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SUMMARY ANALYSIS OF ARC CITY/ IN-HARMONY SYSTEM

Preface

The ARC City/ In-Harmony System is an amalgamation of a highly efficient building structure that comprises residential, recreation and work; with a specially designed exterior environment which supports human habitation that co-exists with Nature.

We have to change the way we live. Our cities are basically the same organizational pattern as 6,000 years ago. The only change is that now we have almost 7 billion people using great amounts of energy! The Earth will not support this density and intensity.

The ARC City/ In-Harmony System is a totally unique re-invention of how people live. By living in a concentrated, organized way, we can have plenty of land and naturalness around us. It is only in low and medium density living that we are over-crowding the Earth. Our present cities don't work. It is time for a change!

The overall ARC City/ In-Harmony System design accomplishes the following:

- Reduction of energy use to 15% of current U.S. cities
- Collection of Renewable Energy and Storage for independent use 24x7
- Elimination of car, trucks and roads
- Local food production & community storage
- Close-loop nutrient recycling back into fields
- Rainwater collection system and storage
- Reduced water usage through grey water recycling
- Natural building ventilation
- Geothermal Heat Pump system
- Multiple use waste distribution system
- Natural waste processing by Jack Todd "living machines" hydroponics
- Elimination of solid waste generation.
- Environmentally controlled Greenhouses for 365 day food production
- Permanent bed, organically grown food in greenhouses, field & orchard crops
- Fish and Algae food production in adjacent lakes
- Exercise and recreational sports fields, both inside and out.

- Triple ring of canals for flood protection and ground water control
- Site Perimeter Boundary Wall and exterior “buffer zone” for protection
- Underground trains to move food into city & people out
- Underground tunnels to parks
- Point-to-Point Elevated Mass transit of people to nearby cities
- Underground subway trains to connect with other cities
- Machine shops to fabricate furniture and clothes in city and effect repairs of the City
- Zero-carbon emission

Background on Urban Planning

Let’s examine what is a city. According to Urban Planning Professor, Herbert Girardet, (Co-Founder of World Future Council), in his book The Gaia Atlas of Cities “Cities are more than static structures of stone and concrete. They are vast processors of food, fuels, and the many raw materials that feed a civilization. With their complex metabolisms they are huge organisms without precedent in nature.” In other words, cities are alive existing more like a cell or tissue (cluster of cities).

With their long history of development and evolution, cities have been created by kings and financiers for control of people and environment; storage and protection of wealth. Cities generate a profit for these rulers by having a more efficient use of time and materials than can be created in a dispersed manner, in the countryside. It is an attempt at organization, but is it the best form of organization both for human productivity and harmony with Nature?

Cities have surreptitiously grown in contour patterns next to hills and rivers or in grid patterns out in flat areas. With exception of high heat areas, cities seldom journey down more than two or three floors into the ground. Instead the climb, originally up to about 5 stories and after the elevator appeared they went upward to the heavens. In all cases, cities are thought of mostly on a materialistic level to generate profit. Their layout and plan has seldom involved the concept of it being a living entity. Water systems appeared thousands of years ago, but it wasn’t until less than 150 years ago that adequate sanitation systems were even considered and implemented to prevent illness through the proper disposal of waste away from the living environment. Even today, most urban planners show little consciousness regarding the human environment and certainly not relating the city environment to Nature. I know of no city design that allows ecological harmony to flow through or around human habitation.

Rather, cities need to be defined organically as having input elements of food, water, air (oxygen), raw materials for work (cargo), and building materials to make the city larger. Through the process of human work the city creates finished goods (merchandise), more buildings, waste (solid and liquid) as well as expired gases like CO₂, SO₂, NO₂ and CH₄.

If cities can be loosely defined as a multi-celled organism, then we need to view this quasi-organism for life support including energy gain and loss. We need to examine a city by dimension (metropolis is say 10 miles by 60 miles with a

thickness of 0.005 miles (2 story). It is very flat! Can any object live on the Earth with that shape and exposure to heat and cold? NO!!! They might occur as a tapeworm inside a temperature regulating host or in the ocean, but certainly not on the land exposed to open environment. The most efficient shape for surface to volume is a sphere. However it is not practical with gravity. A cone or pyramid is very good due to reduced flat roof exposure and loss of heat. Better yet is a truncated cone with a dome in the center.

In terms of food transfer, our sprawling city forms are very inefficient. Food and water must be transferred great distances to the extreme points of the city. Most cities today do not grow food internally and must rely up external food sources. That further adds to the energy requirements to transport food to the city, and then distribute it to all living elements. Where people used to grow their own food, now they don't have the space or knowledge to do so. They are told to move into the city and be dependant on others to provide sustenance.

Water systems have been developed to control the source of water and force a sale of this nourishment of life to all inhabitants. Yet, rainwater, which is basically pure distillation quality, is ignored and allowed to run off our roofs and down the street as if it is valueless. Rainwater collection was used throughout history and has only replaced as we have been psychologically conditioned to only buy water from a bottle or a pipe.

Now we must consider the validity and operation of our new synergetic living system.

THE PREMISE- reducing human presence on the Earth to allow nature to restore itself. This premise was demonstrated at Chernobyl, Ukraine after the nuclear reactor accident a 188 sq. mile area was sequestered from human activity with the creation of the Exclusion Zone around the Chernobyl nuclear power station. As humans were evacuated from the area 25 years ago, existing animal populations multiplied and rare species have returned or have been reintroduced, such as the [lynx](#), [wild boar](#), [wolf](#), [Eurasian brown bear](#), and the [European bison](#). The Exclusion Zone is so abundant with wildlife and greenery that the Ukrainian government designated it a [wildlife sanctuary](#) in 2007. These are the principles of Deep Ecology that the Earth is resplendent with Life and is balanced when human presence is eliminated.

THE VISION – We offer hope for the future with a new way of living. Anthropogenic activities have been increasing for the last 6,000 years to a current level that now affect the ability of the Earth the regenerate and restore itself for human life and all other life. The term “Sustainable Development” has been abused so that it has no meaning.

Under the current reality of human civilization, every form of development takes away from the ecological system and disallows the presence of Nature. It is time that responsible humans commit to a policy of retraction and containment

so that all forms of life may flourish. To that end we are proposing this concept of an entirely new way to Live!

Time is of the Essence! The concept of ecological cities has been existent for over twenty years in the U.S., Europe and Australia. Yet, it has gained very little acceptance. It was an incubating concept that never hatched and grew. As the Earth's environmental degradation becomes more obvious, people will begin to realize that drastic change in lifestyle is necessary. This change will need to be much more radical than what has been currently proposed. When these Earth Change accelerate in frequency and intensity as it happens now, we must have our SYSTEM readied and in place as the most complete and ecologically viable alternative future. Time will be running short. At that point there will be a race to build these new living systems all over the world. We will have to create a contingency plan for a number of survival enclaves located in the Southern Hemisphere.

THE TEAM – We are assembling a team of concerned professionals who will:

1. Examine, review and improve upon the original concept
2. Establish the legal and financial criteria for the organization to operate
3. Create an education program that will disseminate these ideas to:
 - a. public
 - b. government
 - c. corporation
 - d. scientists
 - e. professional
4. Team members will include – ecologists, urban planners, architects, agronomists, soil microbiologists, sociologists, medical doctors, political scientists, lawyers, accountants, marketing, educational writer, economists, mechanical and structural engineers, manufacturing process engineers, atmospheric physicist, marine biologist, restoration ecologists, international trade

PURPOSE OF THE ANALYSIS

It is with full realization and humbleness that I realize this idea for a new living system that has been derived from many diverse disciplines. I may be construed as a "Jack-of-all-Trades". However, I am the first one to admit that in any given field there are many people more knowledgeable. I am looking for all of you to apply your great wisdom in specific areas to improve upon what I have synthesized. I am sharing this vision with all of you and invite you to make it your vision also.

OBJECTIVE OF ANALYSIS

The goal of further analysis is to improve the design, find flaws, fill in the gaps and make this theory more technically accurate so that experts in many fields can view it and find it flawless.

TYPES OF ANALYSIS

1. Resilience Analysis of building and System
2. Ecological Footprint
3. Ecological Modeling for harmony and stability with Nature
4. Relationship of Humans to Building and Environment
5. Structural Analysis
6. HVAC Analysis
7. Food Production Analysis
8. Energy Usage and Generation Analysis
9. Waste Recycling Analysis
10. Manufacturing Process flow for singular and multiple cities
11. Economic System Analysis – Micro & Macro

THE ARC CITY/ IN-HARMONY SYSTEM EMULATING A EUKARYOTE CELL

As stated earlier, a city should be defined as a living cell or tissue. A comparative analysis to a eukaryote cell shows many similarities to the nucleus being like the city, the perimeter walls like the outer membrane and the mitochondria as the factories producing work and the greenhouses absorbing outside energy. Even tunnels connecting activities outside the nucleus, but inside the walled membrane relate to eukaryote structure. The comparison is important to understanding the synergetic relationship of the City to the most basic forms of life.

WHY ONLY ONE BUILDING, WITH FIXED LIMITATIONS, PER SITE

History has demonstrated hundreds of times that cities grow by expanding their outer perimeter, if not contained; and by occupying as much land with increasing density as possible. Cities grow over a period of time from the boundaries of major land holders who then sub-divide their land into smaller parcels with interconnecting roads. This all leads to hundreds of buildings that replace open space. It is similar to malignant cancer growth which usually results in death of the host.

The ARC City remedies this problem by fixing the outer boundary with a perimeter wall and builds one structure in or near the center that does not grow larger once it is built. It is contained. No other human occupancy building is allowed to be built within the site. By doing this there can be no temptation by developers to seek variances to build further housing or commercial structures on the site. This is similar to a benign tumor that is contained and does not kill the host.

An example of an ecological city going wrong is Auroville, India. It started with only two buildings with the rest of the property developed as gardens both food and flowers. Demand was so great to live there that more and more structures were built. Today all food must be imported as there is little room for food gardens to occur. Sprawl came to Auroville, the world's first eco-city.

SITE SELECTION REQUIREMENTS

Each city-structure should be located so that:

- It does not use the best farmland
 - There will hopefully be no underground rivers or streams that will create problems of water intrusion into basement levels
 - There is good air flow
 - There is good insolation (days of sunlight)
 - There is adequate rainfall (min 15"/yr)
 - This is not in an area of increasing desertification
 - There is room to create other cities nearby to create clusters
 - Some locations will be tourist destination for natural beauty
 - Each site must have between 4,000 acres in tropics to 7,000 acres in temperate zones
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DESIGN OF THE ARC CITY

The ARC City is a high-density, mega-structure designed to concentrate its human population (20,000 to 25,000 people) into a culturally, comfortable space. Space is relevant to pre-existent norms of each society. In other words, space in the US for upper class will vary to lower class. Space in Europe will differ to that in the US, Japan, China or India. The relationship of Residential Areas to the Common Areas and that of Work Areas will vary depending on the designation of the City as mining, manufacturing, agricultural or shipping. It will also be relevant to the wealth of the city in terms of inter-city trading.

SIZE

Sizes of the city can vary from 1200' diameter down to 850' diameter. The Height can vary from 18-30 floors in height above the Common Area. Likewise, the Common Area may have 2 to 5 floors depending recreation demand, schools and hospitals. Underground Areas may vary depending upon maintenance requirements (self-sufficient fabrication) storage and factory facilities.

THE STRUCTURE

The structure of the City is made of concrete with twelve major walls radiating equal distance from the center to the outside. These walls are massive shear walls. The floors are slabs and beams that become diaphragms transferring floor loads laterally into the walls and vertically by way of periodic columns down to the foundation. The round shape of building works with interior and exterior bond beams into a tension-compression relationship that dynamically transfers torsion back into the floor diaphragm. The exterior sloping wall is actually a series of vertical walls sitting on top of the floor slab diaphragms.

FUNCTION DICTATES FORM

The Shape - Aerodynamic, seismic resistant with integrated horizontal and vertical load compensation, no vertical walls like cliff (shaped like a mountain), round like nature

Ventilation –emulating termite mounts – (Arup Eng. Uses same model)

The center of the City is open to allow airflow from the subterranean areas rising upward through internal expansion to a focal leaf vent at the top. There would be several giant booster fans that will be auxiliary to the natural ventilation.

Fresh air is introduced from two methods. During warm and cold weather, duct towers located inside the Inner Canal on each of the sloped berms route air downward into the cooling chamber. The ducted air is brought down into the chamber under to bottom of the City where a giant cistern stores cooled water. A heat exchanger radiator system allows the air to pass through and be cooled to approximately the mean annual temperature of the surrounding land. During moderate weather air can be directly drawn into the building at each floor with louvered control intakes.

Scale Similar to European Village

Transportation is accomplished by means of many high speed elevators located throughout the structure. There would be 8 elevators for each of the 12 wedged segments totaling 96 units that traverse between the first floor of the Common Area to the top of the Office Area. In high-end economic cities there will be 12 elevators that connect the Penthouse Residential Area to the Office Area. There are short elevators that connect the Common Area levels and additional elevators that rise through Underground Areas to the Common Areas.

Walking would be the major form of all horizontal movement with ramps also being provided for wheelchair use. Walking is important for health. Yet in most existing modern cities walking has become outmoded by the use of cars. In many places, walking can be dangerous due to proximity to cars, uneven or non-existent sidewalks or mugging.

Pedestrian Circulation

Internally, floor access is based on elevators. Egress and movement will radiate from the elevator locations by each shear wall. Patterns of movement are relative to each floor and can vary tremendously to each building design. Each residential floor will have observation balconies located at the outside edge of each floor accessed by hallways. Once there, the balconies have enclosed viewing space as well as open air. Views at these balconies will be of the adjacent parks. No other buildings can be seen until the next 30-40 story city pops up 5-8 miles away.

Top of the Building at the Dome seat offers unique opportunities for the Top Observation Deck looking outward on the land. Under the Dome, we have detailed several levels of garden decks that may or may not have limited access from

the elevators that go up to the Office Area and to the Top Deck.

Common Areas, may be anywhere from two to four floors with much more open space and movement with wide aisles. Each floor will have different patterns and different stores, restaurants and health facilities. The upper floor is dedicated to schools and research with more linear access on straight aisles.

Externally, the City has several perimeter walkways. The primary level of the Common Area has a major exit doors at each of the 12 segments. There are also secondary exits that are located halfway between each of the prime exits. Once passing through the exterior walls there is a continuous enclosed area, called Outer Vestibule 45' wide that circumnavigates the exterior. . Exiting out the main exterior Façade Entrances there is a 25' wide concrete walkway called the Upper Perimeter Walkway that traverses the building at this main level. From this Walkway there are 12 arching ramps to allow people to access the parks outside. It also works as a security barrier to invasion. The only way into the entrances is up the ramps in view of City defenses

Within the Outer Vestibule are many lounge areas for people to meet, mingle and have a quick bit of food from portable food vendors. There are elevators here that access lower levels of the Bermed Canopy, light retail stores, the Lower Perimeter Walkway and work areas below ground for Food Processing and Food Storage.

DESIGN OF THE IN-HARMONY SYSTEM

Introduction-

Integration of the City to the Land- We must develop a way to allow a high density human environment to live adjacent to Nature. We will do this through a graduated decrease in human activity. In the case of the ARC City, we create a defining barrier of the Inner Canal. This acts to prevent transfer of humans and nature, it is a boundary. Outside the Inner Canal we start integrating humans with nature by having parks with lakes, canals, numerous paths, hills, valleys, trees, shrubs and lawns. Where the ARC City has 100% human activity in high density (25,000 people in 18 acres, 24x7), the parks have intermittent activity (6,000 people in 450 acres, 3 hour x 7 days) that decreases as the distance increases from the City.

Parks

The parks are considered mixed use in that there will be limited human presence with lakes containing fish, amphibians, insects & birds. Other lakes will be used for algae production. The parks land area will have many permanent natural residents selected to inhabit the biome, as well as migratory birds and birds from off-site that come in to visit.

Greenhouse Food Production

The Greenhouse Area is the main life support system for the City providing food and water. Rather than transporting food from long distance, requiring great energy use and low community labor (2%) we use labor intensive activities

(1,500 gardeners) with electric, power assisted small machines to improve efficiency of operation. Greenhouses will be designed to the latitude and altitude of each city. The buildings will be double-walled and insulated with heat from the city building and lighting for the winter that will allow food to be grown all year. The greenhouses have boundary canals on both sides and are elevated to prevent flooding from heavy rains. Along with heated floors, air ducts can bring exhausted air from inside the building into sealed compartments.

With over 1,000 acres of greenhouses, we will use a common gutter roof system that will allow only 13" of rainwater to provide every person at least 65 gallons of pure water each day. Our system separates brown water from yellow water with two-part toilets and urinals. Yellow water is sanitized and distributed on crops with drip irrigation. Brown water and food waste will be decomposed, heat cured and dried. It will then be applied as mulch.

The soil of the greenhouses will primarily be permanent bed with underground heating lines of warm water. The beds will have drainage tiles to allow excess water to be drained off. We will encourage a multitude of micro-organic life from earthworms, pin worms, mycelium and forms of char-wood. Reinvigoration of the soil with natural micro flora and fauna will allow return of the primal state to the soil.

There will be 8 radiating canals from the center city to the perimeter. Under the canals will be a tunnel that allows people to travel out into the fields without facing temperature, rain & snow or possibly toxic air. On each side of the canal will be two food processing chutes to drop food down to the train food containers. Once a container is full it is sent to the city building, with the container being transferred onto a perimeter track where it is taken to processing.

Field Crops

The area for fields crops will cover over 2,200 acres. Since we do not know the exact locations and condition of the soil, it will be assumed that the site will be commercial farm land with subsequent soil contamination from chemical fertilizers and pesticides. Soil remediation and restoration techniques should be employed to neutral the chemicals. An alternative would be to fallow the land for at three years. The area where field crops will be grown should not have too much disturbance from foundation excavation, the exception being trenched areas for tunnels and canals.

Most field crops are annuals and require planting, weeding and harvesting. With permanent bed plantings the seeds will need to be drilled into a friable soil. With this area being permanent bed and minimum of soil disturbance during the year, human impact will be greatly reduced.

Orchard and Vineyard Crops

There would be almost 1000 acres of permanent bed tree crops that do not have soil disruption. The trees will have annual applications of mulch and a grassy cover planting that will stabilize the soil and prevent wind erosion. Nutrients will be added by way of subsurface drip irrigation. Earthworm development will be encouraged and new worms will be

applied after frosts have ceased. Again these areas will have far less human impact on subsoil life once the new plantings have been established and become permanent.

ENERGY GENERATION

Renewable energy generation is relative to the location of the City.

- a. Wind is relative to the specific area of wind flow.
- b. Geothermal is relative to the depths of sub-surface heat
- c. Solar is relative to insolation values of the site for latitude and cloud cover.
- d. Hydro or micro-hydro may possibly generate power.

The “main” power supply will come from the “Green Nuke”, Liquid Fluoride Thorium Reactors. This is a Generation IV system that utilizes 99% of all fissile material and produces no bomb-grade Plutonium. The reactor housing is relatively inexpensive to build, operation costs are lower than coal (\$0.02/KwH), virtually no waste to store and has sufficient Thorium supplies to fulfill all human energy needs for over 600 years.

The solution is creating much less energy demand (through efficiency methods) and storing power, when available in quantities that will last a long period of time.

Energy storage is the solution when modeled for the limited energy of a population of 25,000. The solution is an isolated in-ground tank near the city that will store large quantities of heat energy stored as liquid fluoride salt that can drive gas powered electric turbines 24x7..

WASTE RECYCLING AREA

Waste is the key to the entire system. There can be no waste. What we take from the land must be returned to the land! We bury no solid waste and we do not inject any liquid waste! There are chemical and biological solutions to all pathways. An important concept is to create fewer and fewer situations that need to be mitigated. In other words, reducing a complex society to a more efficient simplified society is the answer. An example of this is that for 4,000 pound automobile produced requires almost 50,000 pounds of waste products. Eliminating a billion cars and trucks eliminates 50 TRILLION pounds of waste by-products.

Recycling simple organic waste is easier than breaking down complex compound chemicals. Creating closed loop systems of carbon, nitrogen, phosphorus, potassium and oxygen within our site is most advantageous. Recycling by using natural systems of plants, enzymes, fungi and bacteria are superior to most other ways. We shall try to use methods developed by Dr. John Todd to accomplish much of this.

- Sewage will flow by gravity to processing plants at the far corners of the property
- All liquid chemicals entering the drain system will be bio-degradable so that heavy metals & synthetic chemicals will be eliminated
- Purifying & Processing techniques will use microbes and enzymes to breakdown sewage sludge.
- After purifying the sludge it is naturally cured with heat under plastic mulch and air-dried

- Each batch is tested and certified to be safe for food
- It is then taken to the greenhouses, field crops and fruit crops and placed as cover mulch so earthworms can transport them down into the soil

OUTER PERIMETER WALLS & SYSTEM SECURITY

Concepts of Security

- Security is the degree of protection against danger, damage, loss, and criminal activity.
- Security as a form of protection are structures and processes that provide or improve security as a condition.
- Social stability is intermittently broken by thieves, robbers and muggers who do not recognize the sanctity of boundaries and hence try to intrude. They must not be permitted this intrusion.
- The future stability of a society is unknown. There may come a time when the rule of “Law and Order” disintegrates. The ensuing chaos must be halted.
- Creation of walls is the best passive form of protection from both forms of intrusion

Modern Perimeter Walls

- An outer defensive wall system is put in place to extend this Concept of Security.
- It is not the intent of the ARC Cities to fight or resist modern armies. Rather our Security Walls are designed to repel local marauders and thugs during periods of social breakdown and chaos.
- Walls and fortified wall structures are still built in the modern era. They do not, however, have the original purpose of being a structure able to resist a prolonged siege or bombardment.
- Walls may only be crossed by entering the appropriate [city gate](#) and are often supplemented with [towers](#).
- Most of the "modern" city walls are made of steel and concrete. Vertical concrete plates are put together so as to allow the least space in between them, and are rooted firmly in the ground. The top of the wall is often protruding and beset with [barbed wire](#) in order to make climbing them more difficult. These walls are usually built in straight lines and covered by watchtowers at the corners. Double walls, i.e. two walls with an interstitial "zone of fire" can be used successfully.
- We will establish an “outer buffer zone” outside of the main Perimeter Wall. This space, about 0.5-0.8 miles in width will be a grazing area for animal production as well as some grain production. There will be dense layers of trees that will also impede vehicle movement. Within this zone will be sensors and cameras to identify intruders.
- The edge of the “outer buffer zone” will be demarked by a large sub-surface canal that will prohibit most entry by vehicles and individuals.
- Because the mobile offensives practiced by both sides usually focused on avoiding the strongest points of a defensive line, these defenses were usually relatively thin and spread along the length of a line. The defense was usually not equally strong throughout however. With the advent of automatic computer controlled weaponry, much of the personal needed upon attack can be set for fast response from nearby garrisons.
- Response from light aircraft attack can be rebuffed with automatic fire from Perimeter wall turret using electric cannons.
- The [terrain](#) that was being defended was of primary importance because [open terrain](#) that tanks or fortified vehicles could move over quickly made possible rapid advances into the defenders' rear areas that were very dangerous to the defenders. Thus such terrain had to be defended at all cost.

REPACKAGING OF THE CONCEPT

Once the Design Concept of the ARC City/ In-Harmony System has been tested, analyzed and re-written, it will then be necessary to create complex marketing package.

Our first target is generating funding through Grants & Corporate Sponsorship/Partnerships. Then we will need to address marketing to various groups of people in many different countries. To do so the Concept will need to take on many different faces. Each face will must be comfortable to that specific audience. That will take the work of marketing and public relations people. It will also need economists and financial experts to put their spin on the system to show people in the world of socio/ economic power that this Concept is viable!

We will need to prove to the Rulers of the Earth that an ecologically sustainable system can work economically on a slow stable growth pattern of 1% - 2%. However, it will be necessary for the human race to re-stabilize its population to a size of 500 million to 1 billion. Population levels must stabilize at close to zero growth. That will take education and discipline of humans to be a part of world (natural balance) while having a bio-engineered environment that allows for food security. That is the continuum of the In-Harmony System as it reaches across the two realms of Natural Reality and Bio-Engineered Reality.