TATTVA
Emergence

Working Paper / November 2022

Beyond Technical Solutions

Is our obsession in finding technical solutions to the climate crisis the root of our problem? Can we explore a different paradigm for alleviating the problem?

by Hersh Thaker

TATTVA
Emergence

Working Paper / November 2022

Beyond Technical Solutions

Is our obsession in finding technical solutions to the climate crisis the route of our problem? Can we explore a different paradigm for alleviating the problem?

by Hersh Thaker

About Emergence

Emergence is a documented set of conversations that are published on a periodic basis, exploring the various domains of life and society, in the hope that new, thoughtful ideas can emerge through the coming together of multiple perspectives.

About Tattva

Tattva is an independent, non-profit, non-partisan organisation, dedicated to accelerating creativity and ideas that improve the world.

As an interdisciplinary platform, *Tattva* nurtures creatives and thinkers, and provides velocity for their ideas in tackling today's issues. We are a resource for researchers, authors, creatives, educators, students, civic leaders, journalists and any other interested individuals.

Tattva offers learning experiences through a range of programmes in its academy; facilitates research across a number of thematic areas; incubates ideas in collaboration with other organisations; and curates public conversations. More information can be found at: www.tattva.org.uk

Cover photo by Kelly Sikkema on *Unsplash.*

Contents

Introduction

The American Ecologist Garrett Hardin, Hardin describes the problem of unencumbered population growth as *a" Tragedy of the Commons"* . His basic premise is that the earth and its resources are finite and cannot continue to accommodate exponential growth in the human population.

To describe the tragedy at play, he uses the analogy of an open and common pasture where herdsmen raise their herd of cattle. Since the herdsmen reap the proceeds from selling his cattle, as a rational being, it is in his interest to continue adding cattle to his herd. All herdsmen share the negative consequence of overgrazing, made worse with each additional cattle. Hence, the cost-benefit analysis of adding cattle is always positive in the common pasture. The problem is that all rational herdsmen individually conclude that the only sensible action for them to pursue is to continue to grow their herd in a shared and limited common. Herein lies the tragedy. It is the conflict between individual and collective rationality, and ultimately *"Ruin is the destination towards which all men run... Freedom in a commons brings ruin to all".*[1]

This piece uses the tragedy of the commons as the framework to view the challenge of net-zero transition. I will assess whether transitioning to a net-zero world requires us, as rational beings, to change our values or whether it is enough to rely on technical solutions alone. The transition to net-zero describes moving from a world where we collectively generate more greenhouses than we eliminate, to one where we are at equilibrium. For ease of phrasing, I will refer to this simply as 'net-zero' from this point onwards. I will also borrow Hardin's definition of a technical solution grounded in the natural sciences and extend it to include any formal government legislative instruments that create a legally binding obligation, such as paying taxes, subsidies or regulation.

When referring to 'solutions ', I am referring to solutions that will transition us to a net-zero world whilst keeping global

1. Hardin, Garrett. "The Tragedy of the Commons." Science, vol. 162, no. 3859, American Association for the Advancement of Science (AAAS), Dec. 1968, pp. 1243–48. doi.org/10.1126/science.162.3859.1243.

temperatures under 1.5 degrees[2] . That is the unequivocal ceiling that the international scientific community has set. The 1.5-degree target is important in our definition because, although burning all the oil we have until we run out might eventually transition us to a net-zero world and force us to look for alternative and cleaner sources, it would not serve as a solution in stabilising our climate.

I argue that technical solutions alone cannot solve the climate crisis. It requires a collective paradigm shift. I start by assessing the standard technical solutions we have today, focusing mainly on governance instruments but also technology. Instruments of governance include domestic law, international trade agreements, embargoes, and voluntary international agreements facilitated by the United Nations. I will show that this techno-optimistic approach is too theoretical and not supported by how the world operates in practice. Hence, although they play a critical part, they cannot be relied upon without changing our paradigm.

I will then argue why a shift in our moral paradigm is essential for the technical solutions to be effective and to overcome the tragedy of the commons. I draw upon systems thinking to help frame the conclusion.

2. IPCC. (2018). Impacts of 1.5C Global Warming on Natural and Human Systems. In Global Warming of 1.5°C (pp. 175–312). Cambridge University Press. https://doi.org/10.1017/9781009157940.005

Governance as a technical solution

The main tool nation-states have at their disposal is to implement laws to govern within their recognised jurisdiction; let's call this domestic law. At a local and national level, domestic law, on the face of it, seems perfectly equipped to mitigate externalities within its boundaries.

The Climate Change Act, introduced by the Labour Government in 2008, is an excellent example of an effective technical solution. It represented the first global legally binding climate change mitigation target set by any country and set out compulsory climate change reduction targets. It committed the UK government to reduce greenhouse gas (GHG) emissions by 80% by 2050 compared to 1990 levels. This agreement was amended in 2019 to further commit the UK to net-zero by 2050, making it the first country to make such a commitment.

The policy gave direction and impetus to UK lawmakers. In recent years we have seen a cost on plastic bags, subsidies to purchase electric vehicles and build commercial wind farms and grants to insulate homes better. The outcomes have been largely positive here in the UK. Total GHG emissions in 2019 are estimated to be 43.8% lower than in 1990 [3], and Carbon Dioxide emissions are down 40% over the same period. Despite the success experienced in the UK, I believe this policy instrument falls short of being a solution as defined earlier.

Britain should feel proud of the progress that we have made. However, it cannot be seen as a success if our collective emissions increase. In the commons, this would be the equivalent of one man reducing the rate at which he adds cattle to his herd each year but finds his neighbour is increasing his by an ever-greater pace. The resources of the commons are still depleting.

Britain reduced its GHG emissions by over 40% between 1990 and 2019. Over the same period in the USA, GHG rose by 2%

3. UK Government. (2021).2019 UK Greenhouse Gas Emissions, Final Figures. Department for Business Energy & Industrial Strategy. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957887/2019_Final_greenhouse_gas_emissions_statistical_release.pdf

and carbon dioxide emissions by 3% [4]. Carbon dioxide emissions in India and China grew by over 300%, South Korea by over 150%, Brazil by 120%, Mexico by over 70%, Australia by 50% and Canada by 40% [5]. The data shows that despite the UK 'successfully' deploying domestic policy to reduce its emissions, the aggregated outcome during the period took us further away from our goal.

It is worth touching upon why emissions have risen so dramatically in developing countries. Developed countries have shifted much of their heavy, carbon-intensive manufacturing industries to the developing world, resulting in Carbon Leakage. Carbon Leakage refers to the situation where businesses transfer production from a country with strict climate policies to one where they are more lenient. We have seen this shift from the EU to developing countries, notably China. For example, as British manufacturing capabilities fell by half between 1990 and 2020 [6], emissions from manufacturing also fell by 40%. Over the same period, our imports from markets like China have grown significantly. This shifting of emissions from one domestic market to another shows that domestic policy instruments cannot be relied on as a technical solution for the commons, although valuable in our toolkit.

Domestic policy as a solution works well where geographical boundaries within which the problem you are trying to solve are well defined. For example, legalising gay marriage, giving women the vote, or introducing mandatory vaccines are all examples of policy instruments being used to (essentially) solve a problem. To make something illegal or legal enables you to control the outcome within your jurisdiction. However, it does not work for climate change issues because no matter the benevolence of one country's climate policies, they are largely irrelevant without collective action. Although the UK had implemented the climate change act, a technical solution, to reduce its emissions, the world was still producing more

4. EPA, Climate Change Indicators: U.S. Greenhouse Gas Emissions, 2021 (Accessed December 2021) [https://www.epa.gov/climate-indicators/climate-change-indicators-us-greenhouse-gas-emissions]

5. Tiseo, Ian, Change in carbon dioxide emissions in selected countries from 1990 to 2019, 2021 (Accessed December 2021) [https://www.statista.com/statistics/270500/percentage-change-in-co2-emissions-in-selected-countries/]

6. Macrotrends, U.K. Manufacturing Output 1990-2022 (Accessed December 2021) [https://www.macrotrends.net/countries/GBR/united-kingdom/manufacturing-output]

CO_2 than it ever had. Herein lies the problem with domestic policy as a technical solution. The climate impact is on the commons, and no matter how effective a domestic policy instrument might seem, it does not work as a sustainable and stable solution in isolation. As we shall see later, because the entire ecological system transcends political boundaries, and operates as a complex, adaptive system, it requires the coordinated thrust of a entire network of global actors.

Technology as a technical solution

We will need to improve and scale existing technologies and invent new solutions. Technologies included making existing solutions more efficient and cheaper, such as Electric Vehicles (EVs), new and safer ways of producing cleaner energy, such as nuclear, or finding ways to sequester carbon via carbon capture technologies. I will not focus on the merits and challenges of deploying such solutions. (For those looking for an introduction on the topic, I would recommend Bill Gates's book "How to avoid a climate disaster"). Instead, I believe that technology alone cannot serve as the primary solution to climate change.

Developing and deploying new technology is expensive, requires shifts in how economies are organised and requires mass upskilling of the workforce. Technology and private enterprise, where the market is still nascent, as it is in the clean technology space, needs government support and domestic policy initiatives. For example, in the UK, the government has announced a ban on the sale of new internal combustion engine vehicles from the year 2030. They have also been subsiding the cost of new electric cars, home charge points, and public charging infrastructure. It is difficult to see how EVs would have picked up any serious momentum without such interventions. However, since we have just shown that domestic policy alone cannot be sufficient and technology without policy support cannot be relied on, we need to look further.

To show that technical solutions, in the form of governance instruments, as being an effective solution, we need to mandate action in a coordinated manner that involves all countries and people.

Global Climate Governance

We have demonstrated that domestic law as a technical solution is effective to a certain point but fails when other countries do not coordinate similar responses. Since climate does not recognise boundaries, who is the common authority at this level?

Accountability on the global political stage has always been challenging to achieve because of the fundamental premise that nation-states are sovereign. In a democracy, leaders are accountable to voters; in a theocracy, leaders believe they are accountable to God; leaders from authoritarian states feel accountable only to their ideological values.A common authority does not legally bind nation-states and would see any restrictions on resource utilisation or extraction as a threat to their sovereignty. This is where the United Nations (UN) comes in. The UN does not claim to be a common global authority, despite being the closest thing we have to one. Achim Steiner, previously executive director of the UN's environmental programme, described the UN as an *"honest broker",* whose role was to realise trust between nations *"based on mutual self-interest and a sense that all are acting for a common cause".*[7]

The UN supports climate action through the UN Framework Convention on Climate Change (UNFCCC) and is the primary forum for agreeing on multilateral policies between nation-states to stabilise greenhouse gas emissions globally. The conference has a nearly-universal membership of 197 countries, making it the only international body with which all countries are signed up and engaged. The Convention supports several international bodies and processes working towards international policy-making on climate change. Most notably, it supports the Conference of Parties (COP), the supreme decision-making body of the Convention at which all 197 parties are represented. It is at COP where countries will negotiate, agree on targets, and track progress each year at the annual COP conference.

7. Steiner, Achim, The UN role in climate change action: taking the lead towards a responsible future (Accessed December 2021) [https://www.un.org/en/chronicle/article/un-role-climate-change-action-taking-lead-towards-global-response].

Here are the key milestones that COP have agreed over the years:

1997	**Kyoto Protocol**	The first legally binding agreement that required developed countries to reduce emissions by an average of 5% by 2012 on 1990 levels. It also establishes a system to monitor countries' progress.
2012	**Doha Agreement**	Extended the Kyoto to second phase 2013 - 2020 and sets a goal to reduce GHG emissions by 18% on 1990 levels for participating countries. Developed countries agree to support developing countries to adapt and mitigate the impacts of climate change. efforts to keep it below 1.5°C.
2015	**Paris Agreement**	First global agreement that required both developed and developing countries to set emission reduction targets. Clear mission to keep global temperature rise below 2°C and pursue efforts to keep it below 1.5°C.
2021	**Glasgow Climate Pact and Paris Playbook**	Calls for countries to reduce coal use and fossil fuel subsidies for the first time and urges governments to submit more ambitious emissions-reduction targets by the end of 2022. Smaller groups make side deals on deforestation, methane emissions, coal, and more.

The UN and COP have been critical in providing a framework and forum through which countries can influence, debate and cooperate. This has led to notable agreements and milestones, as highlighted above. Some would say it is the closest thing we have to a global 'government'. However, it also falls short because it is not a government and cannot be referred to as an instrument of governance that will provide a legally binding solution. It simply does not have the mandate or authority.

We can assess the shortcomings of the UN by assessing the notable agreements I just referred to. Heralded as the first legally binding agreement, the Kyoto Protocol was limited only to developed nations. The USA never formally ratified the treaty, and Canada later pulled out entirely. Even the countries that remained within the agreement only collectively met the commitment by chance. The fall of the Soviet Union decimated their manufacturing industry which caused an inevitable drop in emissions. The Doha amendment, which extended Kyoto to a second phase and bought it up to 2020, only had commitments from European member countries and Australia. USA, Russia, Canada, Japan and other developing countries did not make any commitments and instead made voluntary pledges for climate action [8]. Voluntary pledges are not reliable.

Paris 2015 was important because it was the first time both developed and developing countries made commitments. They committed to setting Nationally Determined Commitments (NDC's), which are each country's emission reductions targets by 2020 and submitting updates every five years after that. The commitment to NDC's explains why so many countries and companies have set net-zero reduction targets over the last couple of years. However, frailties of such international 'commitments' were laid bare by Donald Trump when he pulled the USA from the agreement in 2017. There was nothing the UN or any country could do about it. The USA did re-join in 2020 after Biden became president. Still, a major

8. European Parliament, Doha Amendment to the Kyoto Protocol, 2015 (Accessed December 2021) [https://www.europarl.europa.eu/EPRS/EPRS-AaG-559475-Doha-Agreement-Kyoto-Protocol-FINAL.pdf]

emitter was willing and able to walk away from this agreement, which is why the UN framework is not a reliable solution.

Most recently, at COP 26, the Glasgow pact introduced the first global commitment to reduce coal usage, amongst other agreements such as stopping deforestation. However, analysts note that even if all countries follow up on their obligations for 2030 and beyond, we will still miss the target of 1.5°C. Some assessments go further to say the pledges would not even achieve the weaker target of keeping temperatures below 2.0°C [9].

My intention is not to downplay the importance of the UNFCCC. The climate conferences and agreements are critical if we want to stay within 1.5 degrees, stabilise the climate and protect communities that will inevitably be affected by the impacts we're already seeing. Each agreement has been a building block that has led to more action. However, the UNFCCC falls short of being a technical solution like domestic policy. There is no mandate to enforce action, and it is too easy for countries, often constrained by their own political pressures to dither and renege on their commitments. We have enough empirical evidence of this since the conception of the UNFCCC in 1992. We cannot rely on these international agreements alone as a solution to keep us under 1.5 degrees. We need to recognise that the effectiveness of the UN is constrained because it sits within the context of a broader system at play.

9. Edie, Glasgow Climate Pact: The 7 key talking points from the new global deal at COP26, 2021 (Accessed November 2021) [https://www.edie.net/news/9/Glasgow-Climate-Pact--The-7-key-talking-points-from-the-new-global-deal-at-COP26/]

Systems Thinking as a framework

Systems thinking is a helpful framework for assessing the effectiveness of a solution. It allows us to look at the shortcomings of technical solutions to a complex problem like climate change by holistically considering the relationships with different systems parts. Governments only have a finite number of policies to implement in their time in power. They benefit from an inflow of support when they do something popular and suffer from an outflow of that support when they do something unpopular. The partisan nature of politics means that there is always an inflow and outflow of support for governments at any given time.

The flow rate of this support will determine the stock of policies the government can implement. The longer they maintain a substantial inflow of political support and the slower the outflow of support, the longer they will stay in power and the more policies they will have the opportunity to implement.

The rate at which they gain and lose support will be determined by what system thinkers call feedback loops. Feedback loops are the critical driving force here. J.W Forrester once said, "*Everything we do as individuals, as an industry, or as a society is done in the context of an information-feedback system*". In the governance model, the information feedback system is the political will and support

Fig.1

of the people. Even non-democratic countries count on political will and feedback flows; it would have a lesser impact on the stock because they can hold onto power for much longer.

In figure 2, stock represents the finite stock of technical solutions. These technological solutions represent all government's political, technical and economic apparatus at its disposal. Such as the climate change act, new subsidies for wind farms or carbon taxes. The more significant the discrepancy between public expectation and government implementation, the slower the inflow of support and the faster the outflow rate. Losing support faster than you gain will deplete the stock of policies those in power can implement. Therefore, it is in the interest of those in power to reduce that discrepancy by delivering popular and public interest initiatives.

Let's look back at global climate agreements made by countries at COP. Suppose setting and delivering on international commitments increase the discrepancy between the expected and delivered political agenda. In that case, it will reduce the inflow and increase the flow of outflow support. Therefore, governments will not prioritise it. This system of governance explains why successive governments have

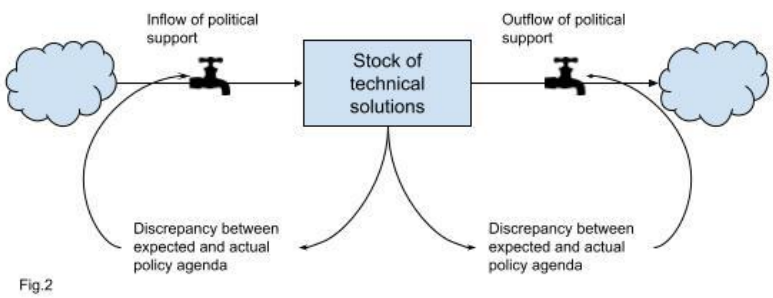

Fig.2

reneged on agreed commitments over the years, as Trump did, with the Paris agreement. He was doing what he believed would maximise his stock.

There has been a system failure in using technical solutions alone to solve the climate emergency. Many competing policy issues and crises are higher on the priority list and will increase the government's stock much faster. Climate-focused action needs to compete against these other initiatives. Until the lack of climate action reduces support inflow and increases outflow, frameworks like the UNFCCC will fall short. We need a way to strengthen the system by strengthening the feedback loop.

Shifting Paradigms to strengthen the feedback loop

The tragedy of the commons arises because of weak, delayed, and often missing feedback loops. In the commons, we miss or receive weak feedback loops when we act rationally but against the interest of nature. For example, we still choose to drive rather than take public transport if it is more convenient, we consume more than we need for survival, we don't always clean up after ourselves or refuse to give up using single-use plastics. But we suffer no consequence for our selfish behaviour. Instead of behaving in the responsible interest of the community, it is usually easier to enjoy rewards of convenience and profitability.

As a result of the missing feedback on our behaviour, our expectations of what we expect from our leaders or what we are willing to tolerate become skewed. For simplicity, in Figure 3, I have labelled public expectations as "public opinion". Public opinion in the system will determine the public's expectations and, therefore, determine the discrepancy between what we expect and what is happening. For example, most of us would not tolerate dramatic increases in fuel prices or costs of goods imported from China. Rationally this makes sense since my fuel use is not having any adverse impact on my life today, and neither is me wanting cheap toys for my children. However, spending more on these goods would have an immediate and painful feedback loop.

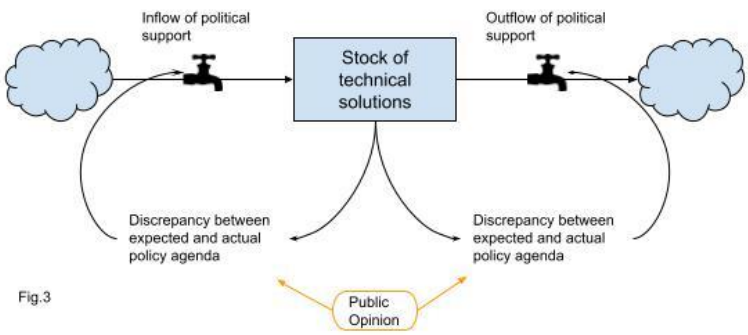

Fig.3

Science-based technology solutions to climate change are critical. Technology solutions such as renewable energy generation, electrification of heat and transport or the development of non-hydrocarbon-based bio-plastics are real solutions for the energy transition. However, as we have established, they are not sufficient in themselves. Similarly, domestic policy and international frameworks such as the UNFCCC are levers our leaders must pull on. Again, however, we have established that they are not sufficient in themselves. For technical solutions to be effective, they require a change in our attitude, behaviours and preferences.

Herein is the trap of the tragedy of the commons and why using technical solutions without shifting our paradigm will not allow us to combat the climate emergency with the vigour needed. We are missing the feedback loop to incentivise us.

Education and exhortation are ways we can achieve this. Indeed, many cultures have managed common resources in this way. For example, despite being relatively well off, my family in India has grown up valuing and preserving every drop of water because of restrictions on clean water supply. These cultures have lived closer to nature or, like my family, have had to live with scarcity; therefore, they have a faster feedback loop than the growing urbanised population of today. Hardin also saw the education and exhortation method as valuable but with limited use because it is open to being abused by those who refuse to respect the traditions and choose to be ignorant.

We need an extension of our current moral compass or what the America Philosopher, Thomas Kuhn, referred to as a 'paradigm shift' to shift our current systems feedback loops and ensure our leaders prioritise the technical solutions we need. By shifting our paradigms, we move society collectively along with us. It seems like a big ask, but as the systems thinker, Donella Meadows concludes, *"there's nothing physical*

or expensive or even slow in the process of paradigm change. In a single individual, it can happen in a millisecond" [10] . Admittedly, making such paradigm shifts across whole societies is much more difficult. Collectively we are far more resistant to change. But it can be done and is already happening. Issues such as slavery or female disenfranchisement, which society accepted as the norm only a couple of generations ago, would be unthinkable today. Therefore, we must continue to call out the failings of the old ways of thinking and to keep speaking about the issue loudly. We ensure that when we vote, we put people into places of power with this paradigm, and we teach it to our children so that it becomes all they know for the next generation. This change is already happening and will continue to happen as long as we are deliberate. It is important to remember our collective paradigm will shift slowly. It is not a revolution, and we will only see the success of our actions when we have the luxury of looking back at the world and the life we used to live. For example, our children will find it hard to comprehend that we used to burn fuel extracted from the ground to power our cars.

This paradigm shift will allow us to build systems of what Hardin labelled "*mutual coercion mutually agreed upon*" [11]. We ultimately need to get a place where we are happy to enforce the restriction on our ability and freedom to abuse the commons. Thinking back to Figure 3 above, to have restrictions imposed upon us could risk the flow of support for leaders. Therefore, to avoid the system's trap, any form of coercion needs to be an expectation of the public.

There are everyday measures of mutual coercion agreement that we hardly think about because they are grounded in a shared idea amongst the people living in the community. For example, taxation, traffic lights, parking restrictions, and building permits are all cases of having our freedom restricted. We accept them because they follow the shared idea in our minds that make up the collective paradigm of our society.

10. Meadows, Donella, Thinking in systems book, P.163 (Chelsea Green Publishing: 2008)

11. Hardin, Garrett, The Tragedy of the Commons, in, Science, New Series, Vol. 162, No. 3859 (American Association for the Advancement of Science: 1968

Conclusion

Effective to a point, technical solutions alone can be fleeting because of political or economic pressure and thus cannot be solely relied upon as stable and sustainable solutions to the climate crisis. Their leverage is limited and may not contribute towards long term behavioural change. Instead, we need to recognise that we have a collective responsibility to shift **our paradigm as a society away from relying on technical solutions and towards a change in collective psyche**. Global cooperation is possible in protecting our commons only when prioritising the well-being of our climate becomes an unstated, deeply subconscious assumption for every citizen, rather than a political or partisan issue. Indigenous cultures held such regenerative paradigms that empowered all individuals to be more aware of their surroundings [12].

Ralph Waldo Emerson best sums up the idea when he says, "*Every nation and every man instantly surround themselves with a material apparatus which exactly corresponds to their moral state or their state of thought. Observe how every truth and every error, each thought of some man's mind, clothes itself with societies, houses, cities, language, ceremonies, and newspapers. Observe the ideas of the present-day—orthodoxy, scepticism, missions, popular education, temperance, anti-masonry, anti-slavery; see how each of these abstractions has embodied itself in an imposing apparatus in the community; and how timber, brick, lime and stone have flown into convenient shape, obedient to the master-idea reigning in the minds of many persons*" [13].

Finally, as Krishna tells Arjun in the ancient poem, the *Bhāgavad-Gita*, "*considering the well-being of the world, you must take action*". In the same way, we must also continue to act, and talk, and only then will we achieve the shift in the paradigm of the world needed to protect our natural world.

12. The Climate Change Primer. (n.d.).https://www.tattva.org.uk/ideas/the-climate-change-primer.

13. Emerson, Ralph Waldo, The complete works of Ralph Waldo Emerson: Miscellanies. Vol. 11, Page 167 (University of Michigan Library: 2006)

About Author

Hersh Thaker is currently senior product manager with *Shell* . In 2018, he co-founded a circular economy start up - *The Good Plate Company* - which works with Areca Nut farmers in India to create single use tableware made from agricultural waste.

His interests span politics, governance, sustainability and social impact.

TATTVA

Nurturing creativity and ideas.

Registered as a company in England and Wales number 12057432 .

www.tattva.org.uk
hello@tattva.org.uk.