Figure 4. Permabioreactor Prototype © Tiago Vasconcelos, 2018

CULTIVATING SOCIAL CAPITAL—RESILIENCY AGAINST ADVERSITY

Thiago Vasconcelos

Based upon the fieldtrip and context analysis developed during the Master Architecture and Extreme Environments at KADK Copenhagen, the work described in this paper explores the resilience of food supply system, connected to extreme scenario development and socio-political trends, largely impacted by climate changes in Alaska, USA. A specific design focus has been set in the city of Anchorage where the project *Permabioreactor* explores new modalities for combined cultivation of super-nutrients, such as Algae, which sequesters excess carbon dioxide. This results in activating a process of circular economy, by providing a source of food and alleviate the impact of onset permafrost thaw because of the warming climate. Introducing a critical discussion on how scenario building methodology could be a strategic tool for planning against uncertainty, the contribution deals with themes across food production and security, energy resources and population distributions and development.

food production / future scenario / architecture / climate change / resilience

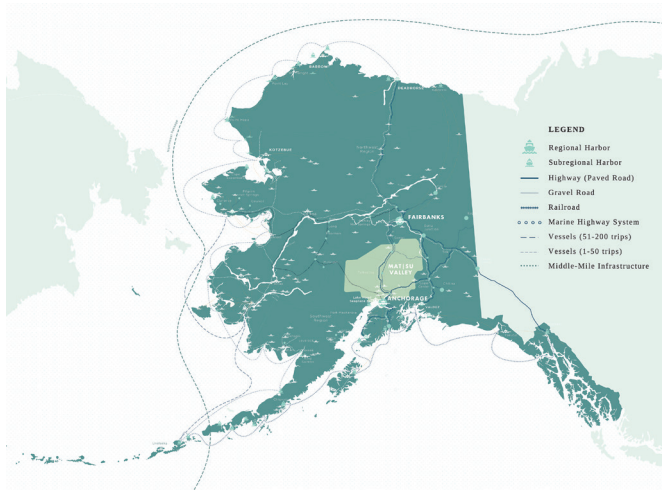

Figure 1. State of Alaska Infographic © Tiago Vasconcelos, 2019

CULTIVATING RESILIENCE IN ALASKA

Food cycles: production, distribution, and innovation have and certainly will continue to be greatly affected by the impacts of climate change. As the global industries continues to grow —to meet complex urban demands— so too do our environmental woes. Scenario planning has, since the early 1970's, been an integral strategy of Royal Dutch Shell's preparations for an uncertain future. Dealing with energy, water, and food security, Future Lens Scenarios assisted the exploration of possible ways forward. (Shell and International, 2014)

Studies show that resiliency within a society acts as a key marker for determining the capacity for a group to "weather a storm". (Gotham and Powers, 2015) Resiliency, through cultivating Social Capital may offer a means to a more cohesive social unit —one which may be better prepared to face adversity and uncertainty of the future. For the purposes of the investigation, the concept of Social Capital is defined as "the collective values of social organization such as networks, norms, and public trust that facilitate coordination and cooperation for mutual benefit." (Putnam, 2016)

Thus, when faced with adversity and challenges, socially cohesive communities may fare better overall when evaluating outcomes. (Aldrich and Meyer, 2015) In or-

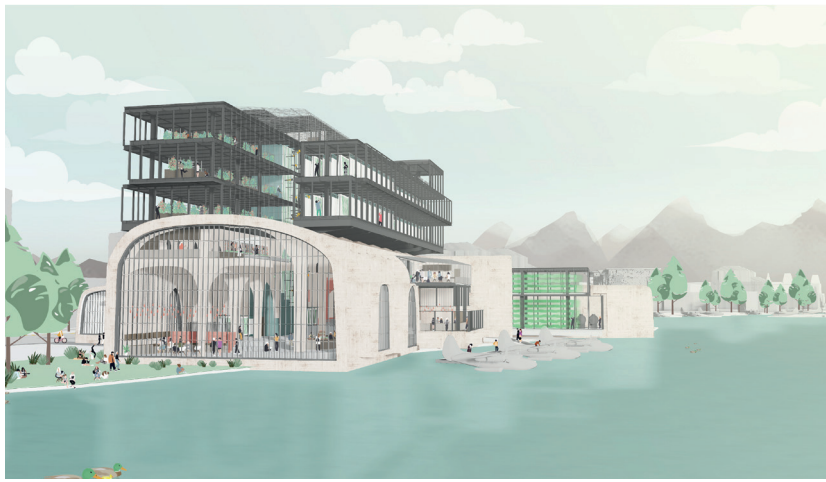

Figure 2. Building Perspective - Food Museum and Cultivation Facility © Tiago Vasconcelos, 2019

der to face current urban-societal challenges we need the cultivation of multi-sectoral approaches by connecting dots, coupling ideas, and creating solutions to potential impacts by responding to seemingly unrelated issues simultaneously.
The scenario building methodology adopted for this paper is based on extreme conditions and socio-political trends, largely impacted by global warming and climate changes. It aims to open and initiate critical discussion on how scenario planning could be leveraged as an effective methodology for strategic planning facing uncertainty. Alaska serves as an intriguing case study, given its climatic, social, and geo-political conditions. (Himes-Cornell and Kasperski, 2015; Jay et al., 2018)
In particular, the history of Anchorage has been explored not at its current state, but how it might come to be tomorrow. According to the Fourth National Climate Assessment, (Jay et al., 2018) as climate change continues to mar our planet and prospects of comfortable and sustainable habitability, Alaska has been warming twice as quickly as the global average since the middle of the 20th century.
The study is organised through a scenario-planning approach, with reference to the methodology introduced by Royal Dutch Shell company connected to the status-quo of current local territorial trends (Shell, 2008; Shell and International, 2014). The story draws heavily from and builds upon the current state-of-affairs (2018), recent news, discoveries and discussions being had within the selected the-

Figure 3. Building Corner Section - Food Museum and Cultivation Facility © Tiago Vasconcelos, 2019

matic spheres in Anchorage and Alaska today, and is too, inspired by explorative fieldtrip spent by the author in Anchorage, Alaska.

2010 | 2019 Scramble for Sustainability

Throughout Alaska, record temperatures and adverse weather conditions have been plaguing the state with greater frequency as time has progressed. Recent news has confirmed that the Government identified 31 towns and cities with impending risk of sea level rise —due to coastal erosion and ice melting— evidence of rapid climate change at an ever-increasing pace. (Goode, 2014) Some of these coastal settlements are predicted to be uninhabitable by 2050, laying down a difficult choice for the native Alaskans who have settled here for generations.
Contemporary food production technologies have gradually made their way into main urban areas and social scape over the past few years. Alaska Seeds of Change —a hydroponic greenhouse located in midtown Anchorage which implements direct cultivation and smart distribution methods— employs and empowers local youth, promoting self-reliance and community involvement, to cultivate and sell fresh products. It offers employment and educational opportunities at the modular hydroponic growing facility for those who might not find opportunities elsewhere.

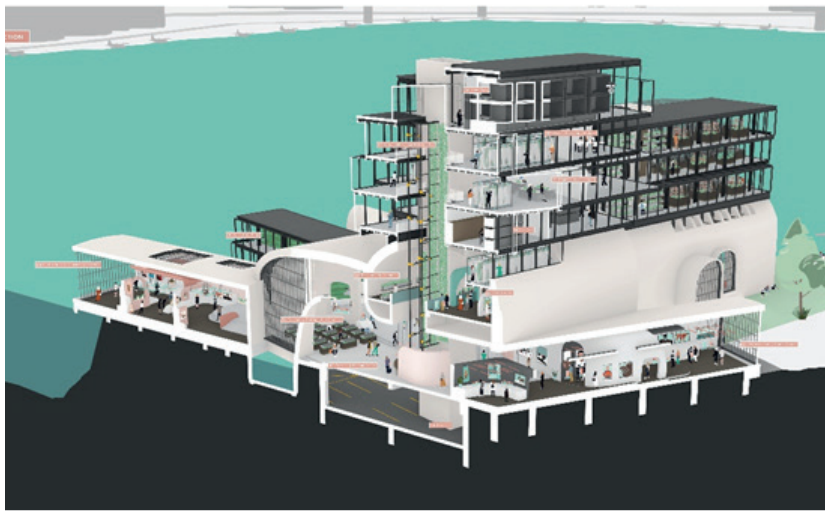

Figure 3. Building Corner Section - Food Museum and Cultivation Facility © Tiago Vasconcelos, 2019

(Giving teens POWER!, 2018)
This place has become a local haven for civic participation, co-creation, and inclusivity for the most vulnerable social categories. Its central location facilitates the role of a multifunctional urban-cultural hub: cosy, vibrant and open most of the day, every day, offers some respite from the cold to those who seek it. The office spaces above remain operational; Seeds of Change administrative employees plan out the week's schedule and milestones —forecasting productivity and making way for professional and self-help workshops— to this young, vibrant community which now shares the space below.

Beyond the metropolitan area, Seeds of Change run precision agriculture research operations extending into the Matanuska-Susitna Farmland Valley, also known as Mat-Su by native Alaskans. 56 km north of Anchorage, over 95% of Alaskan vegetables are cultivated (Meter and Goldenberg, 2014) The Mat-Su valley is as enormous as it is beautiful; flanked by the Matanuska river to the east and the Susitna river to the west, it encompasses a 60,000 km2 area which extends northerly all the way up and past the Denali National Park.
It is estimated that as much as 14% of the state's population is food insecure and that a staggering 100,000 out of 700,000 Alaskans is serviced per year by the char-

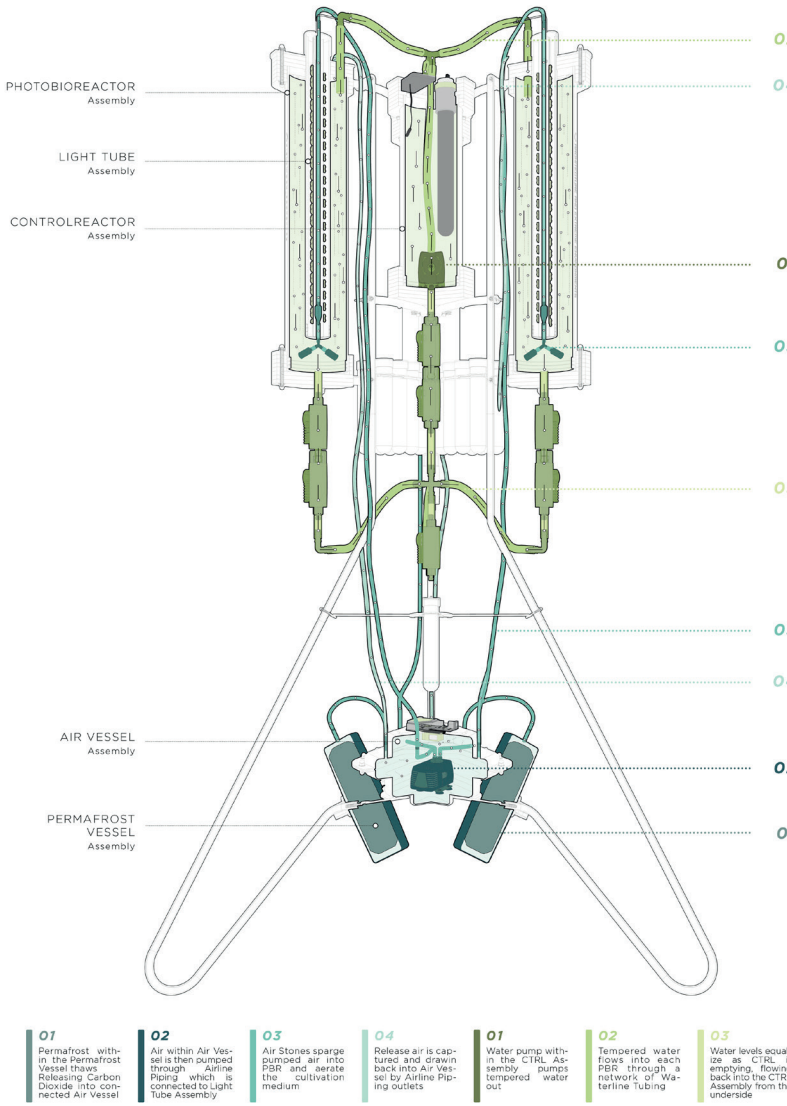

Figure 5. Permabioreactor Section Drawing © Tiago Vasconcelos, 2019

ity measures from Food Bank of Alaska. Food insecurity as defined by the "three Pillars of food security" (Sullivan, 2014) is strongly connected to three key-features: (1) food availability, as the possibility of obtain food products on a weekly consistent basis; (2) food accessibility, as the ability to purchase food or attain food from other sources; (3) food utilisation, as the ability to meet daily nutrient requirements.
Production and security, however, is not singular ubiquitous theme at the Alaskan food policy frontline. Energy sources have too been affected by the ever-decreasing supply of oil from Prudoe Bay, which has inadvertently severely affected the U.S' cost of petroleum and refined oil production despite a global reduction in price per barrel of oil. (Walker et al., 2017) In light of this, legislators have sought alternative avenues for fuel production, and biofuels are fast becoming the go-to source. A 2018 Farm Bill which expands export prospects for farmers by providing an additional $500 million in permanent funding over the next decade has recently been passed. (Congressional Research Service, 2019)

2020 | 2029 The Next Green Revolution

In a report published by the Organization of Petroleum Exporting Countries (OPEC, 2017), the projected global oil demand will increase on average by 2,2% per annum leading towards 2040. The trend in 2022 remains consistent with report projections; and much of this increase is attributed to non-Organisation for Economic Co-operation and Development regions (OECD).
Despite the apparent push toward more sustainable energy solutions, global coal and oil production has remained consistent and as such global warming has continued on-trend. Emissions and temperature observations are on track with RCP6.0 (Representative Concentration Pathways) projections and has led to an increase in global policy concerns. (Hayhoe et al., 2017)
Alaskan summers have, year on year, continued to lengthen and warm up. This year marked an extension of over four days compared to the previous decade; signs that the globe is not only warming but doing so at an increasing rate. On-going coastal erosion has significantly affected northern land masses, because of thawing permafrost soils, and as such a number of the towns which were earmarked back in 2016 for relocation have been evacuated "ahead of schedule". (Wexler, 2014)

2030 | 2039 Necessity, The Mother of Invention

Considering the lengthier growing season and reduced costs of technologies, the agricultural industry in Alaska has seen a boost in interest from corporations

based in the Lower 48 — the Contiguous United States, which excludes Alaska and Hawaii and other archipelagos. Investment into the expansion of agricultural infrastructures has come in waves from large companies, such as Foster Farms, Tyson Foods and Alltech. Additionally, industry fuel leaders, such as Royal Dutch Shell and Exxon Mobil Corporation, have also opted to begin investing more extensively into local agriculture. Alaskan reliance on liquid fuels —given its slow up-take of electric vehicles— makes for an obvious deduction that these oil giants are aiming to profit heavily off the continued development and proliferation of biofuels since the mid-2020's surge in algal systems. (Kothari et al., 2017)

Dwindling game populations, erratic migratory patterns, reduced fishing locations and increasingly sparse fertile landscapes are quickly leaving rural Alaskans with little to no options, when providing for themselves. This necessity for adaptation has opened channels for opportunity and engagement between an organisation like Seeds of Change, and the Native Peoples. (Himes-Cornell and Kasperski, 2015) Climate change consequences have continued to worsen at a global scale, and the Lower 48 US has been hit especially hard by adverse weather conditions and natural disasters. Worsen climatic conditions in the Global South and the mild summers in the northern states have prompted what is being called widespread "climagration", migration as a result of climate change. (Hamilton et al., 2016) Given its relatively temperate climate, compared to the rest of the Arctic region, its interconnectivity and mostly stable weather conditions, Anchorage has resulted as one of the more attractive cities for climatic migrants along northern latitudes.

2040 | 2049 Blueprints for Climate Change Responses

The heavy investment of past decades into Alaskan agriculture has marked a tremendous improvement in the industry's ability to provide local food supply. In 2040, Alaskan imports of fresh produce came in 18% lower compared to that of the late 2010s, marking a significant reduction in economic outsourcing, increase in freshness, quality and finally strengthening the argument for development of localised production. This warmer Alaska, with an average growing season of 134 days (20 days longer than in 2010) albeit represent a significant step forward for agricultural sector, it has also come with dire future consequences, which are at the forefront of today's Alaskan challenges.

Amongst others, the principal issues at hand are a severely diminishing supply of fresh water, and immense infrastructural damage caused by thawing of permafrost as the main climatic impact in Alaska registered since 2017. Water supply has been impacted by the continuous shift and adverse conditions brought on by

a warmer climate. Meteorological patterns and weather offsets have affected how precipitation falls to Anchorage. In addition, the warmer summer months have become drier, an effect which places strenuous demand on the capabilities of the city to store water safely long-term.

2050 | + An Ever-Warming Globe

All of Alaska, for many years has experienced wave after wave of harsh territorial effects, and lingering consequences as a result of climate change. Anchorage now, with its developed agri-infrastructure and densification, faces a much more substantial adversary; how will it continue to deal with struggle, tackle challenges and face hardship. How will the city of Anchorage position itself, its policies; and how will its people adapt and overcome?

REFLECTIONS ON RESILIENT FOOD CYCLES

Whilst this essay offers but a sliver of one possible future scenario, it becomes evident that despite uncertainty, change is absolutely certain. We will continue to see change, as an inexorable shift of our climate, territories, industries, and societies, and with change comes adversity. Cultivating resiliency may be a credible way, in which we can begin to prepare current and future generations to be better equipped to tackle adverse challenges. (Ferreira et al., 2018) Resilient food cycles in and of itself are a means to an end; a mechanism through which means may be developed: by providing a stable platform upon which they may flourish. A resilient society may ultimately be better equipped to generate the eventual solutions to face inevitable change.

A new territorial resilience borne of adaptive cycles, responding to climate changes, not only as a social practice may offer just the platform. Thus, the question becomes "how?". How do we begin to generate this sort of social capital and territorial resilience? Could systems of production not coincide with spaces of collaboration? Do places of learning and healing benefit from cultivating and tending? And how does the interplay between biology and technology open opportunities in our current socio-cultural climate? These questions: spurred on by the research, essay and timeline which built the scenario, led to the Permabioreactor prototype (CFC, 2019). How could technology, synthesized with biology, through a research-by-design thinking, begin to respond to the challenges of climate change?

The prototype aims to deal with this discussion, by serving as a physical departure point for these questions: generating new modalities for cultivation by exploiting climatic impacts. By cultivating algae which sequesters excess carbon dioxide, the process of providing a source of nutrients could in turn alleviate the impact of onset permafrost thaw because of the warming climate.

The project does not present just a technical solution to what is a globally-related problem. It is neither feasible nor practical to think that in its current form it would even begin to scratch the surface as a 'solution'. Rather could this become a device to be deployed at different scales on a spatial perspective? Could we imagine that with sufficient resources and governance, we someday utilise the carbon-sequestering abilities of algae to deal directly with one of the consequences of permafrost thaw through design and architecture? And in turn respond to social issues by offering a supplemental solution?

It is this notion of coupling through architecture which this paper aims to initiate the critical discussion and consideration of imagine the possibility for generating novel adaptive cycles. Alaska Seeds of Change has already implemented a novel adaptive cycle today; coupling a space of cultivation with social programmes which empower disadvantaged youth. Could coupling be an effective mechanism for responding to technical and social challenges? A response which may in turn provide the platform upon which we develop adaptive cycles generating territorial resilience?

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