

Lower-Tech, Low-Impact, Passive Heating and Cooling - Architectural Ideas as Solutions to Turn from Toxic Fossil Fuels Energy Dependent Modern Culture

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It was almost 2018 that around 15,000 top Scientists around the world came together to declare the “**Climate Emergency Declaration: World Scientists' Warning to Humanity: A Second Notice**”: a letter written and directed to the Heads of States and to the general public around the world at-large. In fact, such dire warnings to humanity had been predicted by conscientious scientists against the trajectory of exponential growth of fossil fuels back in 1972 (Computer Modelling - **Limits to Growth** Report by MIT with **Club of Rome**). The consequences of built-up of greenhouse gases from the digging and burning the ancient fuel deep underground would lead to Climate Collapse and even Societal Breakdown. The enviro-activists would now pin-point many of our modern, social, environment ills and even human health woes are contributed directly from this unrelenting burning of coal then oil and natural gas since only around 1750's. Led by Britain with their unabated cutting and burning of trees then with their easily accessible coal and later along with other European countries colonizing much of the world that eventually led to the upping the ante with burning of cheap oil and gas by the Colonial North Americas with their industrialized paradigm – the recent book ‘**Power**’ by long-time climate change author *Richard Heinberg* chronicles the history and development of the fossil fuels affecting societies.

Moreover, perhaps to fight this colonial nationalistic aggression / dominance at the world stage, the developing countries in Asia would follow suit this same tactic of the striving for economic competitiveness by scaling up even more this same pillaging, devouring and ‘**business as usual**’ fossil fuels based culture status quo approach that would result, in hindsight, in bringing about the Covid-19 world pandemic in the year 2020 just 2 years after that many scientists’ climate emergency declaration.

One of the most educational climate science knowledge YouTube channel is **Climate Emergency Forum** with 2 re-occurring Canadian expert climate watchers *Paul Beckwith* a professor at University of Ottawa and a retired MD

Dr. Peter Carter - an expert reviewer of the IPCC (Inter-Governmental Panel on Climate Change) reports. In fact, Dr. Carter would often call out in their many videos - the continual unapologetic burning of fossil fuels by the industry is humanity's "Crime of All Time" because of the industry's consciously knowing of the ill effects on air and water along with the greenhouse gas pollution problem that would mess with life cycles of living beings and also be directly contributing to causing deaths. In one episode on air pollution, recent reports reviewed by Dr. Carter, the scientists had concluded that respiratory deaths from burning of fossil fuels is responsible for up to 10 million people a year around the world.

The latest according to scientists, the focus now is to avoid getting above 2 not 1.5 degrees Celsius (target from Paris Accord can no longer be met is the consensus now) above pre-industrial levels by 2100 which would mean requiring and getting to zero emissions from fossil fuels use within 50 years or sooner that is if we want to leave behind a safe world for the following generations. This will mean an all hands-on-deck effort with all countries with their gov't's and citizens around the entire planet together all drawing-down, being led by USA, Europe and China. We are currently already at 1.1 degrees above pre-industrial level.

Modernity's Over-dependence on Fossil Fuels Energy Supply

In another CEF episode on 'Climate Emergency Response', one of the commentators brought up another recent science knowledge book by Vaclav Smil titled 'How the World Really Works'. In it states the 4 pillars of modern civilization: cement, steel, plastics and ammonia are 4 materials ranking highest on the scale of necessity most needed in large quantities in our modern culture. Three of the four are directly related to the making of modern architectural materials via by burning of fossil fuels with the 4th being ammonia, for making nitrogen as chemical fertilizers in modern industrial farming practices. So, is modern architecture now practiced around the globe with its voracious use of man-made materials not responsible for fueling the exponential growth of fossil fuels culture just by using these high embodied energy materials at a global scale?

Another climate scientist educator, *Prof. Jem Bendell* of University of Cumbria UK (who started the **Deep Adaptation** forum movement which openly discusses the topic of imminent climate and societal collapse from climate change was based on the PhD paper he wrote that went viral and later published in book form 2021), presented last month at COP27 UN Climate Change Conferences in Egypt. He mocked our love for superfast-cars is a form of modern psychological sickness and the reason why our elites (those in power) have not stopped climate chaos as witnessed most recently by the entire **Global North** with their record heat, flooding and drought in last few years – a problem not contained just for the vulnerable **Global South**. As I edit this paper, the historic blizzards at Christmas along Lake Erie lakefronts and in the Maritimes and not mention the 10th approaching atmospheric storm for California are all cases of extreme weather events much closer to home. He used the hashtag *#juststoplambo* on one of his recent YouTube channel videos in reference to **Just Stop Oil** and **Extinction Rebellion UK** - the radical climate activists campaign groups that many esteemed scientists and scholars have been supporting. These activists' cry of imminent global climate collapse is a call-out of their UK gov't's hypocrisy who claimed to be a transition climate energy leading country committed to the Paris Accord while allowing ever more oil and gas licenses for off-shore drilling. Incompatible realities, how they not be? The recent 33 million climate refugees from record flooding in Pakistan we witnessed this past summer and the anticipated 800 million Africans to be displaced by 2030 are all climate realities or soon-to-be. In addition, much of the tropical islands will no longer be habitable due to sea level rise are all extreme climate events that the scientists now saying will happen sooner and more severely than most of their studies had predicted. This is due to **Positive Feedback Loops** a sort of spiraling self-reinforcing effects of Climate Change and also because of the fact that scientific academic community is a conservative culture that tends to tone down their findings in order to not risk losing their reputation or funding for their research for being alarmists.

Problem of Using Modern Building Materials in a Cold Climate

Perhaps mostly due to my own ignorance, my experience with the architectural culture in Toronto from academia in the 1990's through my working years in the architectural field has been one that included very little discussion on how

modern materials are made and their relationship with the burning of fossil fuels until the recent building science movement on topics such as **embodied energy** and **embodied carbon** of building materials in articles I came across in the mid 2010's. To add to this lack of awareness on embodied energy of materials, the modern design culture in Canada seemed to have negated the reality that we live in a cold climate environment and would, in my opinion, erroneously perpetuate the use of thermally conductive metals; with its the ribbed metal armour look and its knives' edge aesthetics, as the epitome of exterior form and cladding ideals. And only up until recently, all in thermally unbroken exterior building envelope assemblies that are considered now as "thermal bridges" in building science terminology.

This is in my opinion a total disrespect of our local climate conditions, the antithesis of our indigenous peoples building traditions or similarly with other ancient civilization traditions of building small and only having to heat the body rather than the entire 'hermetically sealed' interior space. This old-world frugal way of living lasted for millennia for both the indigenous and the Asians (for example: The Chinese Kang thermal mass heating bed (*See link#1*)). Similarly, the homage to the modern glass tower, what it is really the most energy inefficient, un-insulating yet solar gaining edifice ever created; was it not just conveniently and meaninglessly expropriated from the much milder U.S. climate via the design magazine culture with no consideration for how much annual energy use is required to make their interior spaces comfortable year-round in our cold climate?

I have come to learn that in multi-unit residential high-rises most units have little heat-loss in the winter due to the fact that units are small in size (each having their own heating elements) plus the fact that they are insulated by their adjacent attached neighbouring units. Also, each unit's vertical face exposed to weather to its unit's volume ratio is small. I can attest from my experience of living in a North facing small dwelling unit with much glazing and even with spandrel panels in a multi-unit building built around 20 years ago where the interior temperature hovers around 20 degrees °C. without having to turn on heat for much of the winter. This may be due to the thermal mass quality of the concrete slabs that captures the sun's rays from its massive southerly oriented building face that is much glazed. As well, the heat from my neighbouring units may leak through the hollow sound insulated (STC 50

rating) demising unit walls. In fact, with much of the high-rise residential building typology, it is heat-gain that is the issue not heat-loss for these multi-unit small dwellings when they are facing toward the South, the West and may be even to the East, being in direct paths of sunlight. This is especially the case for the older apartment buildings with solid masonry with thermal mass exterior walls where the thermal energy is absorbed into the solid material. I should mention that my much South and West facing building has of course a serious A/C use issue during the summer months.

The criticism of Canada's heavy-handed fossil fuels tradition for building use can be summed up by a quote from the American scholar Ralph Waldo Emerson written more than 150 years ago.

“Coal is a portable climate. It carries the heat of the tropics to Labrador and the polar circle; and it is the means of transporting itself whithersoever it is wanted. Watt and Stephenson whispered in the ear of mankind their secret, that a half-ounce of coal will draw two tons a mile, and coal carries coal, by rail and by boat, to make Canada as warm as Calcutta, and with its comfort brings its industrial power.”

The Problem with Sprawl

The biggest problem with urban sprawl (low-density dwelling housing developments) is that it bulldozes natural woodlands and basically wipes out all the living species in the existing natural biodiversity habitat into sprawling low-density energy inefficient detached single-family dwellings (or more recent now low-density townhouses in the GTA area) with mono-species grass lawns and asphalt driveways with little bio-diversity species remaining.

The second major problem is that much of the carbon sequestering ability of the perennial plants with deeper stronger roots especially trees will no longer be present to recapture CO₂ from the atmosphere then to make oxygen for other living beings like for us humans. To add to this problem, more recent scientific studies are revealing that much of the carbon the perennial plants need to regenerate themselves for next spring is store in the roots systems and

in the soil beneath; so, when the trees / woodlands are cut indiscriminately the much carbon sequestered and stored by the trees in the soil and their root systems will also be re-released back into the atmosphere.

The next criticism is the nature of wood frame houses itself as shown by building scientists in recent years and until recently with outboard insulation requirement is extremely air-leaky due to the fact that many of the suburban homes (may be as far back as early 1980's) the wall cavity spaces between the structural wood studs are filled with fibreglass – the cheapest man-made insulation with the lowest insulating value - lower than any natural materials while requiring much fossil fuels to make. The one-inch air space between the only 3-1/2" thick masonry veneer is needed because the traditional +/-8" min. solid masonry wall thickness was strong and wide enough for a 2-story building to not allow the migration of moisture and water toward its interior face due to its natural material quality of being porous. This air space between the single brick course and the wood structural framing is what the building scientists call a 'pressurized space' with a vertical convection current because of having weeping holes at the top and bottom of all wall openings and at the top and bottom of each exterior wall itself – a space that is like being outside or is constantly losing heat to the outside in the winter or gaining it in the summer!

I attended a webinar with a North American passive house design community and learned that the embodied energy highest for the detached or semi-detached houses category are those in the big cities because of the use of brick material as exterior cladding - a material of choice throughout affluent 'civilized' cultures of the past millennia - a symbol of wealth and status. I think it is because of this expense in manufacturing the bricks and from excavating the clay requiring building factories and much fossil coal to be burnt that eventually led to the transition of wood frame structural back-up exterior wall dwellings. The use wood as structural frames were much lower in cost with the much available woodlands across the vast North American continent: all easily accessible via established rail-lines for the newer generations of industrialists/settlers in societal power.

Are the developers and contractors led building culture in Canada not responsible for perpetuating the decadent North American private dream homes culture by simply building and profiting from all those eager-to-emulate

the North American lifestyle ‘nouveau riche’ immigrants including its “real state casino” culture of flipping properties; all not really toxic money driven at the detriment to our natural environment?

This deforestation for decades of the suburban detached single family wood frame culture grew exponentially and was made possible in places like Ontario by the modern *super energy supply* or ‘*instantaneous heat*’ that is natural gas (methane). NG with their centralized furnaces and mechanical fans can push air via an elaborate ductwork configuration hidden behind drywall stud framing can make an entire detached 2 storey building with basement warm in a matter of minutes. I suspect this energy transition was implemented en masse along the eastern seaboard of North America then across much of the entire U.S. and Canada through a massive network of gas pipelines underground over the following decades. **Global News CA** recently presented a news story on the NG history in Canada with slides of maps showing the densely intricate network of gas pipelines across Canada and the U.S can be found online. (*See link #2*)

The serious Fugitive Methane (Natural Gas) Leak Issue

The seriousness of the issue of fugitive methane leak was first exposed in an episode of the climate change documentary series backed by James Cameron – the famous CA born movie director released on Showtime TV network in 2014. The series casted Hollywood’s biggest, newest stars and world-renowned journalists to expose 17 different and most impactful climate change topics/episodes around the world. The cast included the likes of Harrison Ford, Arnold Schwarzenegger, Jack Black and Matt Damon. Clips of episodes were released on social media with episode#6 being on methane (natural gas) leak that was discovered by a female PhD student with a CO₂ device in a moving van in the streets of Colorado near Denver. She wanted to find out why there was a high reading of methane from the devices as well along with CO₂. It was discovered that the 2 main sources of natural gas leak were first a slow but steady one present in the entire city NG pipeline infrastructure as the metal pipes carrying the gas under moistened ground is aging and the second even more serious being the ‘super emitters’ where the many thousands of fracking

drilling sites in the nearby Permian Basin along the Texas and New Mexico border are located. The industry has been claiming that by flaring at the top of the drilling towers the invisible gas is captured and burnt into a state of CO₂ that is 50% less strong as the CO₂ released from the burning of oil. According to the industry, only 1% methane is leaked into the atmosphere and hence touted as 'clean fossil transition energy' from coal to renewables. This, I think, is becoming another total lie from the big profit driven corporations of North America like the plastics and smoking industries which have now been well exposed in many recent documentaries. The problem with methane is that when unburnt and escaped into the atmosphere it is at least 80 times stronger than CO₂ in the first 20 years as a greenhouse gas then 30 times stronger for the rest of its 100 years lifespan.

In 2018 **Environmental Defence Canada** published a report with the title of **Canada's Methane Problem** (2017) then **Less is More: Methane Decline** (2018). In the latter report, it talked about the many chemical respiratory toxins present in natural gas when exposed in the air such as formaldehyde and benzene which are also known carcinogens. It also brought to light the topic of **fugitive methane leak** issue in the entire supply infrastructure (*See link#3*). All this would relate to the online articles from **npr** and **PBS** online articles published in the late 2010's that brought out calls to remove gas stoves from residential kitchens in the U.S. Again, the PhDs' research is finding that the invisible methane with its chemical toxins is leaking into the interior space even when the stove is turned off with the pilot lights are unlit.

In July 2021 **PBS NOVA** published on their Terra YouTube climate change channel, the methane consultants' finding and tracking of the methane leaks for the city of Boston. (*See link#4*) In this video, another young PhD at MIT would say that methane gas is "*what everyone should be talking about*" and described it as the "*invisible elephant of GHGs*" and a gas that really wants to leak into our atmosphere.

More recently, as reported by **DW online** English German public broadcasting YouTube channel and **Bloomberg** online article news and again by **PBS** this time from **PBS NewsHour** are the stories of **Methane Hunters** with their \$100,000.00 infra-spectrometer cameras that can finally see the plumes of invisible methane gas leaking around the pipes and their storage tanks above

grade and at the top of the flaring towers continuously; debunking the myth of only 1% leak the natural gas industry is still holding for decades. (See link#5)

One may ask all this concern with U.S. fracking how is it an issue for us Ontarians? The fact of the matter is since 1980's the Neoliberal policy of Free Trade / Globalization, the rich Industrial Global North with their big industry corporations backed by governments' subsidies would be able to trade freely without tariffs between industrialized nation states especially between friendly ones. These big Global North corps had also been able to bully their way through the poor and developing countries around the world, again, with their governments backed subsidies programs for the big corporations.

I understand that in Canada also now, be it to a lesser extent, too have been fracking for natural gas in B.C., Alberta and Quebec and most recently right here in Ontario (I heard through word of mouth). There has been little news on fracking of natural gas in Canada from our mainstream media to my knowledge. Another major issue with fracking is the contamination with ground water aquifers with their chemicals and their tremendous water usage issue which I think has been more documented by the media and the industry's critics.

In the Michael Moore's climate change documentary: **Planet of the Humans**, NG is shown to have been replacing coal power in the U.S. as backup power for Solar and Wind as the renewables have an intermittency supply issue. More locally in Ontario, the controversy of late is the increase demand for NG use to back our 'clean hydro-power electricity grid' due to more extreme Climate weather events and the ramping down of the Pickering Nuclear Plant due to its old age.

Local enviro non-profit groups like **Ontario Clean Air Alliance** also alleges that our Conservative government's default status quo solution is a 6 fold increase use of NG to sustain our current and growing population energy need in the near future as the Pickering Nuclear Plant is too expensive to refurbish.

Lastly, the massive Arctic methane bomb from permafrost melt will be the for-sure '**tipping point element**' that will flip our stable Climate system since pre-industrial era which lasted for hundreds of thousands of years into a post-

industrial climate chaos period (many scholars and scientists have been warning) along with the re-release of many ancient deadly viruses also expected to come back to life. This Arctic methane release catastrophe can only be slowed if we first stop the anthropogenic methane leak (only recently brought to light) and the much CO₂ (Carbon Dioxide) and N₂O (Nitrous Oxide) release in the atmosphere since the Industrialized Revolution not even three hundred years old.

The Problem with the Unchallenged Building Practice of Building Basements

It was at an Annual **Ontario Natural Building Coalition** weekend conference in the late 2010's I attended near Peterborough that a licensed architect in Quebec who then recently was certified as a **Building Biology Institute** (California) professional presented their principles of healthy natural buildings. Many of which in my opinion resembled ancient Asian architectural design ethos; if I recall correctly by memory here, they are:

1. benefits of courtyard buildings for their ability to provide natural ventilation via cross ventilation especially effective with a small central courtyard roof opening that encourages the bending of air flow from vertical window openings to the horizontal roof opening of the central courtyard. The fact of having openings all around the 4 sides of the courtyard roof encourages more outward and upward air flow.
2. Use of natural materials for the interior with the absence of any volatile organic compounds (VOCs) from man-made materials and finishes.
3. Shading of walls with deep roof awnings to protect and shade the often-natural exterior building material that can erode over time, for example, such as exterior walls with lime plaster over strawbale.
4. The insistence on the benefits of a one storey house which included the requirement of houses without basements. This is in keeping with the "**Universal Design**" perspective and the simple reason that the deep overhang of the roof can shade the interior rooms more easily as a one storey house leading to the lessening of mechanical cooling.

It is the 4th aspect of no basements that I want to expand upon. The main problem with basements areas is that not only is much cement needed for the underground enclosure and plus the much heavy machinery use, labour and shoring required for the excavation, but all that most intensive petrochemicals such as bitumen, tar is required to keep the underground concrete 100% waterproof! This building practice is extractive, energy intensive and costly to both the environment and in monetary value. It is most absurd when applied to high-rises to build underground parking areas where above the mentioned high embodied energy waterproofing materials and the intensive energy underground construction will only sky-rocket the construction budget – all for the storage of inhabitable spaces for cars.

The better alternative architectural solution would be to build above grade parking decks with smaller mercantile and office spaces wrapping around the parking deck structure (which can be as compact as a switch-back sloping floor ramp configuration with parking off the one of both sides) since this inner area of the building has no access to natural sunlight anyway. Above the parking deck and these wrap-around commercial spaces can rise the residential blocks with a potential for a publicly accessible roof podium space above the parking deck roof as a grand courtyard space above street-level (*See video*). Granted that parking spaces will be less than the conventional underground area layout but with lesser car spaces could lead to a new kind of car-sharing vehicle culture having fewer private cars space allocation (eliminating the 1 parking space requirement for every dwelling unit especially in big cities with public transit) and the idea of using this limited space parking deck to be shared between the residential and commercial uses.

Finally, this organization between above grade parking deck and its surrounding small commercial spaces with access to windows can allow for an old-world-like pedestrian (either enclosed or unenclosed) streetscape space at a more human scale architectural feeling space with potential pedestrian bridges and stairways to link the outer commercial usable spaces with the ramped parking levels promoting walkability around the 4 sides of the parking deck all within a mix-use urban fortress-like development all above grade. (*See video*)

Canada's Continual Rising Fossil Fuels Culture

It was at COP26 (2021) that on social media that people were claiming that Canada for being the biggest investor country of fossil fuels. This claim may be clarified by a more recent article by The Tyee: *(See link#6)*

The recent COP27 Climate Conferences in Egypt, CBC National News confirmed and reported that Canada was ranked the one of the last countries in the world to meet its Paris Accord agreement. *(See link#7)* According to the UN panel committee member interviewed this is because of building big houses (not in a cold climate?) and a popular SUVs and trucks driving culture not all related to the profit driven 'real estate casino' building industry also)?

In an earlier online article *in 2018*, CBC article reported Canada as the 2nd highest GHG emissions per capita behind 1st place Australia, for their export of raw fossil fuels and minerals to the developing Asian countries for the last several decades and 3rd place being Korea, for their surging high-tech electronics and automobile based economy. *(See link#8)*

Passive Solar, Low-Tech and Low-Cost Architectural Solutions *(in no particular order):*

1. *Non-mechanized Earthen Tubes for Suburban Back Yards Related to Texas Losing Power in Feb. 2021 and to Those Older Townhouse Housing Projects in Toronto's Suburbs with Shared Yards. (See video)*

When Texas lost power in Feb 2021 due to the slowing and dipping of North Atlantic Jet Stream pattern to the southern U.S. state due to Climate Change / Melting of Arctic Glaziers, CNN online news reported that in some suburban areas people were dismantling their backyard fences to use as fire wood.

This image reminded me of the older townhouse developments those almost Social-Housing-like Townhouses of having ungated 'common' spaces both in their front and backyards. One can still find some in the older suburbs of Toronto such as in Don Mills where backyards of 2 row-house buildings

would face each other and share their connected grass lawns where saplings can develop into mature trees and where such inanimate semi-public space can bring about a sense of community and sharing of green scenery and even sunsets. *(See video)* The fronts of these townhouses are usually lawned with paved walkways and sometimes would even form garden courtyard-like spaces where kids can be found socializing *(See video)*. Such habitable spaces are possible because the parking for all the dwelling units is pushed aside to the edge of the property as an above grade parking area off a main driveway and sometimes even under a carport roof structure that can shelter the cars beneath just enough from rain and snow.

I first learned of the non-mechanized earthen tubes low-tech heating and cooling method from a paid online article from the U.S. Taunton Press website **GreenBuildingAdvisor.com** written by an architect in Quebec who was designing and building his own house where he installed only 4” diameter wide plastics pipes and ran them continuously for just over 100ft in a trench ~7ft deep below grade around his property. This not only brought constant below grade warm air all year round but also fresh air into the basement mechanical room. I later came across a research PhD paper from B.C. that emphasized the longer the pipes with less joints the lesser chance of condensation inside the non-mechanized metal pipes. Is this much warmer air coming into the basement mechanical room not the perfect place for air source heat-pump tech and where its A/C condenser may even be possible to be placed to dissipate the condensate heat or be sent to the earthen tubes underground outdoors?

Now back to the imagery of the dismantled Texas yard fences or the 1960’s townhouses with their shared backyards. With the back yards open to neighbouring units in a street block, would these continuous runs of earthen tubes not be installed quite easily especially in the suburbs where their yards are large and where all the existing utility lines are usually installed along the front yards of the houses? *(See image #1)*

In the last in-person seminar before the start of Covid, Passive Buildings Canada had a presentation on earthen tubes to their members. One of the

presenters' data showed an above 20 degrees °C. warmer incoming air entering a house than otherwise would during the dead of winter. (See Video link below):

[Boots on the Ground: Tales from the underground: revealing data on earth tube performance](#)



There is also a recent science faculty building at U of T Scarborough (by Diamond Schmitt Architects) that utilizes this low-tech heating technology to bring warm and fresh air into the lab building without operable windows and to save on annual fossil fuels energy use for heating and cooling to its all-glass glazing and spandrel panels enclosure facade. (See link#9)

2. *Shading of Building Faces for Apartment High-rises*

I have come to understand that building facades facing South, West and may be even East should really be shaded when they are in direct paths of the sun's solar rays for exterior walls that are both fully glazed or with solid masonry with thermal mass quality (that can absorb much of the heat energy) as in the post-war high-rise older apartment buildings typology.

This is because if not shaded A/C use will be required to keep its interior rooms comfortable for human use especially if one is to sleep in the space.

Now, imagine having planters at every floor level where simple cables can be secured and deciduous vines can grow upside-down to not only shade the solid masonry walls but can be offset several inches proud of the building face to possibly create a natural air current flow effect known as "the venturi effect" that can further cool the building face! (*See image#2*)

Would this not be a worthy design idea charrette for design architects to dream up these cooling shading metal lattice structure for plants in front of building faces that would also allow solar rays to come through when the plant leaves shed in the autumn months and be absorbed by the solid masonry in the winter? The manicuring of the vines themselves can create a new kind of green city maintenance staff-work that can be trained to create local jobs?

Can these lattice works with catwalks and ladders up and down the building face potentially even double as fire exits (places of refuge) in times of fire emergencies during rescues for fire-fighters?

3. *Balconies Need to be Used for Growing Food as Urban Food Gardens and Such Idea Should be Supported by Municipal Governments as Community Resiliency Building Initiatives.*

Yes, in Toronto alone, all those brutalists concrete balcony **thermal bridging** fins are so ubiquitous and mostly still unused; although I believe many of such older apartment buildings are now allowing residents to decorate as at least garden storage spaces (something not allowed in the past I believe, in keeping with the homogenous 'white picket fence' tidy and polite look preference). Now again imagine if the South and West facing balconies are filled with sub-irrigated planters (planters that hold soil nutrients and allow the water to be sucked up when the plants need from the bottom reservoirs in the hot months with soil nutrients not

drained) (*See image #3*) be used as food gardens to promote a growing local organic veggies culture that again can be supported by building maintenance staff and residents alike and such green act be taken up as a lifelong hobby of learning to nurture edible plants. And again, simple cables can be hung from concrete balcony slabs from above near the edge of the balconies for vining plants and be manicured as exterior shading devices to block out solar rays on building facades to shade the living areas or sometimes even bedrooms behind? What about enclosing the North facing balconies as greenhouses for shaded plants or even as storage spaces for bikes as our big city has always been so keen to promote a bike riding culture but where there have never been enough interior bike storage areas in high-rise residential towers is my experience in the big cities.

(*See image #4*)

4. *Non-mechanized Solar Chimney Concept in Conjunction with Earthen Tubes*

This is a 3-D concept sketch I worked out as a non-mechanized heating solution with the idea of capturing solar rays inside a thermal mass tower interior that is outboard insulated. The captured warm air inside would then rise and be captured by a bending elbow ductwork that is protruding from the masonry chimney and is slightly less insulated and with an outer metal casing that can create a downward air flow toward either directly to the basement furnace room or to the non-mechanized underground earthen tubes near the solid base (available thermal mass absorption from solar rays at the top) and that can be controlled with a manual flap with gasket depending the time of day. (*See image #5*)

5. *Outboard Insulated Metal Shipping Containers Principles for Creating a Small Dwelling Laneway House*

The structure of a typical metal shipping container is with 4 columns at its corners and a floor structure with structural beams where when stacked the floor of the container above becomes the roof of the container below. The corrugated ribbing of its shell is usually vertical for vertical strength.

The reason for outboard insulating the metal shipping containers is to thermally protect conductive metal shell and by doing so its max. interior width dimension is maintained. Another important principle is to respect the structural shell integrity of the vertically ribbed surface meaning only minimal cuts / incisions are applied for small width openings such as windows and doors and never an entire side because that will then require at the very least: a wooden stud framing structure to probe up the cut shell from collapsing.

A compact 3 container laneway house scheme is possible with the principle of only small incisions to the metal shell for windows, doors and opening for stairs. The stacked 2nd floor container is the bedroom where one can step out onto the roof of the one container at grade (where this lower container at grade can be flipped so its floor structure becomes the roof structure). This single at grade container is the 'utility' container containing the kitchen, the 3-piece washroom and the stair to the 2nd bedroom. The enclosure of the stair is outside of the boundary of this bedroom container. The container below the bedroom contains the living areas.

(See image#6 and #9)

Those who are following the natural materials building movement would criticize that the un-breathability of the metal container shells is a problem for human comfort. But what if, in the cut-out wall sections above and below the small openings of windows and doors are insulated and cladded with natural breathable materials such as hemp or cellulose insulation then can even be finished with exterior breathable plastering. There is potential of these opening with natural insulation and panelling on each side of a container that is exposed to weather to create a bit natural air movement inside each container? *(See image#7)*

6. *4 Shipping Containers Greenhouse Courtyard Passive Solar Rural Dwelling*

This is a rural small dwelling scheme that uses 4 shipping containers providing 2 bedrooms and a glass atrium in the centre with 3 containers that

forms a U-shape surrounding it. This enclosed courtyard will have passive thermal mass heating quality from the 3 surrounded attached and habited containers and then be used in the colder months of the year as a semi-heated indoor space. In the hot months, more effective cross ventilation is possible by venting the glass greenhouse at its top via a stairway landing leading to the 2nd floor bedroom with windows. (See image#8 and #9) I believe by having this more dedicated and elongated air travel path from ground to the 2nd floor windows will promote better cross ventilation and funnel hot air out than convention greenhouses with opening at the ridge of its shed roof which this greenhouse courtyard space also has along its remaining top portion. (See image#10)

7. *Mass Housing Concepts using Metal Shipping Containers*

This is a large concept community housing scheme that uses a colony of stacked metal shipping containers with attached greenhouses in between forming a horizontal low-rise development. These enclosed greenhouses again will have passive solar heat from the attached shipping container dwelling units during the colder months and can be used as semi-heated enclosed gathering space or as spaces for extending the growing season in our cold climate. The passive thermal mass heat can be enhanced further if the interior walls surrounding the shipping containers are constructed with raw unfortified rammed earth. (See image#11)

**All 3 low-cost shipping container housing schemes above mentioned were submitted to the Affordable Housing TO competitions by Bees Breeders Architectural Competitions in 2021. (See image#12)*

8. *Live / Work Row-House with Pedestrian Streetscapes*

This is a Mix-use live-work units 3 storey row-house scheme incorporating alternating pattern of pedestrian streetscapes with roads for cars. Stores or offices are located at grade and the living quarters on the 2nd and 3rd floors. The pedestrian streets are formed when the ground commercial units for

every 2 row-house buildings face each other. Their carports and driveways face the roads located on their back sides.

A semi-private intimate courtyard space next to the 2-car carport is made possible by mirroring the form of 2 adjacent units where the upper dwelling units can look out onto. The 3rd floor for each unit has ample space for 3 bedrooms, 2 washrooms and a large laundry.

The alternating pattern of pedestrian streets and roads for cars can create these ever-expanding city blocks where they exist in harmony with their intersections while co-habiting in equal distribution. (*See video*)

9. *Raised bicycle path structure*

A low-tech Urban Planning idea with elevated bike paths that are sheltered by a green-roof above along its entire length and potentially even where trees can grow. To save on precious existing tight urban street space, cyclists can pedal themselves upward to the elevated path via manual gear-lifts. The elevated vegetation corridor can be a dedicated space and refuge for birds (and even animals maybe) during the migration months or as sanctuary habitats that architects and landscape architects can help design for animals in the future where these wild spaces can co-exist with humans all within an urban environment. (*See image#13*)

10. *Raised Parking Deck and Outer Commercial Spaces Podium Base with Residential High-rise Towers Rising Above*

Please refer to earlier section titled: '**The problem with the unchallenged building practice of building basements**' starting with paragraph sentence starting: 'The alternate solution....' (*See video*)

11. *108 sq ft Rammed-Earth Greenhouse and Passive Solar Greenhouse with Insulated Roof*

This maximum size 108 sq ft rammed earth greenhouse does not require a building permit to be placed in backyards. The outboard insulated and exposed to the interior rammed earth walls will provide passive solar heating through

its thermal mass ability via its South facing windows. When rammed earth is protected by man-made material finishes and by outboard insulation it will not require as much structural fortifying of cement or other chemicals for making it waterproof. (See image#14)

The interior can fit at least 5 halved food grade barrel raised planters. The insulated sloping roof opening toward the south will help insulate the space in the colder months to extend the growing season. The raised planters can be further insulated by having another halved white barrel as a cold frame cover to create a warmer micro-climate within the thermal mass greenhouse space.

A dormer window is placed on the opposite side from the south windows to allow for cross ventilation clerestory window flow for the hot months. The roof of the greenhouse shed can of course be used to catch rain-water with the wooden rain-barrel stand I also designed by using only 2 2x8 spruce members which can hold an empty barrel in place throughout the year or when full at its 450 lbs weight off 11" of grade for a water can use via a bottom spigot.

Concluding Commentary:

Is it not time to wake up from our fossil fuels dependent modern culture that is toxic and renew our reverence to our local cold climate environment as the Indigenous or similarly as ancient Asian cultures did - both lasting for thousands of years? (As pointed out by the educated and compassionate international enviro-social-activists' groups like **Local Futures**). The design culture of architecture as a practice of designing buildings as one-off sculptural objects un-seen-before by architects / designers with no clue to how much fossil fuels energy it took to extract, make and deliver the materials to site; should be confronted. The horrific effects of unabated burning of fossil fuels have to be reckoned with, otherwise our profession is just a kind of superficial decadent arts discipline that really just harms rather than stewards or improves our environment. The detriment to the health and resources of our planet has to be realized as most of today's societies are following this modern design ethos trajectory at a global scale is really frightening. Architecture differs from Art in this respect - Design at the scale of buildings has a much heavier impact on the environment, it is not an aesthetic inspirational exercise to be valued for

just its visual strikingness. Deeper search for meaning for a decarbonized design movement must be pursued in order to turn from further climate and societal collapse due to the fossil fuel 'ecological overshoot' modern paradigm; and which modern architecture has been intrinsically part of, I will reiterate, all in a very short span of time. We must understand again the importance of the modularity of building components is a function of efficiency of materials used and re-value that almost sacred-ness of the time-spent on crafting out beauty from natural materials by hand that didn't involve much of burning of fossil fuels to create into being.

Solutions in the world of architectural design lie in repurposing already manufactured / already made materials in our modern throw-away-society. For example, re-using shipping containers as a low-cost ready-made self-supporting structural shelter when applied en masse can alleviate the destructive practice of indiscriminately cutting trees to use as structural building frames which contributes ultimately to the loss of bio-diversity and responsible for leading us into the 6th Great Extinction?

How about also re-purposing the now many empty glass office towers as greenhouses for growing veggies as their concrete slabs can hold passive solar heat and thereby enabling the operators to not use propane to heat the interior to grow seedlings during spring time as in convention greenhouses practices here?

Or to use man-made materials that often have a durable and waterproof finish to protect those natural carbon storing materials such as unfortified raw rammed earth walls or natural material insulation such as cellulose or hempcrete insulations but also to solve the un-breathability issue of man-made waterproof claddings?

I wonder is not better to use more solid materials with thermal mass quality as part of the exterior building envelope (more in keeping with our cold climate predicament) such as concrete block back-up (many are already made) that does not require as much cement as pour-in-place concrete or even better to use hempcrete blocks as currently being developed with Ontario's local natural building groups like **The Endeavour Centre** in Peterborough?

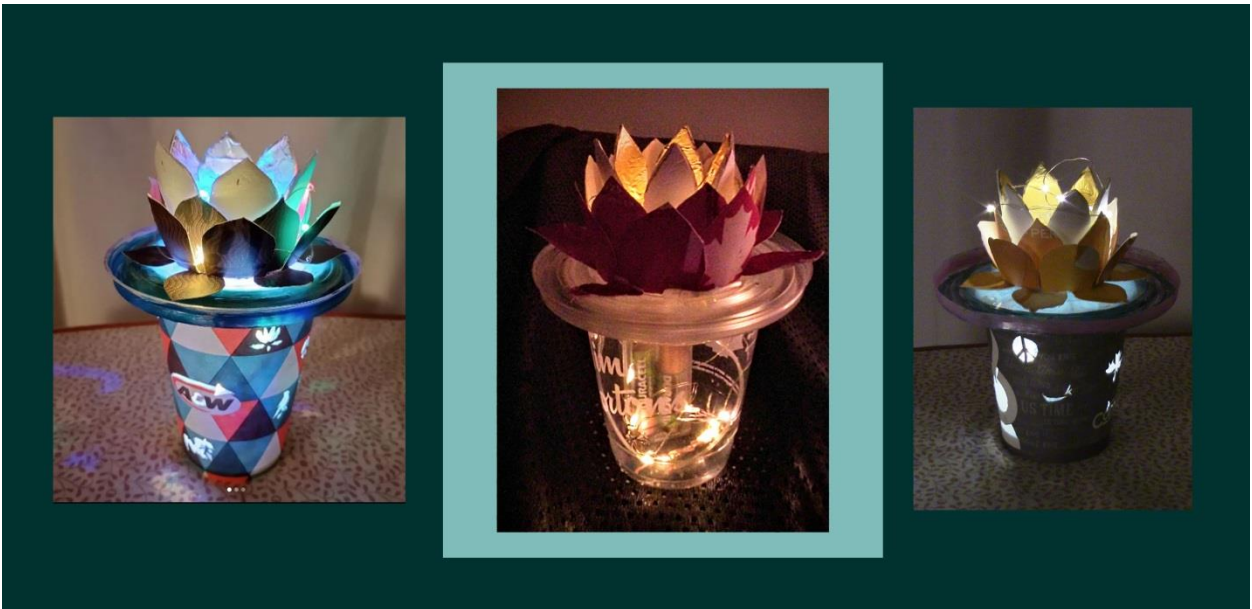
Not better to consider again, design compact energy efficient built-forms or attached multi-unit high-density instead of low-density detached houses that can has less surface area exposed to weather? And to envision innovative low-impact design solutions such as vine shading that can shade and even cool exposed building faces with the bending funneling of air often referred to as the 'venturi air current effect'?

Should we not follow the intuition to question that held energy industry's claim that an invisible instantaneous energy supply via pipelines (which we now know that is constantly leaking) has no consequences to our environment? And realize that such easily accessible powerfully energy supply 24/7 365 days cannot really be good for the health of living beings and for the planet at large!

Is it not the time to respond and heed the calls and alarms by those who are more educated, more compassionate and who would be bold enough to call-out against the status quo establishment upholding the mindless fossil/petrol-state that is really part of the colonialists' / industrialists' tradition? Is it not a society that is fundamentally life destroying and toxic affecting powerless animals, creatures and the many more fellow humans less fortunate on the side of the world?

Is it not now time to take notice of scholar-activist with succinct, articulate and inspiring messages like *George Monbiot*: a grad from Oxford who didn't belong would then go to war-torn places to work as investigative journalist to report on conflicts and truths and now decades later working as a columnist at **The Guardian Newspaper (UK)**. In this TED talk video, he calls on the need to be cognisant of our place on earth and ask what it means to be alive and to show up as a rich 1st world citizen to be that 'guiding light' for the rest of the world to follow. One that can lead living beings into a better narrative toward a decarbonized, decolonized, healthier, Earth-centred regenerative age, again!

[The new political story that could change everything | George Monbiot](#)



> *The Repurposed Coffee Cups Water-Lily Lanterns with rechargeable AA batteries (X'mas 2022)*

Footnote Links*

Link #1:

<https://www.localfutures.org/low-tech-solutions/>

Link #2:

<https://www.youtube.com/watch?v=7CKPbqKWrM4> (Global News on Canada's oil and gas history)

Link #3:

https://environmentaldefence.ca/wp-content/uploads/2018/09/Less-is-More-Elimination.pdf?fbclid=IwAR2rADYUzTI3EZQhyiffRm_QDkzhBWIAkGL6vj7vDn3-5VhiPuW9kcoZofQ

Link #4:

<https://www.youtube.com/watch?v=UetkmReTrkk> (PBS terra on Methane Leak)

Link #5:

<https://www.youtube.com/watch?v=t8Lrr5LTWjw> (Methane Hunters)

Link #6:

<https://thetyee.ca/News/2022/03/31/Canadian-Banks-Billions-Fossil-Fuel-Financing/>

Link #7:

<https://www.youtube.com/watch?v=udATnXvlUOs> (CBC Canada's climate change performance ranking at COP27)

Link #8:

<https://www.cbc.ca/news/science/canada-climate-action-1.5355517?fbclid=IwAR17EOw1ouQfsynaK4kpueVymrG1SdjWNE7KMVURBzNaq nCsZCFYuFbXpXU>

Link #9:

<https://dsai.ca/explorations/earth-tubes-at-the-university-of-toronto-scarborough/>

Other Online Links and Books for Reference

-FacingFuture.tv YouTube channel

-Climate Emergency Forum YouTube channel

-GreenBuildingAdvisor.com

-Years of Living Dangerously (The Years Project YouTube channel)

Books:

-Regenesi s by George Monbiot

-Deep Adaptation by Jem Bendell

-Power by Richard Heinberg