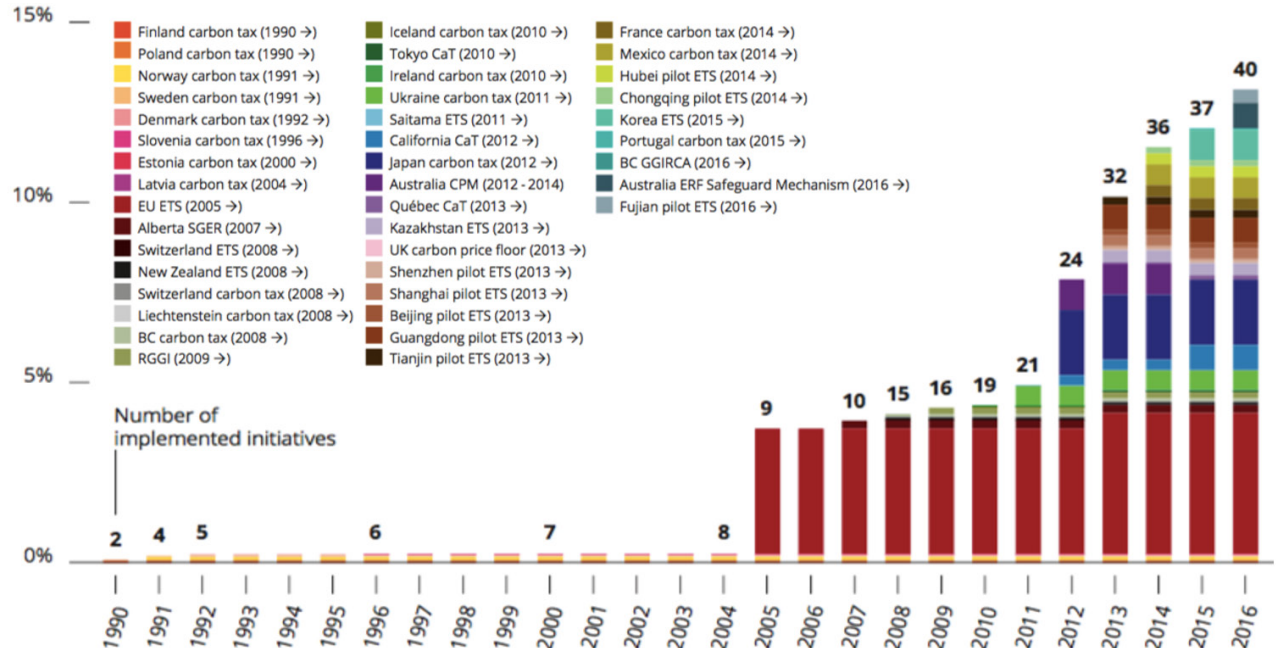
Thor Heyerdahl Climate Park: Magyi (332 Ha), 1,099,000 Mangroves	Jan - Jun	Jul - Dec
Seed Purchase, Bagging Sowing, & Nursery Planting	103,000	42,000
Seed Storage Building and Nursery Stocking	5,450	49,050
Land Cleaning & Garbage Removal	2,324	20,916
Land Clearing & Hydrology	3,320	29,880
Mangrove Planting 80/Ha	40,000	10,000
Plantation Patching 6/Ha	0	2,000
Fuel/ Maintenance for 2 boats 12 months x 350	4,200	4,200
Transportation for Field Staff and General Goods	1,500	11,100
Plantation Weeding 30/Ha x 2 times	0	19,920
Forest Patrols and Survival Sample Plots	2,400	2,900
Field accommodation 12 months x 200	1,200	1,200
Pyindayae Project w/ Patheingyi Forest Department: (50 Ha), 250,000 Mangroves		
Seed Purchase, Bagging Sowing, & Nursery Planting	25,250	21,000
Seed Storage Building and Nursery Stocking	2,250	11,250
Land Cleaning & Garbage Removal	1,750	1,750
Land Clearing & Hydrology	500	4,500
Mangrove Planting 80/Ha	18,000	4,500
Plantation Patching 6/Ha	0	300
Fuel/ Maintenance for 2 boats 12 months x 350	600	600
Transportation for Field Staff and General Goods	180	4,820
Plantation Weeding 30/Ha x 2 times	0	3,000
Forest Patrols and Survival Sample Plots	2,400	2,500
Worldview International Foundation Staff, Overheads & Operational Expenses		
Salaries For Nursery Permanent Labor 200 x 5 Pax	6,000	6,000
Secretary General 12 months x 2000	12,000	12,000
Project Forestry Director 12 months x 2000	12,000	12,000
Field Manager w/ Hardship Allowance 250 x 2 Pax	1,200	4,800
Boatman 300 x 4 Pax	7,200	7,200
Finance Assistant 400 x 1 Pax	2,400	2,400
Night Guard 250 x 3 Pax	4,500	4,500
Life Insurance for Staff (one-time payment per year)	1,000	1,000
Research Manager	3,500	3,500
Office House Rent/Maintenance 12 months x 2000	12,000	12,000
Electricity/Utility/Telephones	4,500	4,500
International networking /travels	5,000	5,000
Car Hire and Fuel	3,200	12,800
Coordination and quality control 12 months x 500	1,200	4,800
Networking Community Communication	2,000	2,000
Accounting, Documentation & Stationary	3,000	3,000
Auditing	1,250	1,250
Total	296,274	326,216

Source: Worldview International Foundation

EXHIBIT 8: GLOBAL CARBON MARKETS



Share of global annual emissions covered by carbon tax or emissions trading system (2016)



Source: The World Bank, State and trends of the carbon markets 2017.

Zechter, Richard H.; Kossoy, Alexandre; Oppermann, Klaus; Ramstein, Celine Sarah Marie; Klein, Noemie; Wong, Lindee; Lam, Long Khanh; Zhang, Jialiang; Quant, Maurice; Neelis, Maarten; Nierop, Sam; Ward, John; Kansy,

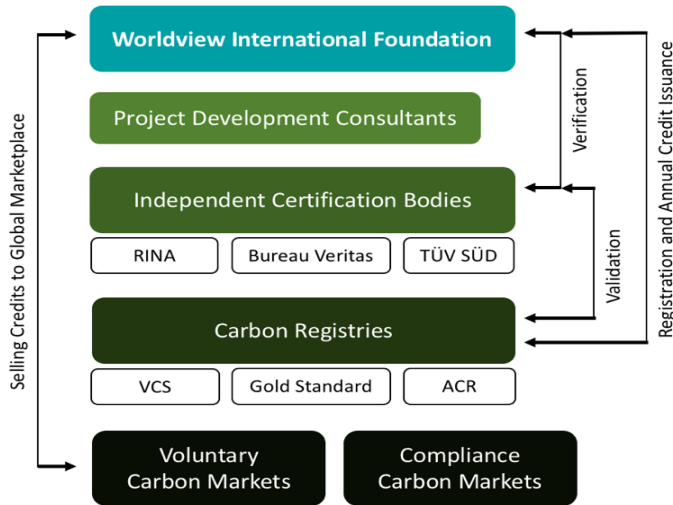
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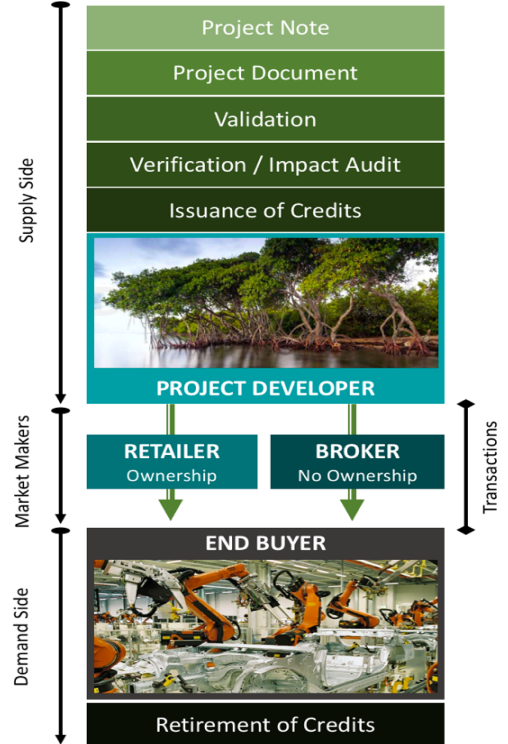
Thomas; Evans, Stuart; Child, Alex. 2017. *State and trends of carbon pricing 2017 (English)*. Washington, D.C: World Bank Group, Ecofys, Vivie Economics. <http://documents.worldbank.org/curated/en/468881509601753549/State-and-trends-of-carbon-pricing-2017> - reproduced under creative commons attribution 3.0 IGO license

EXHIBIT 9: CARBON MARKET SUPPLY CHAIN

Understanding the Carbon Credit Supply Chain

Carbon Market Ecosystem

To supply carbon credits into global carbon markets, Worldview must first secure Verification and Validation for their project by an Independent Certification Body. This process is often assisted by expertise from an ecosystem of consultants, and seeks to establish Worldview within one of the world's leading Carbon Registries (e.g. VCS; ACR, etc.). These Registries issue annual credits to Validated projects for sale into various carbon markets, where sales may be facilitated by an additional ecosystem of retailers and brokers.

Lifecycle of a Carbon Credit

Source: This figure was designed by Ryan K Merrill (co-author) in collaboration with Suraj Vanniarachchy (carbon expert) for this case.

EXHIBIT 10: CERTIFICATION PROPOSAL**Development of a VCS REDD methodology for mangroves in Myanmar
Submitted to Worldview International Foundation - 20 Aug 2015**

Worldview International Foundation (WIF) has been working to restore 725 hectares of degraded mangrove in the Ayeryawady Region of Myanmar. They are currently expanding their operations to include an additional 3000 hectare project site, and hope to develop similar projects throughout Myanmar. Project activities include planting mangrove species into heavily degraded areas, and protecting the entire area from further degradation.

WIF hope to finance part of the project costs through the sale of Voluntary Carbon Units (VCUs) certified by the Verified Carbon Standard (VCS). Methodologies for assessment of greenhouse gas (GHG) emission reductions and removals from mangrove restoration activities that can be used in VCS projects are available (e.g. CDM methodology AR-AM0014)⁷. There are currently no methodologies approved by the VCS for assessing reduced GHG emissions from deforestation or degradation (REDD) of mangroves, however.

In order to generate VCUs from REDD at their mangrove project sites, WIF needs to develop a methodology for assessing GHG emission reductions from avoided deforestation and/or degradation of mangroves and submit this to the VCS for approval. If approved the methodology could also be applied to other mangrove projects in the region, and potentially globally. To assist them with the development of a VCS approved methodology, and the parameters needed to implement it at project sites in the Ayeryarwaddy Region, WIF would work in partnership with two organizations with expertise in REDD and VCS methodologies for mangroves.

Project Methodology

1. Literature review and consultation to identify VCS requirements, existing methodologies, and examples of best practice
2. Literature review and consultation to identify remote sensing approaches for assessing and monitoring mangrove deforestation and degradation
3. Develop a methodology detailing applicability conditions; additionality assessment, baseline definition, quantifying emission, and monitoring:
 - Project boundary and GHG sources, sinks and reservoirs;
 - Criteria and procedures for identifying alternative baseline scenarios;

⁷ UNFCCC, Afforestation and reforestation of degraded mangrove habitats ,
<https://cdm.unfccc.int/methodologies/DB/KMH6O8T6RL3P5XKNBQE2N359QG7KOE>

- Criteria and procedures for demonstration and assessment of additionality;
- Criteria and procedure for quantifying net GHG emission reductions and/or removals, as a function of baseline emissions, project emissions and leakage.

Indicative budget

A tentative schedule and budget is provided at this project concept phase to give an indication of likely costs and timeframes. A complete budget and project work plan will be developed at the proposal phase. The project will require the following personnel for a total of around 250 person days over a 24 month project period:

1. REDD Specialist [~50 days]
2. Mangrove Carbon Specialist [~50 days]
3. Soil Carbon Specialist [~50 days]
4. Remote Sensing Specialist [~75 days]
5. Statistician [~10 days]
6. Project Manager [~15 days]

The total cost for the above personnel would be around EUR 250,000.

In addition to this, costs for travel and subsistence for international staff who will train field teams, and payment for field technicians who will conduct fieldwork over a six month period will be required. Fieldwork costs are estimated at around EUR 50,000.

The cost of the VCS methodology approval process must also be included in the project budget. This includes a USD 2,000 application fee payable on submission of the methodology concept note, a USD 8,000 processing fee payable when the draft methodology is submitted and sent for public consultation, and the cost of two independent reviews. The cost of reviews depend on the validation/verification body contracted, and the scope and complexity of the methodology. A total budget of around EUR 50,000 is likely to be required for the full approval process.

An indicative budget for the project is therefore in the region of EUR 350,000.

EXHIBIT 11: LYKKE TREE PROPOSAL

Value proposition to coin buyers: Carbon pollution destroys global welfare so company's and impact investors want to buy assets that keep carbon in the ground and out of the air. Right now Google is currently paying about \$12 per ton for carbon offsets. Exxon Mobile anticipates paying for \$80 / ton in its medium-term planning. Active carbon sequestration in power plants, injecting the emissions into the ground, costs about \$600 per ton. But a mangrove tree can capture a full ton of carbon in only 20 years, and planting a mangrove tree costs \$1!

HCP (TREE) is an asset, a colored coin on the bitcoin block chain that allows investors to fund a mangrove tree. 1 TREE coin = 1 Mangrove planted at the Heyerdahl Climate Park. Each year an investor holds a TREE coin, they increase the amount the offset their carbon footprint. Assuming investors hold the coin for 20 years, the average person needs 200 TREES to be carbon neutral. The average European needs 500, while an American need 2,000. Frequent travelers need about 8,000 TREES.

If investors want to capitalise their investment, they can also draw on revenues produced by these mangroves. A TREE coin gives an investor claim to 50% of revenue from carbon credits; the local communities gets the other 50%. Per TREE, investors can expect to get about 25 kilos in carbon credits. At \$5 per ton, this corresponds to 14 cents annually. If investors sell their credits, they are no longer balancing their carbon footprints, but its each investors' choice. Before TREE is accepted in international accounting, it can be exchanged on the Lykke exchange as a tradeable asset,

Agreement with Worldview:

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- a) Worldview International Foundation (WIF), founded in 1979, is a unique international development NGO working together with UN agencies, governments and civil society in developing regions.
- b) Lykke is creating an internet exchange platform technology with settlement on the Blockchain using colored coins technology and is willing to provide such services for Heyerdahl Climate Pioneers (HCP) holders.
- c) This Client agreement, hereinafter referred to as Agreement, governs the rules of HCP issuance.
- d) The HCP colored coin will be issued by Worldview International Foundation with technical support of Lykke and will represent the IOU to exchange it to a Mangrove tree CO2 certificate.
- e) Holder of one HCP will be entitled to receive carbon credit rights for 30 years per average vintage 2015 to 2016 mangrove tree in Thor Heyerdahl Climate Park (e.g., carbon credit rights of trees planted to date) as described in HCP Fact Sheet. 50% of Net VCU Sales Proceeds will be allocated to WIF to fund local community development.

- f) Lykke's underwriting fee will be 5% of issuance of HCP. In addition, 10% of HCP will be allocated to the broader community to develop a marketplace for HCP (this will include partners participating in the PR, marketing, and sales of HCP, as well as winners of contests posted on Lykke Streams).
- g) Lykke will hold funds raised for WIF, and send payments upon request of WIF. Current needs are approximately \$70,000 monthly, but WIF can ask for additional withdrawals at any point in time. All fund requests must come from WIF, not third parties. Lykke will hold at least 10% of the cash raised as liquidity cushion. 100% of funds raised belong to WIF.
- h) Lykke will do a secondary offering of 1,000,000 HCP using ConsenSys and their WeiFund platform, by issuing an Ethereum token. Existing HCP holders will be upgraded to an Ethereum token in the future. Lykke asks Worldview to reserve 2,000,000 tree rights (included 770,000 trees to be planted in 2017, excluding trees already paid for by other partners), except if unsold by June 30 2017. After a successful sale of 2 million trees planted, WIF will reserve another 2 million unplanted tree for a future offering until Dec 31 2017.
- i) WIF will found a "World Mangrove Fund" with funds raised, and establish transparent governance structures designed in cooperation with Lykke. This will include an Advisory Board with Lykke participation, independent auditors, and regular financial reporting of expenses and carbon credit sales.
- j) WIF will establish an escrow registry for Verified Carbon Units (VCUs) in cooperation with Bio 8, Starboard and other established partners with Lykke and HCP investors by December 2017, when Verified Carbon Standard (VCS) registration is expected to be completed.
- k) WIF gives Lykke non-exclusive rights to sell VCUs, and to list digital tokens of VCUs on Lykke Exchange.

- l) WIF will establish a bank account in Myanmar for VCU sales.
- m) All HCP trades will be placed on Lykke Exchange. Lykke will organize listing and trading of HCP and spot exchange to other colored coins traded, such as BTC, IkeUSD, IkeCHF, IkeEUR, IkeGBP. Asset specification is provided in Appendix A.
- n) Lykke will make market for HCP as for other colored coins listed on Lykke Exchange.
- o) Liquidity pool of at least 50,000 HCP (approx. valued at \$50k) should be accumulated to issue the respective amount of HCP, which will be transferred to Lykke market making algorithm. This liquidity pool will be lent by WIF.
- p) Lykke will transfer the initial inventory to the market maker: 10k IkeUSD, 10k IkeEUR, 10k IkeGBP, 10k IkeCHF, 12 BTC (in total approx. valued at \$10k). This 10% of cash liquidity pool is borrowed from WIF.
- q) Lykke will run market maker and report profit & loss from market making on quarterly basis.
- r) Lykke will accumulate and distribute the profits on annual basis proportionally to the stake in the liquidity pool.
- s) Stake of Lykke in the liquidity pool is 50%.
- t) Stake of Worldview International Foundation in the liquidity pool is 50%.
- u) Market making Losses will not be mutualized, and will remain on Lykke, if any.

The period of this Agreement is five years, with automatic extension unless cancelled by either side.

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EXHIBIT 12 – HCP TREE COIN SPEC SHEET

Spec	Proposed value
Underlying asset (IOU) type	CO2 Certificate
Short name	HCP
Symbol	HCP
Full name	Heyerdahl Climate Pioneers
Representation	1 HCP = 1 Mangrove tree + carbon rights
Number of coins issued	Initial issuance 500,000 HCP, with secondary issuance planned
Divisibility	0 digits
Brief description	The HCP colored coin (HCP) represents the IOU to exchange it to Mangrove tree CO2 certificate. Holder of one HCP is entitled to receive one Mangrove tree CO2 certificate
Ticker (Symbol)	HCP
Asset name	Heyerdahl Climate Pioneers
Base currencies	lkeCHF, lkeEUR, lkeUSD, lkeGBP, BTC
Deposit enabled	Yes
Withdrawal enabled	Yes
Can be base asset	No
Accuracy	0 digits
Multiplier	1
Trading commission	0%
Initial Mid price	\$1
Tick Size	\$0.001 (10bp)
Bid-ask spread	20 bp (2 ticks)
Depth quoted	20 levels
Depth on level	1000 HCP
Implied volatility (annualized)	30%
Relaxation time	120 minutes
Market maker inventory	50'000 HCP (provided by WIF) 10'000 lkeCHF; 10'000 lkeUSD; 10'000 lkeEUR; 10'000 lkeGBP; 12 BTC (provided by WIF)

Source: Worldview International Foundation