

HAKONO HARARANGA



TAHI

2016 Newsletter
Hakono Hararanga Incorporated

Hakono Hararanga: Tahī

Kia Orana and Welcome to our first newsletter. Our first year has been a bit slow, but this is common with new organisations:

Our Society was Incorporated at the Ministry of Justice in July 2015 as a *not-for-pecuniary-gain* organisation. Our registration certificate no. is **469/2015**. Lawyer Wilkie Rasmussen is appointed as our legal adviser.



Most of our Members headed south for *Te Maeva Nui* 50th Anniversary of Independence; some are still away in 2016.

We applied to open a Society bank account with BCI in December 2015 ~ giving all documents, Constitution, AGM & Board Minutes, signatures and IDs of Trustees etc. ***This has still not been completed*** (July 2016), even though BCI Rarotonga has been sent the documents three times!

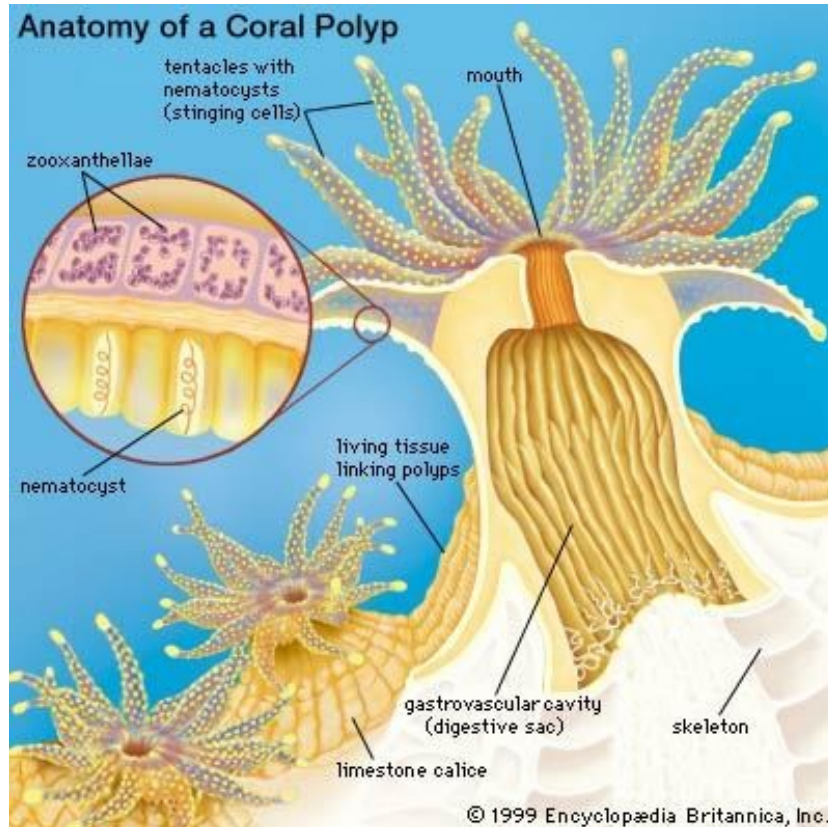
Our Treasurer, Mereani Taime, found us a contact to buy *tahirihi*. We are preparing a shipment.

We will hold an AGM in July 2016: and then email the Minutes, this newsletter, and our financial account (which is only the initial joining fees of our Members; we didn't make transactions as we have no bank account) to the Ministry of Justice; which complies with our Constitution and the law.

Coral Bleaching (*sinasina*):

Our President (Dr Michael White) discovered the first **coral bleaching** at Tongareva Henua on 21st December 2015. Dr Mike has been carefully observing corals since 2010: we had been lucky. But a combination of global warming and a strong *El Niño* pushed us over the top. **Bleaching happened very quickly ~ in a few days.**

January 2016: Dr Mike and our Chairman Ru Taime surveyed many toka and found wide-spread bleaching. Worse was that most (95%) of the *pasua* died. Tiny organisms (*zooxanthellae*) live inside the tissues of corals and *pasua*: this is what gives them their bright colours. As the lagoon temperature rose (it was 35-38° C) those little algae became poisonous and they were pushed out: which leaves the corals & *pasua sinasina*.

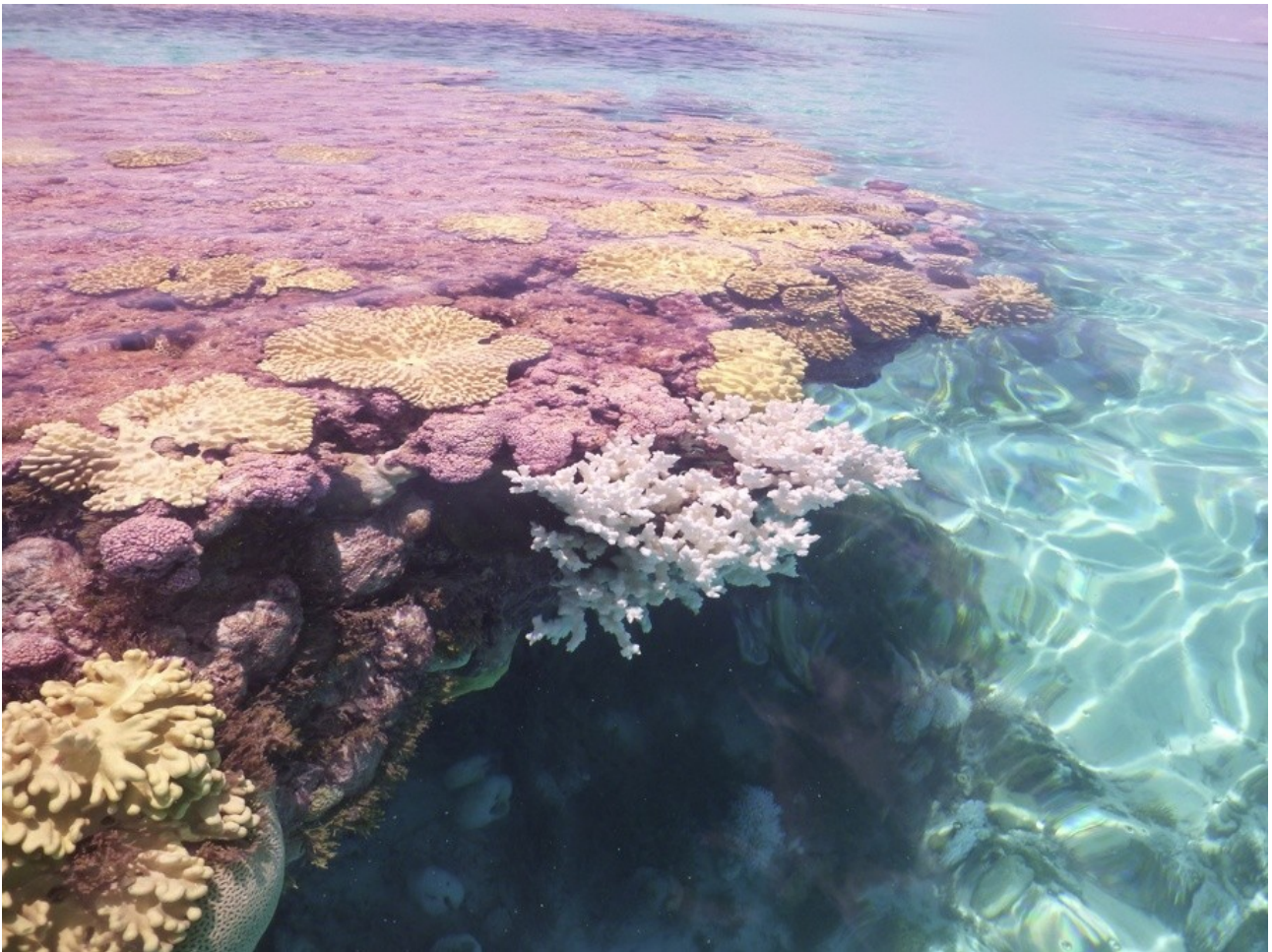


We might think that corals are just rocks, but really they are tiny animals living as a colony. They make a hard skeleton ~ *the rock* ~ but then usually at night they put out tentacles to feed; you may have seen them? If you've ever been stung by a coral: the **nematocyst** holds a tiny spear that shoots out at great force (1100 psi). The **zooxanthellae** take in carbon and using sunlight they make sugars, most of this high energy food goes to the coral colony. As the lagoon heats up, food production gets faster & faster. The coral polyps can't eat it all, so they push the *zooxanthellae* out of their skin. We can see the white carbonate skeleton. At this point the coral may still be alive, but now its only food is caught by the tentacles, and there may not be enough living tissue left to process it all.

Pasua have *zooxanthellae* in their mantle; also giving them bright colours. We saw some interesting things during our surveys: a *pasua* might be half *sinasina* and half coloured ~ this was them dying. When *mate* all the colour had gone, and other animals ate the flesh leaving an empty shell.

We learned just how good *rahui* has been. Because we keep *pasua* exports closed, only taking them on special occasions, there were **tens of thousands of *pasua***. So even though these died this is exactly the right approach for us to protect our natural resources at Tongareva. **Take a few and**

leave the others in peace. Although this was a waste ~ what we hope happened is before the clams died they did a **mass spawning**, so we should see new shells settling soon. **They are** (May 2016).



You can see here that some corals on top of toka are used to high temperatures in the daytime, but the acropora *fingers* bleached. More important is the deeper corals had died, which shows hot water went right to the lagoon floor & those corals cannot take higher temperatures.

Dr Mike wrote a short science paper on the corals and pasua deaths and very quickly managed to get it published (The Marine Biologist, Issue 6, April 2016: pages 26-27)¹. This was real luck as far-away places like Tongareva don't get mentioned in the news. We often hear the Great Barrier Reef is endangered ~ it is badly affected by bleaching too, for exactly the same reasons as we are ~ so when scientists want to know the true impacts of climate change usually there is no information from the South Pacific. This time there is ~ **so that's a big credit to our Society.**

Climate change is very real. For many people in the world, including down south, climate change is just some idea that may happen some time, some place; or maybe it won't. A quick look at the science news reveals that **December 2015 was the hottest month since records began** 135 years ago in 1880; British records are even older (1850). But January 2016 was even hotter, then February hotter still; and March and April are even hotter: in fact *the last few months have all set new global temperature records*. Some of you know that we've lost many trees on the motu; every survey we find more collapsed. This is a combination of things: increased solar and u/v radiation, too hot, high levels of salt in the wind, high tides washing into the forest, and very limited rainfall. In March 2016 even some *tausunu* and *noni* have died ~ these are very hard to kill. Also many manu have left: maybe 95% of the larger birds went somewhere cooler. We still had some *kakaia*, *rakia*, *ngoio*, but very few *tapuku*, *kapu*, *tarakura* and *kotaha*. This means now we must be very careful to protect those manu still here. **All living things are affected in some way by climate change.**

Staying with manu: Papa Rongo Taia of Te Tautua passed away on Sunday 29th November 2015 ~ a great loss to us all. Papa Turoa Taia is now caretaker of the Taia Family. He says **rahui** is still in place on *Tavake*, so **please no birds to be taken without permission** from him first. Meitaki Poria.



Papa Rongo Taia at Te Tautua Constitution Day 2015. He was a great friend and a protector of nature, so we should honour his legacy. The Taia family agreed to continue the rahui on Tavake.



This year we've had two new birds: one is a **Great Crested Tern** *Thalasseus bergii*. First seen on a post near Molokai in April, but then again in June ~ did it stay and are there more than one?



Thalasseus bergii Great Crested Tern (April 2016 near Molokai).

Dr Mike found a **koekoea** (Long-tailed cuckoo *Urodynamis taitensis*) on Mangarongaro in June, not easy to see, but it shrieked from a tausunu and we now have this photo. Apparently they breed in NZ, but may fly out to the islands over winter.



Koekoea Urodynamis taitensis Long-tailed Cuckoo (June 2016 at Mangarongaro).

Connecting to the world of *Far-away*:

Our Board decided to raise our Society profile by connecting with suitable groups around the world. We think Cook Islands groups are very limited ~ too inward looking ~ so we looked for places where our research could help. Dr Mike set up a page on www.projectnoah.org [NOAH networked organisms and habitats]. **Search there for Michael White or Tongareva Biodiversity**. You'll find this is a site where we can report our animal and plant sightings.

How? You take a good photo of something interesting, remember when and where you saw it. We need a scientific name, but Papa Mike can help with this. **You upload your data** and that goes into our records: we call this '**citizen science**': real people helping our planet. Just like Noah. Cool hey?

Another organisation we contribute to is www.coralwatch.org at the University of Queensland: we can report coral bleaching impacts on there. Five surveys have been uploaded already.



This is a *coralwatch* colour chart being used to show coral health; this small coral is recovering now.

We also report manu to the global database of the **British Ornithological Trust** www.bto.org

And lastly, Dr Mike puts the honu sightings on www.seaturtlestatus.org

Tongareva is doing a good job environmentally, but we need our local government to catch up and do things that benefit our atoll, instead of still causing so much damage!

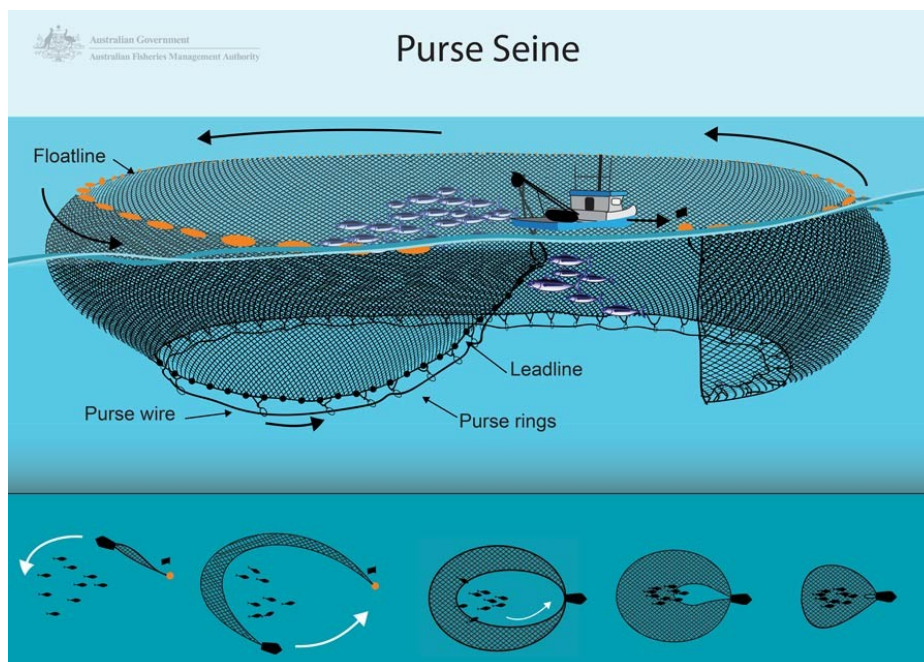
Purse seine fishing:

In March 2016 we had a delegation from Rarotonga persuading us to approve purse seining in northern waters for skipjack tuna. The evidence presented by the PM & MMR was weak and some was not true. After the talk Dr Mike & Papa Ru Taime spent a long time discussing the various options. Dr Mike wrote a science review on the various tuna (skipjack, big-eye and yellowfin). The problem is FADs (fish aggregating devices): these cause non-target species like big-eye and oceanic whitetip sharks to get caught. We call this **bycatch**, and it is this aspect that is unsustainable. Our Society's Constitution notes that we should use all natural resources sustainably and take great care to leave a healthy & abundant ecosystem to our descendants. *Every fish someone else takes is one fish less for us and the mokopuna.* Therefore as a Society we should **oppose purse seine fishing with FADs**.

There is a neat trick here: the **Luen Thai albacore fishery** at Rarotonga recently got accreditation from the *Marine Stewardship Council* (MSC): this means they can show their fishery is sustainable. So what we do is tell the Rarotongan government that **all fisheries** in the Cook Islands should have MSC accreditation: *we want proof that they are sustainable*. We think it will be hard for Rarotonga to say they don't want fisheries to be sustainable. For us the argument changes from being a protest against something, to actively urging the government to do something **positive** for a change.

Update 27th May 2016: we may have just been given an unexpected gift. MSC accreditation group just said that Luen Thai now wants to extend the accreditation to cover yellowfin tuna. Luen Thai uses long-lines, but if we support this ~ yellowfin is our main kakasi here (& big-eye for deep sets) ~ and that fishery gets a sustainable certificate, then we insist that **all yellowfin fisheries** must be MSC approved. Purse seining catches yellowfin & big-eye as bycatch. Dr Mike sent some feedback to the accreditation team, and **we got a big thank you** ~ as they too want all fishing sustainable.

Update 13th July 2016: Dr Mike was told that a Parliamentary Select Committee was meeting this week to investigate the reality of purse seine fishing in our EEZ. If you remember all the protests & marches against purse seining (over half the population is against it) ~ the House of Ariki suggested that we need more details: so the Select Committee is the government's way of doing this. Dr Mike sent a detailed report from Tongareva to John Tangi, Clerk of Parliament, this is with the Committee for review. Our report includes climate change, biodiversity, pollution, and how we like to live our lives here in the North. We have a voice ~ whether they listen to it or not! On behalf of our Society and the mokopuna we have urged that ALL fisheries in Kuki Airani are certified sustainable.ⁱⁱ



Climate change: what is it and how is it caused?

Energy comes from the sun to make everything grow and to keep our planet warm enough to live on. Greenhouse gases (CO₂ & methane for example) get trapped in our atmosphere and prevent the sun's heat energy from escaping back into space overnight. So the world's temperature slowly rises.

Where do greenhouse gases come from?

People's activities. **Basically everything we do has some impact on our world.** Because the gases are invisible we think nothing of them ~ and that is a big problem. Burning fossil-fuels like petrol, diesel and cooking gas produces CO₂. The carbon in the fuel combines with oxygen and remains in the atmosphere. **This is the exhaust from your truck or pasikara.** The more you use it, the more CO₂ gas you make. Just think how much CO₂ you make by riding up & down all day? That's pretty stupid! **And it's not just you: it's 7.4 billion other people too!!!**



What can we do about global warming?

Carbon footprint! If we calculate our own energy use then we show our personal contribution to climate change. Even when we share bikes & boats, we can tally how much fuel we use each week.

1 litre of diesel = 2.68 kg CO₂

1 litre of petrol = 2.31 kg CO₂

1 litre of LPG = 1.51 kg CO₂

Once we know this we can start to reduce our personal energy use: this helps the planet, but saves us money too. **And we'd be healthier if we all walked more!!!**

Paris 2015: last December there was a United Nations Conference on Climate Change in France. For the first time the world's countries came together **and agreed** climate change is a huge problem; many of them had been denying it for years.ⁱⁱⁱ To close the meeting **197 countries signed an accord** to implement ways to reduce their national carbon impacts. Henry Puna said *Kuki Airani* will cut our emissions 81% by 2030. Now 2030 is very far away, so little will be done for years. But think about it: "How will we reduce our energy use and pollution by 81%? What does that mean?" Well, it means that EVERYBODY, **especially government**, has to reduce their fuel use by 81%.

Imagine you go out fishing 10 days each fortnight. An 81% reduction means you now go on 2 days. That's once a week! Maybe you decide some things are more important than others: **is the boat more important than the truck?**

What if there are different ways to travel without using much fuel? Welcome to technology.



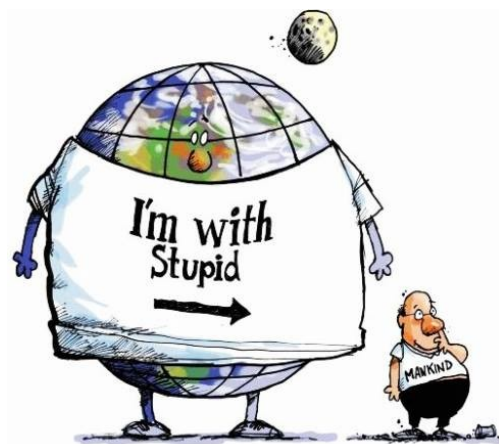
Our favourite: a solar-powered battery-assisted *Rhodes-car*!

Dr Mike told Rarotonga's government it should learn to do **joined-up thinking!** (Think holistically). There is **no common thought** between different Departments down south. **New Zealand AID** spent \$20 million on *Uira Natura ko i Tokerau* giving all northern atolls solar-power. *Wonderful, meitaki.* **Immediately** our carbon footprint dropped. Before, diesel had to come from Auckland to Tongareva to generate our electricity. That is two long sea voyages and the ship's return legs.



But guess what?

The Chinese want to take all our fish, so they donated \$750,000 of heavy machinery ... all of it is diesel-powered!!!



Welcome back carbon footprint, we missed you!

So with Uira Natura it is quite easy for Tongareva to become CARBON-NEUTRAL

This means the carbon we produce equals the carbon we can capture

$$\text{CO}_2 \text{ produced minus CO}_2 \text{ captured} = 0$$

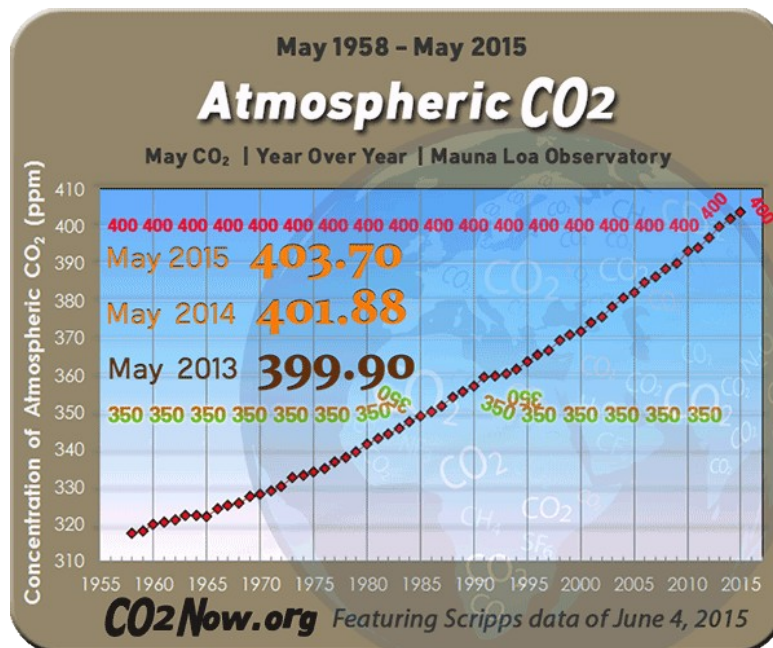
How can we capture carbon dioxide?

When trees and other plants grow they capture CO₂ and photosynthesise it to make sugars; exactly like the *zooxanthellae* in corals ... did you remember?

**Did you know: *Photo* is Greek for *Light*; 'synthesise' means *to put together*.
Photosynthesis is **to put molecules together using light**.
Photograph means **to draw with light**.**



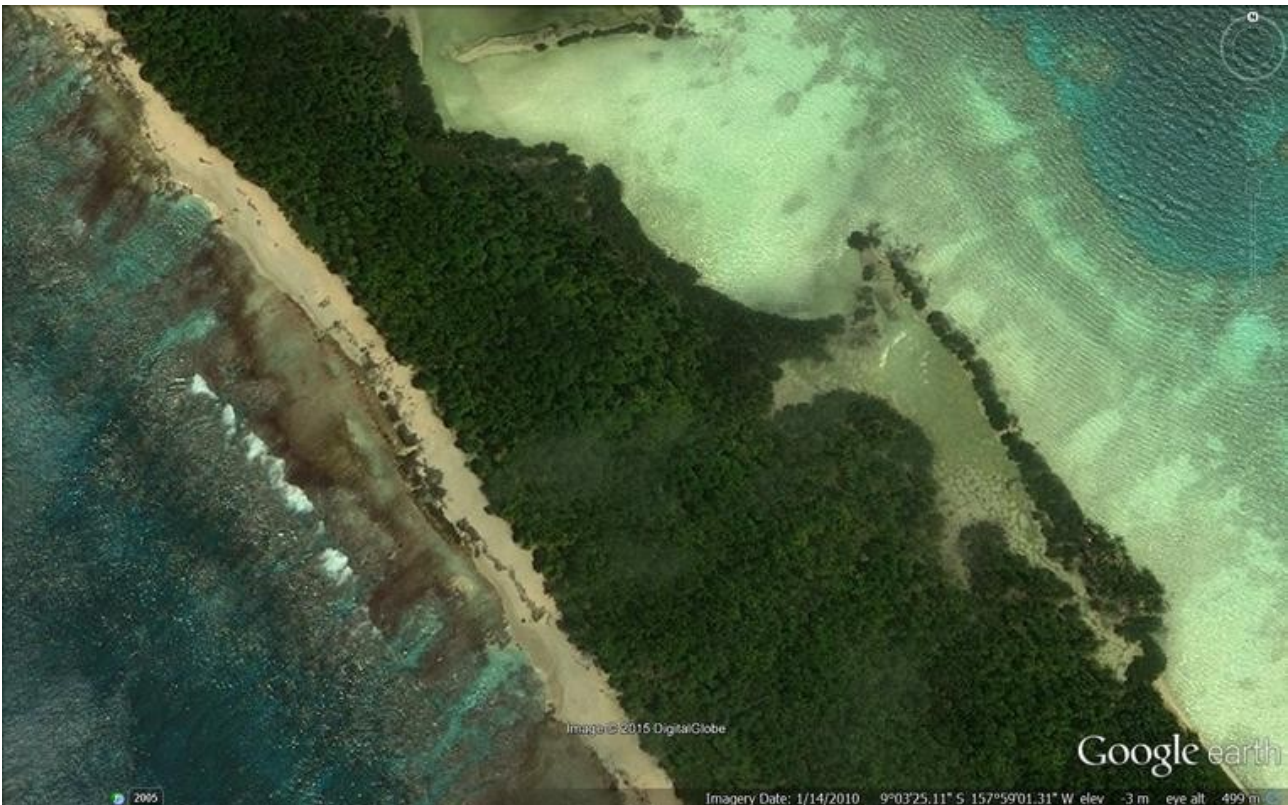
So an easy way for us to live more sustainably is to get planting. The more trees we plant, the more time we gain to replace cars, trucks and motors with electric ones. But trees take time to grow. **We don't have time!**



We have to think ahead: the best way is to plant new trees before old trees need to come down.
We shouldn't destroy mature trees but sometimes we have to chop a tree for safety reasons.

Why are we losing trees?

In recent years our world got hotter. Solar & ultraviolet radiation increased; rainfall is variable ~ at times none and then too much. Omoka had a big impact in **January 2015** when we got over-washed (remember when Papa Aru's hare got flooded?); then for several months the wind carried very high levels of salt, and without rain the trees couldn't get rid of it: *makimkai* & *mate*. When Dr Mike did surveys there were more fallen trees every time: *nimata* & *hara* all crashed down. There were big gaps in the forest and the *sheltered trees* now faced the wind: they had no strength so fell down too.



Above is the northern part of Akasusa in 2010: look how thick the forest is? At the top is the inter-tidal area with the old fish-traps. Lower photo shows the story today!!!



What happens when the trees have gone?

There is no shade so the soil dries out. Small plants have no moisture and are exposed to full sun; so they die. Without plants the soil blows away and the habitat has gone. At Mangarongaro in time the ocean might even be able to cut the motu in two without the forest.

Our present work: we have started to fix the worst damaged habitat on the motu; this is a big job and will take years. Dr Mike started replanting at Akasusa in May 2015; TKU students came three times on fieldwork.^{iv} We needed to grow small tree saplings until strong enough to plant out. We've resurrected the old *community garden* to become our tree nursery; this forms part of *our sustainable forestry project*. SRIC-CC team (Prime Minister's Office) sent us tools and materials to repair this. For several months our Society staff and the Agriculture Officer (Tutavake Vaeau) have collected seedlings from local tree species, some can now be moved to the nursery and left to grow. **We will arrange school study visits to the tree nursery.**

We needed a water supply for the nursery: very kindly the Director of Tongareva Marine Resource Centre (Mataora Marsters) let us fit guttering & downpipe to one of his buildings. We'd also like to thank the Admin for bringing some sand as the base for the water tank. Meitaki Poria!



GoogleEarth map showing haremaki, MMR and the tree nursery, & the water tank supply. April 2016.

Tini Manu Hare Natura: the next step is to build a **water-catchment** on Mangarongaro to help young trees grow; there is no freshwater there. We are lucky this year as we have heaps of rain, but in 2015 it didn't rain on that motu for 6 months. The catchment platform will have a small room: the construction materials were provided by SRIC-CC. The Land-owners agreed we can use their site. We agreed to proceed (Board-meeting, June 2016) with building **Tini Manu Hare Natura**. Our vision is that it will act like a gateway for our conservation efforts ~ *goodwill* flows from the *Hare Natura* out across the land. Dr Mike has identified 20 different places along the motu that need new trees and habitats improved. Another section near Tini Manu is **Tevete**: that needs purapura planting on the lagoon side; the Landowner gave us permission to do this. Hardwood trees like *tamanu*, *miro* and *tou* will be planted once we've created some shade.

SRIC-CC and the GEF (Global Environment Facility) funded this project because of our **honu**. The **sex of honu embryos is determined by incubation temperature**: females from warmer nests, more males from cooler eggs. As global temperatures rise: there are fewer places where males can be produced. At Akasusa our honu nests used to be shady in the mornings: now it's sunny all day.



Many trees at Akasusa have gone (Photo: John Beasley, RuTaima & Dr Michael White, April 2016)

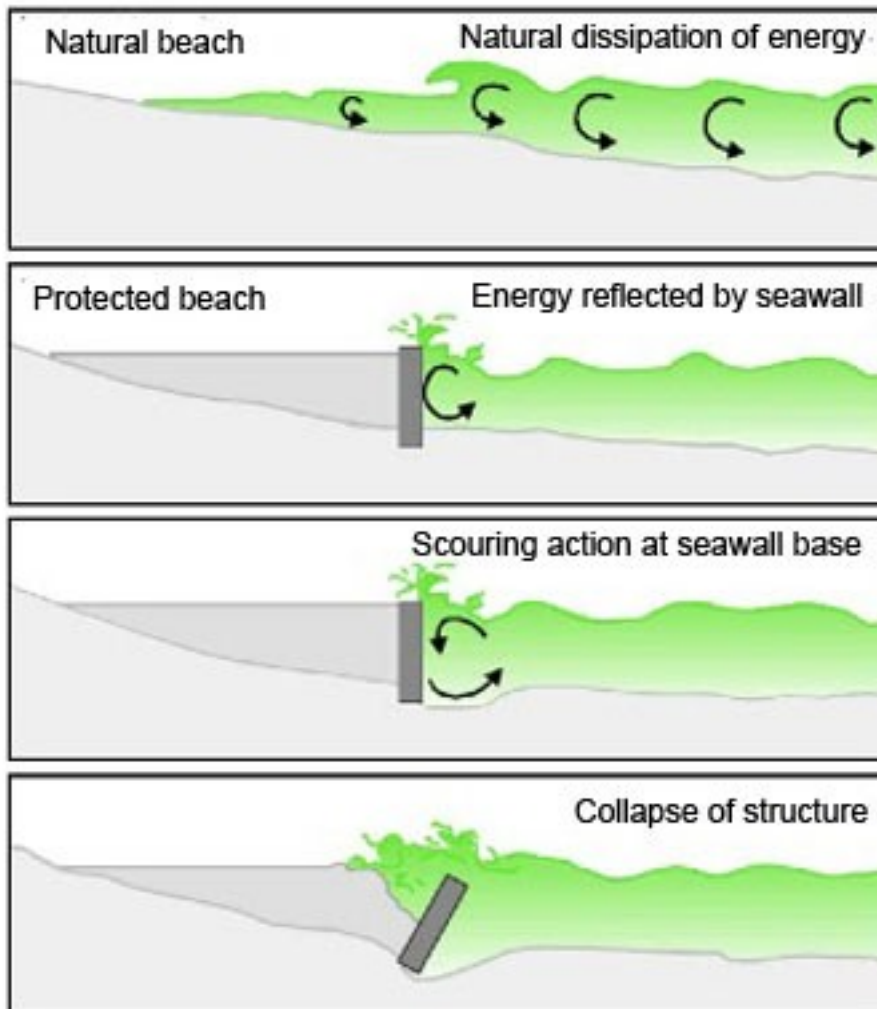
Environmental Stewardship course: we want to try this with a couple of people. The course will take at least a year: there will be some lectures (habitats, species, ecosystems and threats), but most work is practical, including simple mapping and observation skills. People will choose a damaged habitat and start restoring it. They'll report progress, problems they found and how they fixed them, and after a year or so give us a final presentation. We'll award a certificate and guide them into new courses. Our idea is that in a few years time we will have habitat specialists, nature guides, natural resource managers, and some who know about endangered species ~ all from our atoll. This will make it very easy to look after Tongareva for the future generations. **Our Gift to the Future.**

Coastal erosion and sea level rise

One consequence of global warming is **sea level rise**. This happens in two ways: as seawater warms it expands; as the air and ocean get hotter the ice-sheets and glaciers melt creating even more water. Low-lying islands in the South Pacific, like Tongareva, are at risk from flooding. It probably won't happen instantly. Tuvalu has been flooding for years: their runway can be underwater, but other times it's OK. Building sea-walls doesn't really help, because the ocean will always flow the easiest way. If you block off one place the waves find another channel. If you used concrete sooner or later the sea floods over the top ~ so you have to build even higher. It is not a long-term solution.

Do you know? Manufacturing 1 tonne (1000 kgs) of cement powder produces 900 kgs of CO₂. On top of that is all the fuel used to transport it (ships and trucks), plus mixing the concrete.

It's a massive Carbon Footprint!!!



The ocean likes to ebb & flow ~ water moves in and out. If the waves can flow through something like the piles of rocks, coastal vegetation, or onto a beach: it loses the energy from the waves. If you build a wall or barrier ~ the wave energy cannot reduce: immediately causing an energy problem. We can see this at Omoka wharf ~ in time even the iron is eaten away; at Te Tautua the walls broke.



A seawall was built to protect this hotel, but caused many problems. Waves were reflected back by the wall into the path of the next waves, this caused turbulence and a *confused* sea. This started to erode the wall footings. Next, the downstream side beach was undercut because the water patterns had changed; this actually happened on both sides of the hotel when the wind changed. As the beach gets undercut, so the wall collapses. In the front right you can see a normal beach where waves flow over the sand ~ releasing their energy ~ and returning harmlessly to sea.

Using natural approaches to protect our coastline

By far the best approach is to *work with Nature* instead of fighting against it. We will never control nature. If we plant trees along the shore that can grow near salt-water (*ngangie, purapura, hara, tou*) these stabilise sand by putting roots through it. Then the small grasses will spread too (we call these *pioneer species*) and afterwards other species that may not like salt will grow further inland. Waves can flow around these trees: sometimes adding sand, sometimes removing it. Most important is that the ***coastline will continue to grow because it is alive***; concrete is dead and fixed. Living corals are the same: ***as the ocean rises so new corals grow*** to keep our island safe.



Left: *Ngangie & tausunu* growing near lagoon



Right: roots binding the soil reduce erosion

These **natural approaches** are by far the best and *they cost nothing*: but Nature takes time to grow. We can call this *Bio-engineering*. What we must do is think ahead and learn to think in a different way. The stupid ones will say “*We have to leave ~ the island will sink!*” That’s probably not true.

Before that we would build new houses on posts: that method is already common in fishing villages round the world; it’s very easy. Another good way is a tree-house, but you need big strong trees, like Tamanu. The *hare* below is in a living tree, so it keeps on growing.



Here's modern technology helping us: add hydroponics and solar-power too.

Plastic pollution

The last global problem we need to mention is oceanic rubbish, especially plastics. We produce very little litter at Tongareva, but our motu and the lagoon are full of rubbish from far-away. Everywhere we see plastic bottles, floats, FADs, and general bits of broken plastic. In the industrial world this is why people have jobs: *to buy all these plastic consumer items*. I'm sure they never wonder what will happen to their shopping! Well, we could show them!



Top: plastic rubbish, lagoon side of Mangarongaro (July 2016); **Lower left:** Rainbow runner full of plastic; **right:** Chris Jordan's photo of a dead albatross at Midway Atoll.

Plastic is mostly made from *petrol by-products*: fragments are in our food-chain: ika, manu, honu, pasua & pipi all eat small bits of plastic. **Then we eat it.**

Sustainable Development Goals (SDGs): in September 2015 at the United Nations 193 countries agreed that these following 17 SDGs should be implemented.^v The simple truth is that we have made a terrible mess of our planet : greed and stupidity got in the way of common sense.



It is very clear that ALL these things are telling the same story: we have not looked after our planet. Some of these won't apply in the Outer Islands, because our societies are already more balanced. If you look on government websites you may start to see some of these SDGs mentioned. Remember, though, that Rarotonga thinks people in *Pa Henua* are stupid and *too emotional* to understand. Well we are not: we see things very clearly living here. **Goal 14: Life below water is very important** ~ it's the first time this has been included in any treaty ~ usually the underwater world got ignored.

Tipping Points: Another important picture (on next page) concerns **tipping points**: scientists show that any one of these can tip our world into a place that it cannot recover from. Right now we have exceeded three or four of them! The worst by far is **loss of biodiversity**: this is caused mostly by humans destroying habitats for greed; **when species have no place to live ~ they die!** In the Cook Islands this is mostly caused by government and businesses building *infrastructure*. Rarotonga destroyed all of its coastal zone, mostly for tourism. Did you ever wonder why Rarotonga has no honu nesting? There are no quiet and dark places left for honu to come ashore.^{vi}

One of the big impacts at Tongareva was destroying the forest margin all along the main road. The marginal habitats are always very important because they join two different habitat types together. A good example is a beach: it joins the water and the land ~ both are very different places.

Did you know that *Bio* is the Greek word for *Life*?
Biology is the study of life
***Biodiversity* is all the different sorts of living things on Planet Earth**

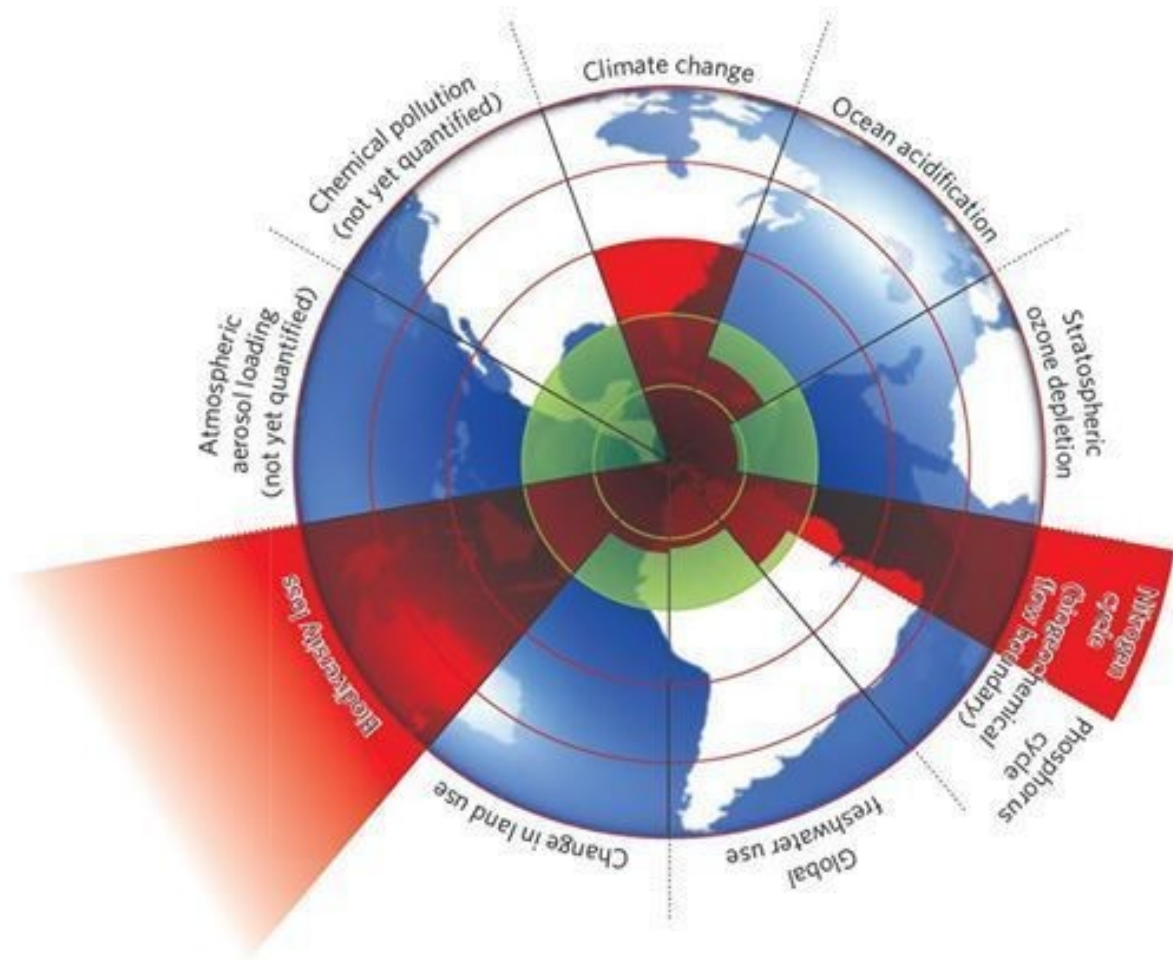


Figure 1 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.

These tipping points are twisted together: for example Ocean Acidification is caused by CO₂ entering the seawater: forming carbonic acid. It affects animals in two main ways: first, the calcium needed to build shells may no longer be available (pasua, pipi & kasi need calcium to make their shells and grow). Then the acid can dissolve the calcium carbonate already in shells & the coral reef structure. This is the opposite to what we want: we need the reef to grow as sea level rises.

This is all caused by humans & our daily activities. We are ALL to blame.

What next?

1. Tell Rarotonga's government that *they* do not own the fish in our EEZ: they belong to everyone. International fishing licence fees should go in a **Sovereign Wealth Fund** and each Christmas every person gets an equal pay-out from the interest. Our Konisara should be representing us with this.
2. Return the heavy machinery to Rarotonga, *with thanks*, then ask for battery-powered equipment.



3. Push Rarotonga to remove the VAT and Import Duty on environmentally-friendly goods, such as battery-powered tools, **electric** vehicles and outboard motors. They could increase VAT rates for fossil-fuel-driven vehicles. This would quickly see a shift to **non-polluting vehicles**; we can share this as a great example to the world (put it on FaceBook).
4. Encourage everyone to use an **Electronic Office**. If you do not need to print something then don't. It is very easy these days: we send files by email, or post on FaceBook. We can convert documents to PDF, share digital photos & videos etc. Just think about printing ~ an ink cartridge comes by ship or plane: **a big carbon footprint** ... and one more bit of plastic pollution for us to deal with.

Our Society is trying this: instead of printing our Newsletter for everyone ~ you can have it in PDF. Most people have a laptop now, so this very easy. Photos are in colour and you can share with flash-drive. We will not usually print things out; but we can do 1 or 2 copies if needed. Do you agree?

5. World governments talk a lot but they take very few actions. **Our planet has run out of time.** As a measure of how urgent climate change is: the UN Secretary -*Ban Ki Moon*- wants a special meeting this September for all countries to ratify the Paris Treaty. What happened in the past was after signing a big treaty, countries went back to **business-as-usual** and did nothing. Even after 20 years some nations had not ratified the Kyoto Protocol; and in fact USA, whose population are the world's biggest polluters, pulled out of the convention altogether. All about money and greed!

Kuki Airani signed up immediately at Paris (2015), but then didn't ratify the treaty when 15 other Pacific nations did in April (2016). We are also a member of the **Highly Ambitious Alliance** ~ who want to limit global temperature rise to 1.5 C°.

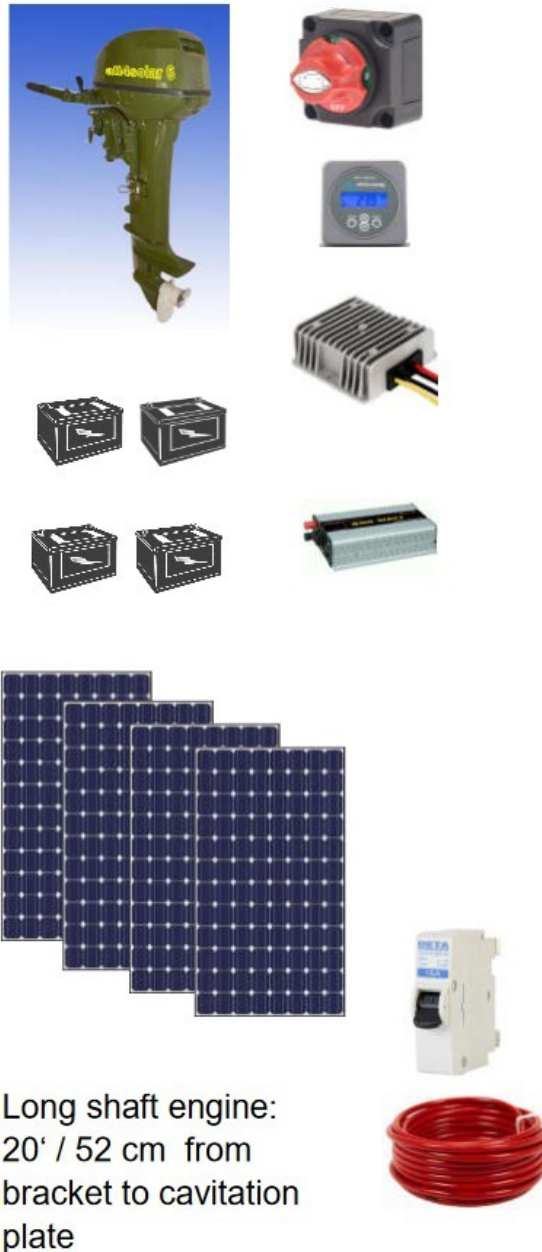
Guess what? June 2016 was the hottest month since 1880. The last 14 months (since April 2015) all set new temperature records. Climate change is very real.

The average global surface temperature for the first six months of 2016 shows an increase of **1.3 C°** above the *pre-industrial level*. That leaves **0.2 C°** before we cross our limit and 0.7 C° for the unambitious countries. Rarotonga could easily adapt to a zero-pollution life-style, but it probably won't.

Let us become the *Environmental Sustainability Flagship* and show the world how it is done.

All we need to do is reduce the fossil fuel we use and plant loads of trees.

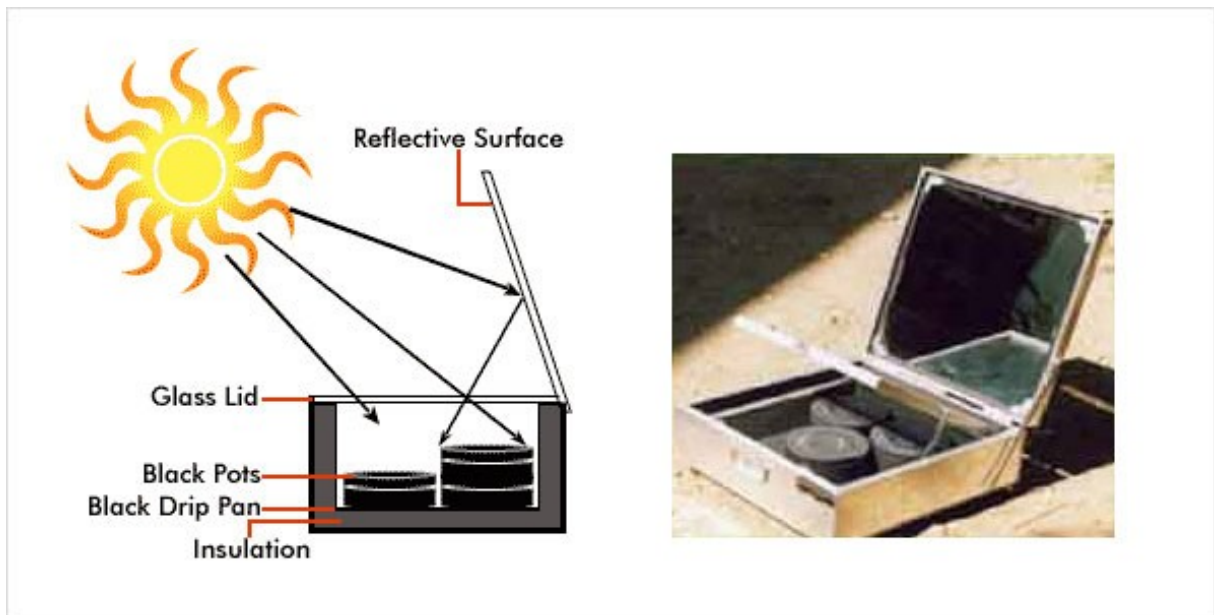
Fed up paying for petrol & high VAT?



This solar-power kit has a 5 Kw motor and everything to install it for **AUS\$ 8290 inc GST**.
In January 2016 this cost \$9000. We'd remove GST (export), but add freight & duty at Rarotonga.

Aquawatt now has electric outboard motors from 1 HP to 70 HP

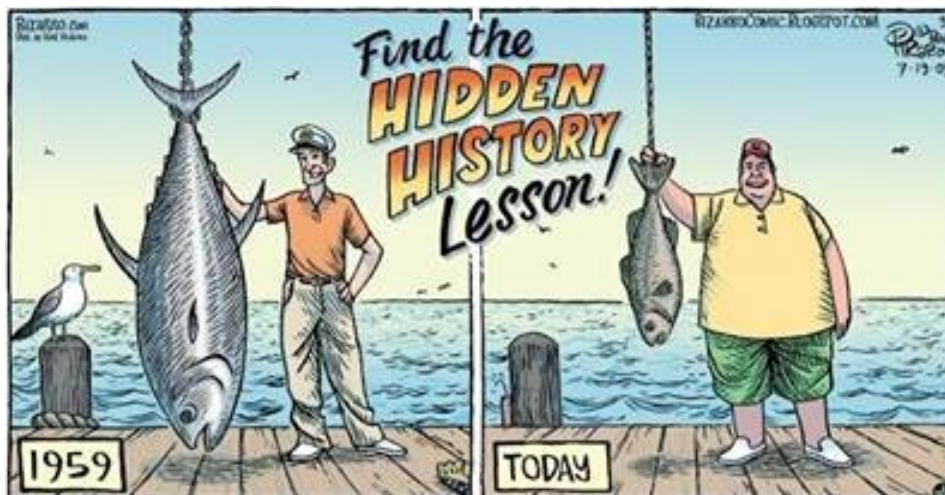
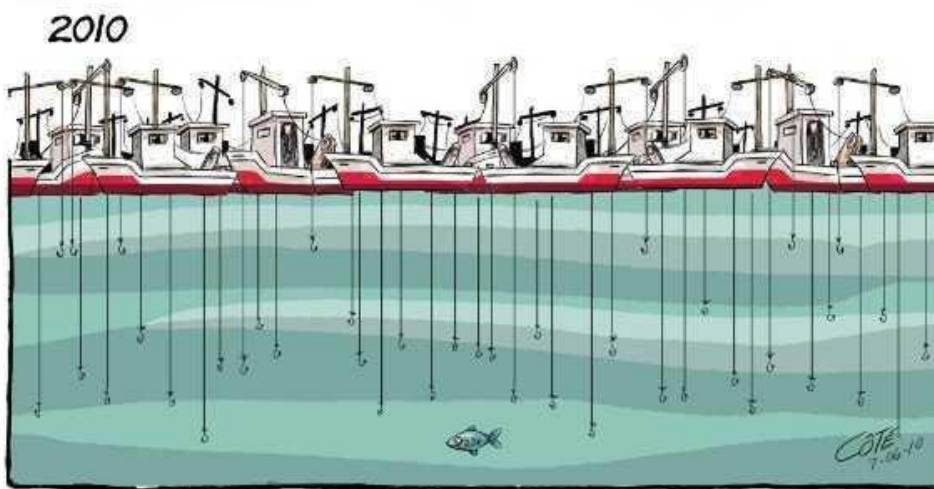
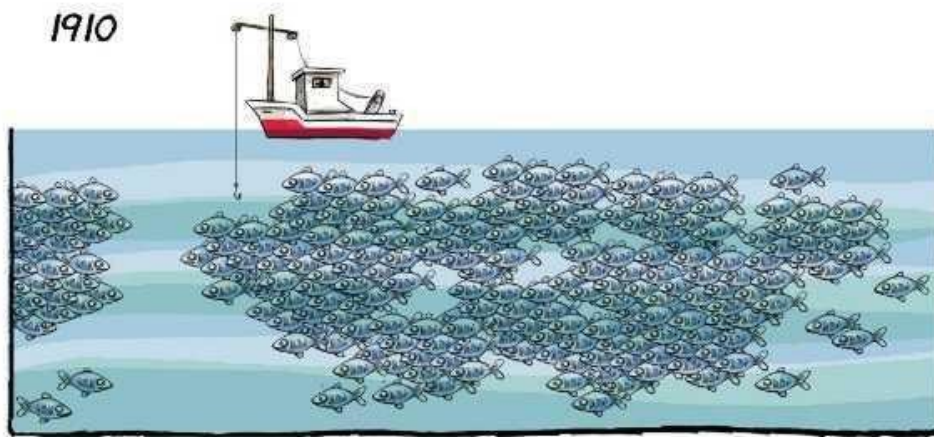
Ever thought of solar-cooking?



The idea is to direct sunshine on to a cooking surface. Many plans can be found online.

The satellite dish 'parabolic' shape would probably work to cook rito

Insist that all industrial fisheries in *Kuki Airani* are certified sustainable. We need to limit how many boats are allowed to fish & catch-size; use *rahui* when species become rare or are very small.



Some final points:

We wrote some *Environmental Impact Assessments* (EIAs) ~ if you don't know about these, they are a way of showing **what might happen** to an ecosystem when you build something or destroy some habitats. They should be written BEFORE any work takes place; but in our case we had to do them afterwards **because the impacts had already happened** (e.g. illegally removing sand from the northwestern beach by the Church; and dumping building rubbish on the school beach). These documents are complicated because first you must describe what an ecosystem is like now (species, habitats, human use etc); then what impacts might be caused by building infrastructure; finally you need to figure out if the benefits are greater than the costs. *Uira Natura* is a good example of this. We had to cut down some trees and a lot of low vegetation to build the facility, but the long-term environmental benefit is far greater than that cost; we have a very small carbon footprint for ever.

Dr Mike wrote two EIAs for *Hapii Omoka*: one was after the drinking-water went bad (2016) and tamariki were makimaki. In this case the problem was the *design of the guttering and water supply layout*. There was an EIA done before the new school was built, but they had not foreseen the water pollution: which just shows we cannot see everything that might happen; the EIA at least makes you think properly before you do something. In the Cook Islands the Environment Act (2003) includes: 'no environmental impacts may be caused without a permit; and that an application for a permit must include an EIA'. However, the Environment Act only applies to five southern group islands. We do not need that Act up here in the north, because **rahui** is a far better way for us to manage our way-of-life and natural resources: **with rahui we can respond immediately to any threat**. If we let Rarotonga take decisions they would discuss our problem, perhaps hire some consultants; and then add it to a list of priorities to be done when money is available. A useless idea!

Konisara should include a simple **Environmental Review** for any council activities that impact the natural world **before approving** the work. Probably Konisara doesn't have any scientific knowledge so our Society can offer a workshop explaining how an ecosystem works, and that every part of it is important. This would prevent deliberate or even accidental impacts occurring.



Left: our 'biological coastal protection programme' on the school beach is coming along really well; Right: Omoka admin dumped rubbish on our beach and destroyed the two big *hara* (May 2016).

Kia Manuia

President: Dr Michael White

Chairman: Papa Ru Taime

Treasurer: Mama Mereani Taime

23rd July 2016

- i Too hot in Paradise! The Marine Biologist, April 2016: 26-27. Published by the Marine Biological Association <https://www.mba.ac.uk/marinebiologist/> **Permalink:** <http://library.seaturtle.org/9685>
- ii Hakono Hararanga Case Study # 6.
- iii The Paris meeting was actually the 21st annual Conference of the Parties (COP 21): it's been a long struggle.
- iv There was some confusion when a few people thought it was a '*school project*': it isn't. What happened was in July 2015 the TKU students attended a week-long workshop on climate change held at Rarotonga by SRIC-CC. To suit *their agenda* it was billed as a school's programme! The last time the school participated in our conservation work on the motu was June 2015 ~ over a year ago. *Hapii Omoka* does not have the knowledge, the skills, the people, or the time to undertake such a project. **The funding is because of our *honu* research.**
- v SDGs are a complete package: you cannot just choose to do a few ~ it's all or nothing. 193 countries signed up. They have to achieve them **by 2030** ~ only 15 years away! Part of the deal is that Heads-of-State will report each year to the UN on how well they are doing. We await with interest?
- vi White M (2013) The first study of sea turtles at Rarotonga, Southern Cook Islands. Testudo 7: 12-29. **Permalink:** <http://library.seaturtle.org/7257>

A4ST10 SYSTEM	Quantity
10 HP 5 KW brushless 48 V DC electric outboard engine Goldenmotor	1
Remote Joystick speed control and steering system incl. 6 meter cable	1
Batteries AGM 12 volt 100 AH capacity with terminals & connection cables	4
Solar panels 100 watt 12 V (Total 400 watt system 48 V)	4
MPPT solar charge controller 20 Amp 48 V	1
Cables to connect all solar panels / to MPPT charge controllers / Battery	10m * 6 mm2
Battery main switch & main fuse (300 A)	1
Main power cables 32.5 mm2 battery to engines	4m * 32.5 mm2
Main board incl. Fuse holder, 12 V distribution, 48 V distribution	1
DC DC converter 48 V to 12 V incl. fuse and switch 240 watts 20 A	1
Digital battery monitor incl. 6 meter cable	1
240 V AC to 48 V DC 10 A battery charger	1

This is the complete list of items included in the Aquawatt 10 HP solar package.

CHALLENGE

Hakono Hararanga wants to plant 10,000 trees in the next year.

Are you up for it?

Dr Mike has started a Society website <http://hararanga.org>

~ it's still very basic and needs content, but it works. I'd like it to be in Maori & Papa'a. Mike :)