The Royal Architectural Institute of Canada - Syllabus

Rethinking the Urban Matrix: A Study of Spatial and Ecological Integration of Diverse Activities at the Scale of the Typical Downtown Block

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To Kasia and Maciek

"This we know...the earth does not belong to man, man belong to earth. All things are connected, like blood, which connect one family. Whatever befalls the earth befalls the children of the earth. Man did not weave the web of life – he is merely a strand in it. Whatever he does to the web, he does to himself."

Chief Seattle, 1854

TABLE OF CONTENTS

TABLE OF CONTENTS.....v
LIST OF TABLES.....vi
LIST OF ILLUSTRATIONS.....vii
ABSTRACT.....ix
ACKNOWLEDGMENT.....x
Chapter
1. PROBLEMS OF THE CONTEMPORARY CITY.....1
The city as environment.
2. THE HISTORY OF PLANNING.....3
Neolithic Cities.
Ancient Egypt, Greece and Rome.
3. URBANIZATION IN THE 19TH AND 20TH CENTURY.....13
4. EVOLUTION OF THE CONTEMPORARY URBAN SPACE.....17
The modern movement.
5. CASE STUDY: TORONTO AND ITS METROPOLITAN REGION.....22
An alternative model for urban growth and form.
6. ENVIRONMENTAL ISSUES.....27
Definition of sustainability
Key problems, characteristics and causes.
The roots of green architecture
Tools of sustainability
-Photovoltaics
-Geothermal
-Wind Power
7. CONCLUSION.....42
8. ARCHITECTURAL PROGRAM.....55
ILLUSTRATIONS.....59
REFERENCES.....90
APPENDIX - SUMMARY OF GRAPHIC MATERIAL FROM ALL PRESENTATIONS
- CD-ROM: ORIGINAL GRAPHIC PRESENTATION MATERIAL

TABLES

Table Page

1. CHARACTERISTICS OF CONVENTIONAL AND ECOLOGICAL DESIGN.....30

ILLUSTRATIONS

Figures Page

1. Washington, DC. Aerial photograph....59

2. Levittown, Pennsylvania. 1952-58....60

3. Junkyard....61

4. Syracuse, New York, 1983....62

5. Residential development....62

6. Cambridge, Massachusetts....63

7. Jericho, Israel, ca. 7500 BC....64

8. Khirokita, Cyprus, ca. 5500 BC....65

9. Catalhoyuk, Turkey, 7000 BC....66

10. Amarna, Upper Egypt....67

11. El Kahun, Lower Egypt, 1897-1878 BC....67

12. Thebes, a street, ca. 1500 BC....68

13. Athens, 5^{th} - 4^{th} century BC....69

14. Miletus, Turkey, ca. 479 BC; Rhodes, Greece, 408-407 BC....69

15. The Roman colony of Florentina....70

16. New York, 1811....70

17. Gordon Cullen, Perspective sequence of townscapes....71

18. Herrington, Kansas, 1887....71

19. Cityscape....72

20. New York, Cityscape....73

21. The Ideal City 1920, Ludwig Hilberseimer....74

22. Gardsten, near Goteborg, Sweden....74

23. Cityscape....75

24. Cityscape....76
25. Urban open space....77
26. Pruitt-Igoe Housing, St. Louis, Missouri....78
27. Federal Reserve Bank, Boston Massachusetts....79
28. Cityscape....80
29. Residential development....81
30. Toronto's Harbourfront....82
31. The Earth's 'bio-cycles'....83
32. The wind towers of the Middle East....84
33. Fabric canopies in the Roman Colosseum....84
34. Traditional Japanese house....84
35. Gdansk, Poland....85
36. Vienna, Austria....85
37. Stone multistorey residential buildings of the Anasazi Indians....86
38. Villa Savoye, Poissy, France 1929-1931....87
39. Wind turbine....88
40. A small wind farm and a megawatt wind farm....88
41. Megawatt turbine during construction....88
42. Wind turbine's components....88
43. Offshore wind farms....89

ABSTRACT

Rethinking the Urban Matrix: A Study of Spatial and Ecological Integration of Diverse Activities at the Scale of the Typical Downtown Block.

The thesis's goal is to investigate an urban alternative to the traditional *ad hoc* blocks of a downtown core, which are currently created without consideration to ecological principles. The objective is to explore, define and address in a holistic arrangement the concerns of use, users and ecosystem implications of a modern urban block in the Northern Hemisphere. The issues to be explored would include: functions, form, structure of human behavior and inter-relationships of the basic city block and challenge the *status quo*. A standard city block will be selected. A proposed development will consist of mixed-use environment. The preliminary program will be developed in conjunction with the research report.

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PROBLEMS OF THE CONTEMPORARY CITY

THE CITY AS AN ENVIRONMENT

"A beautiful and delightful city environment is an oddity, some would say an impossibility. Not one American city larger then a village is of consistently fine quality, although a few have some pleasant fragments.(...) The people living in them "are clear enough about the ugliness of the world they live in, and they are quite vocal about the dirt, the smoke, the heat, and the congestion, the chaos and yet the monotony of it" (Lynch 2).

The present day large developments are simply unsuited for living. Both the city core with high density and lost space (parking) **(Fig. 1, p. 59)** and the suburb's low-density single family houses sprawled all over the land **(Fig. 2, p.60)** is off balance and harmony with the ecology of the site. They are often without public parks and gardens, which should be incorporated into the urban forms to provide relief and relaxation. The bleak picture of a large, modern city was outlined in 1992 UNESCO conference in Rio De Janeiro: *"Cities today are machines for manufacturing social inequality, corruption, barbarity, exclusion, violence and hardship. Nowhere else have continuing pollution of every kind, destruction of natural environment and the deterioration of the quality of life occurred on such a scale. Doomsday scenarios have become commonplace"* (Richards 16). **(Fig. 3, p. 61)**

Most modern cities have lost the fundamental principles of urban space. The result of these loses is referred to as "lost space". The lost space can be an open, undeveloped plaza at the base of a high-rise, sunken plaza away from the pedestrian flow, surface parking, vacant sites, which supposed to be re-developed (result of urban renewal attempt). The lost space is especially visible along freeways, railroads, abandoned commercial waterfronts, former military sites and closed industrial complexes. **(Fig. 4, p.62)** The modern city's urban space is often inhospitable, caused by a sense of "no-man's land". A few major elements created "the reality of living in the large city" problem: the mass use of a vehicle, certain aspect of Modern Movement

in architecture, city policies (zoning by-laws), the dominance of private interest over public and changes in the land use in the city. The above elements have a direct impact on people's quality of life.

The development of typical high-rise building has destroyed the integrity of the city - although skyscraper looks very impressive from the distance, *" at the street level, however, it is less desirable. Without significant transitional elements, the building simply disappears into the ground and makes no acknowledgment of the public surroundings.(...) As Sullivan realized almost one hundred years ago, transitional layers between low- and high- rise levels are needed to maintain the integrity of the street when the predominant urban form is the vertical tower"* (Trancik 40). **(Fig. 5, p. 62)**

The internal shopping malls and sunken or raised plazas eliminated the traditional social life on the street. *"The tendency of the urban interior mall is also to drain activity and economic vitality from the street. Interior malls can be seductive, comfortable shopping environments, but they conflict with the commercial habits and urban form that exist in the public realm of the memorable cities of the world" (Trancik 47).* Main Street used to be the center of community life experienced as high-quality spatial experience. *"America has glorified the small town main street as the monument to commerce, but has at the same time neglected it in favor of the suburban - style shopping center at the fringe.(...) Its diversified commercial activities and close proximity to residential neighborhoods made it the physical and social center of the community"* (Trancik 44).

The traditional qualities of urban space have been destroyed. Buildings are very often treated just like separate monuments with shapeless, giant flat spaces between them. An amazing percentage of urban land is taken up by parking and freeways - for example as much as 75% in Los Angeles. The network of freeways separates not only buildings, but also whole neighborhoods and fragmented districts become isolated. **(Fig. 6, p.63)**

"Districts are the relatively large city areas which the observer mentally goes inside of, and which have some common character. They can be recognized internally, and occasionally can be used as external reference as a person goes by or toward them" (Lynch 66).

"The psychical characteristics that determine districts are thematic continuities which may consist of an endless variety of components: texture, space, form, detail, symbol, building type, use activity, inhabitants, degree of maintenance, topography " (Lynch 68).

Streets intended just for vehicles lose their social functions. As freeways often go through cities, they force people to relocate, creating a stress caused by social disorientation. Freeways cut communication between people and confine them to certain areas and force them to use vehicles and machines to communicate: telephones, faxes and computers. They destroy the "face to face", direct social interaction.

THE HISTORY OF PLANNING

"The world 'civilization' derives from the Latin 'civitas', which means city. This gives us the other accepted characteristics of civilized humanity-that it has for its theater of activity an intricate artifact, the city, that sets apart from the basic life of the village or the pastoral tribe. To be civilized is to be urban; civilization, in this strict sense, is 'the art of living in towns.' Traditionally, the molding of the city as a social and material concept is credited to the same cradle of civilization that invented writing, specifically to the southern regions of Mesopotamia, Sumer, sometime in the early fourth millennium B.C." (Kostof 43)

While life in Neolithic Europe was still based *"on a stone-using peasant economy"* (Kostof 43), two literate cultures: Egypt and Mesopotamia were advanced in metallurgy, food production was transformed into an industry and all transactions and religion were recorded in writing.

If Stonehenge is an architectural answer to the Neolithic revolution in Europe, the creation of the complex urban fabric in the Near East is the urban revolution in the human

history. The urban revolution is different from Neolithic revolution in one basic aspect: it did not change the people's relationship with nature (as transition from hunting to agriculture did), but *"the city, above all else, typified a social process. The revolution it brought about was embodied in the interaction of people with each other."* (Kostof 43) Farming and animal breeding were still primary occupations in the urban revolution. *"Even trade cannot be credited exclusively to the rise of cities."* (Kostof 43) They were aggravated within urban economy: *"the one, profiting from irrigation, crop rotation and the use of fertilizers, to produce the surplus of food; the other, enlarging its scope to include, besides pottery and stones like obsidians, the metals required by the new urban technology and the consumption of luxury goods."* (Kostof 43) The city is like a living organism changing continuously. *"In its living mesh, public structures are bonded to the places where people live, and these, in turn, are bonded to each other, in a rich artifice of contiguity."* (Kostof 43) The city introduced the new elements: the defensive system-walls, gates and towers, public squares and new buildings types: palaces, libraries, baths, shops and markets. *"The chemistry of early cities relied on three active properties: people, production and, resources and ambition. The city- form aspired to be compact and versatile. And the future of this proud amalgam of people and buildings could be secured only through faultless defense and aggressive progress."* (Kostof 44) A city consisted of concentrated population going far beyond farms and tribal clans. The land utilized by city had to provide more then just food for the masses. Food surplus, raw resources and crafts were used in trading for goods people wanted and also offered protection against the unpredictable nature. The city was not able, as village could, to be self-sufficient. *"The local interaction among its people, complicated by numbers, was only one dimension of its social mobility. Outside, there were other centers of closely controlled resources that envied it or replenished its wants. To defend itself against the envious and still carry on trade, the city formed a large sphere of social contact."* (Kostof 44) The population was forced to organize itself into the specialized groups.

Beside the great number of farmers, there were specially trained groups of people: full-time soldiers, builders, merchants, craftsmen and priests. Such specialization created social divisions into classes. Some people had the power over urban areas that went beyond the walls of city, governing the main means of production. They acquired their power over the time and through this they held influence over the people. The ordinary citizens were not equal, because different professions offered less prestige than others did. And since the change in social hierarchy was not a simple move the wealthy and powerful had the significant advantage over the less fortunate. *"The city- form, compact and versatile, reconciled the demands of privilege with the pressing need for unity. The powerful must have stages for the ceremonies of their office, and these must be of a scale and level of grandeur that would impress both the citizenry and foreign embassies. For power manifestations itself through architecture perhaps more easily and universally than through anything else."* (Kostof 45) The city accommodated the ordinary citizens and created the sense of identity: the temples were open for everybody and the gods took care of both: rich and poor, defensive walls were expressions of the common fate. *"Even the opulence of the rich redounded all the way to the simple peasant, for the peasant could boast of belonging to the community that displayed such wealth."* (Kostof 46)

It is impossible to set the exact date of the urban revolution. Based on today knowledge the origin of city-form is assigned to western Asia, with specifically one place: Jericho *"as the earliest surviving town."* (Kostof 46) The site is located on the left bank of Jordan River. It contains quite a few settlements, built on top of each other. **(Fig. 7, p.64)** This stubborn holding to the place proves human's *"durable habit for cities."* (Kostof 46) Despite the vulnerability to human enemies or natural disasters, the city would be rebuilt on its ruins again and again. *"In large measure it is tradition, the genius of the place, that accounts for this stubbornness. (...) It has the imprint of time-honored cults and generations of inhabitants. Beside, there is invariably a tangible advantage to the site that prompted occupation in the first place."* (Kostof 46) That

advantage in Jericho was constant and reliable source of drinking water, which is priceless in the desert of the Dead Sea. First there were hunter's tents around the spring with little space set aside as a sanctuary, and then in the same spot a transition took place transforming the hunters camp into an agricultural based permanent settlement within the thousand years. The very first permanent houses were constructed of mud-brick, with domed roof and rounded walls. The form of the house originated probably from the tents of the nomadic hunters. The floor laid below the ground and wooden stairs provided the access. The dead were buried beneath the floor. Once the settlement had reached about 3 hectares, it *"was fortified by a fine stone wall of cyclopean masonry that guarded the people and their precious substance, the spring water, for more then a thousand years. The fort was overseen by a massive round tower, also of stone, built against the inside of the wall. In its hollow core, a staircase of single stone slabs had been constructed, either to man the tower or else to reach the source of the spring."* (Kostof 46) This Neolithic city was invaded approximately 6500 B.C. The houses became rectangular, with rounded corners. The individual house consisted of few rooms connected via wide portals. The houses were then arranged in clusters around the courtyards, where meals were prepared. The presence of defensive walls with tower, concentrated population and mix of public buildings (shrines and cisterns) and houses definitely classified Jericho as urban environment. Irrigation was another element of the community life in Jericho. In order to be successful, the irrigation system must be under close supervision and planning, the layout of main/secondary channels and fields must be rational. *"The control of sluice gates postulates a community approved code of behavior; its reinforcement will be entrusted, sooner or later, to some governing board with powers of license and sanction. All this outstrips the social contract of a simple village."* (Kostof 48) There is one element of urban space missing in Jericho: the street. People used to move around Jericho through courtyards and leftover space between buildings.

The first recorded street was found in Khirokitia, a settlement in Cyprus of the 6th millennium B.C. **(Fig. 8, p. 65)** The street *"defines the settlement as emphatically as the walls did the first Jericho."* (Kostof 48) But Jericho was a fixed size city, defined by defensive walls and Khirokitia had an open plan. Houses were arranged both sides of the main street, which acted as a spine of the settlement. The defensive walls were non-existing and town could grow without a man-made constrains. *"Growth is linear; it depends architecturally on nothing more than the extension of the main street at either end."* (Kostof 48) The main street of Khirokita was a practical way of preventing erosion and stabilized houses structurally and people had an easy access from a river to their houses. The street promoted a sense of community. People lived either up or down the street and there was constant interaction of friends passing by each other. At some point the street was widened to 4.5 meters wide, rounded along one edge and stepped along the other. This was a special place along the public way and *"out of such stages of public congress will evolve the Greek agora, the Roman forum, the piazza, and all the other variations of city square."* (Kostof 49) The public street created legal and organizational issues. Clear definition of public and private space created social responsibilities: preservation and maintenance of common space. *"Maintaining their communal artery free of encroachments took vigilance, a general understanding, and social maturity."* (Kostof 50)

Catalhoyuk, located in the Konya Plane in Anatolia, is the most complex and largest Neolithic city excavated so far. The city of approximately 10,000 people introduced *"a new rationale for the city-trade."* (Kostof 50) People of Catalhoyuk had control over obsidian, the best Neolithic material for cutting tools. *"The black volcanic glass (...) fed a brisk local industry and supplied the wherewithal for foreign commerce."* (Kostof 50) Another new activity introduced by people of Catalhoyuk was prospecting lead and copper and a primitive form of metallurgy. Although the direct impact of metal application on architecture starts in Mesopotamia, the indirect effect of metallurgy on built environment is visible in Catalhoyuk. *"The desire to obtain and work this*

uncommon material could in itself sustain town that mined it, traded in it, and knew how to fashioned it into sumptuous art. To the traditional crafts embraced by the village-stone carving, pottery, weaving-metal added others that fitted into the nascent townscape with its manufacturing establishments and stalls of sale." (Kostof 50) The town introduced a different urban form, it wasn't enclosed with defensive walls like Jericho, nor was it open like Khirokita. The buildings formed tight clusters with continuous and blank walls towards countryside. There were no streets; people entered homes through the holes in the roof, which also served as a chimney. The courtyards between clusters served as lavatories and garbage dumps.

(Fig. 9, p. 66)

"So Catahoyuk contains it all-it is a telescoped view of human history from the Stone Age hunter to the city dweller. In its ambience, the wildness of the horned beast is at home with no less than three forms of wheat and two of barley; and side by side with the hunter and the sophisticated farmer lives the specialist in metalwork, as well as the merchant with his eyes abroad." (Kostof 50)

The first urban forms of the Neolithic present about 7500 B.C. gradually disappeared by year 5500 B.C. The cities of Mesopotamia fifteen centuries later *"shows up in full force and blossoms with unprecedented intensity."* (Kostof 50) While city-form started in Neolithic eastern Mediterranean, the cities of Mesopotamia are *"a concentrated urban culture sustained by a written tradition."* (Kostof 50) Approximately a dozen cities with population of 10,000 to 50,000 existed in lower Mesopotamia, Sumer and Babylonia around 3000 B.C. Defensive walls and villages surrounded the cities. Two major focal points were the ziggurat and the king's palace. Small temples were scattered within the city, which was a mix of residential and commercial buildings. Although small shops were sometimes incorporated into houses, the norm was to have a separation of uses everywhere. City of Tell Asmar had an industrial zone with building containing exclusively: textile weaving, tannery and ironworks. Main streets

leading to public buildings and adjacent houses of the rich were maximum 3 meters wide. Poor people lived at the back along much narrower passages. *"Once walled, the land became precious, and the high value of private property kept public space to a minimum. Ample squares or public gardens were very rare."* (Kostof 52) The houses were compacted clusters with common party walls. Single-family was the elemental unit, but *"it is difficult to see the block as anything but a raveled agglomerate forever adjusting to the pressure of changing use."* (Kostof 52) The lots had different shape; houses had to be inscribed into predefined void within the "block". New houses utilized ruins of the old ones, using them as the foundations, which did not leave much room for creativity. Refuse was discharged on the public street, which caused the streets to rise constantly. When the street level was covering house's main floor, a new floor would be built on top of the lower. The former main floor was often converted into storage or service rooms. Whole buildings were also converted into new use. *"Nothing about the city-form, in short, was fixed and finished at any time, any more than the human body is fixed and finished at any time during its existence; architectural metabolism constantly transformed the makeup of the cityscape that was held together by the stiffer skeleton of streets and ramparts."* (Kostof 53)

The difference between the intricate layout of Mesopotamian city and rigorously orthogonal Egyptian city is striking. The Nile was Egypt's natural axis and spine. *"Except for the Delta folk, most Egyptians knew no circular horizon."* (Kostof 69) People oriented themselves north and south along the river and perpendicular to it. **(Fig. 10, p. 67)** *"Orthogonal planning came naturally both in the field division of the Black Land and in the design of cities. (...) This difference is between an organism that grew loosely through time in response to patterns of mixed use, and the predetermined plan of El Kahun, laid down at one time, with standardized buildings grouped into special zones-brick row houses, often back to back, for the workers, and craftsmen, a quarter of large mansions for government officials, and the enclosed*

compound for the king next to the northern wall. " (Kostof 69) **(Fig. 11, p. 67)** The residential area consisted of houses of different size and grandeur. The middle class lived in the row houses, which had a court, living space and a kitchen at the back on the main floor and the bedrooms above. Rooftop terraces were used as grain storage. *"It was an outgoing street architecture, not involuted and street-shy as were the houses of Mesopotamian cities."* (Kostof 83) **(Fig. 12, p. 68)** The upper class lived in what might be ancient suburbs: spacious villas on large, individual lots with gardens and support buildings: granaries and chariot houses (the ancient equivalent of detached garage).

The oldest Greek cities were created by joining together a few villages around the 8th century. Aristotle observed: *"When several villages are united in a single complete community, large enough to be nearly or quite self-sufficing, the polis comes into existence."* (Kostof 138) Although most towns' agriculture was the backbone of local economy, some cities (Athens for example) were direct descendants of Mycenaean citadel-towns. Modest economy, even when supplemented by sea commerce in case of port cities, did not allow fine architecture. Except for public buildings and temples, the built environment of the Greek city was often poor. *"A contemporary source describes Athens as: dry and ill supplied with water. The streets are nothing but miserable old lanes, the houses mean, with a few better ones among them. On his first arrival a stranger could hardly believe that this is the Athens of which he has heard so much."* (Kostof 138) The Greek house, similarly to Mesopotamian, was constructed around an atrium containing a well or water container and an altar. **(Fig. 13, p. 69)** The rooms did not have strict functions assigned to them, however the living room (andron) had a low-rise shelf around its perimeter, where people laid down during the meals. The andron room was usually placed at the corner of the house, so it could receive direct daylight from two sides. Homes in the older cities had irregular floor plans, creating loosely shaped urban fabric. Only in the case of the city planned "from scratch", the houses and city blocks were rectangular. *"Planned cities were*

usually colonies imposed on the land at a single stroke. Colonial cities were, at their inception, artificial. They did not come about through the normal growth of an existing settlement and were therefore not bound by environmental pressures of prior occupancy and use. The settlers took possession of their chosen site directly by imposing on it a rational order. In an unfamiliar terrain, the cityscape had to be diagrammatically intelligible and easy to get used to." (Kostof 139) **(Fig. 14, p. 69)** At the beginning the orthogonal order was rather hierarchical than purely geometric. The holy fire, carried along with the expedition from the mother city, would be placed in the *prytaneion*. Then the public gathering open space: the agora would be selected. The land around the agora and prytaneion would be divided among the people by the expedition head. The grid offered a simple and clear tool of land division, shaped the urban form and kept the city size under control. It became an egalitarian planning apparatus. *"In the Greek colonies the grid inscribed the social preeminence of a property owing class, a kind of territorial aristocracy."* (Kostof 140) The very first settlers dividing the land secured the power to govern a new city. *"To guard against change, they passed laws that declared property inalienable and discourage a land market."* (Kostof 140) The middle class of renters consisted of late arrivals: artisans, merchants and soldiers. Skillfully applied demographic and economic pressure could drive them away from the city in order to set up a new colony. *"Orthogonal planning is of course as old as Egypt. But none of the pre-Greek grids can be considered fully coordinated system of public and residential buildings with coherently organized blocks. This is the achievement of Greece."* (Kostof 141) Greek city planning was based on *per strigas* ("by bands") system. Broad east-west avenues divided the land into bands, crossed by few north-south running streets. The big blocks were then divided by narrow lanes into rectangular blocks, which in turn were subdivided into building lots. The grid also set the size of all-public buildings and temples.

Rome's early irregular city-form was directly influenced by topographical conditions and ancient traditions and rituals of town planning. Rome used Greek orthogonal planning in the new military settlements and in the new additions to existing towns. Romans divided land into squares 728 meters per side, which were called centuries, because they held 100 small lots. New towns were usually placed at the crossing of the main north-south and east-west cross-axes, called: *cardo* and *decumanus*. **(Fig. 15, p. 70)** This was the beginning of *centuriation.*

The Roman c*enturation* served as a great precedent to North American grid systems. Generally the grid on the American continent has been used as *"a mechanical ordering system"* (Trancik 35). Grid was used *carte blanche*, regardless of local conditions. For example San Francisco grid totally disregarded topography being perfect rectangular over hilly terrain, similarly to the prairie cities. The grid system was a preferred planning system because right-angle buildings were cheaper, simpler and quicker to construct. The most drastic example of dense academic grid applied on a massive scale is New York City, where three men of state legislature commission covered Manhattan with same size blocks. **(Fig. 16, p. 70)** The commission argued that the public spaces are not needed and they are *"those supposed improvements...circles, ovals and stars"* (Kostof 627). Also they claimed that *"a city is to be composed of the habitation of men, and that strait sided and right angled houses are the most cheap to built, and the most convenient to live in."* (Kostof 627) From the very beginning the American grid did not support an idea of public space promoting human interaction.

Contrasting to the diversity, density and irregularity of the urban form of the historic European cities **(Fig. 17, p. 71)**, most of the American cities have an open, right angle grid *"principally serving its economic life"* (Trancik 35). Furthermore, most American cities were not built as cohesive areas suitable for human interactions, *"but as orderly arrangements for economic independence."* (Trancik 35) **(Fig. 18, p. 71)** The rigid grid helped creating highly repetitive, lacking hierarchy buildings.

URBANIZATION IN THE 19th CENTURY

At the beginning of the 19thCentury the main factor behind urban growth was the population increase. The birthrate was accompanied by immigration, particularly in 1840's, when regular transatlantic steamship service was introduced. The growth of cites was also the direct consequence of the industrial revolution. The farmers became more productive thanks to the agricultural machinery, that in turn freed a massive labor force needed in the new factories. Also the shift from cottage industry to factory production created concentration of workers and their housing in a relatively small area. Further, massive-scale production gave way to the present day corporations with their administrative force placed near the industry. The sudden increase in consumer goods introduced the modern day department store, which also required a near by labor force. The low cost transportation: railroad and steamboats promoted the growth of the 1840's cities as well, giving them an easy access to raw materials and a means to distribute the ready product. Although the following factors: growth of population, increased agricultural and industrial production and low-cost transport changed dramatically the size of the 19th century city, they were not entirely shaping the urban form. The eminent feature was concentration and density. The ton/kilometer cost of transporting goods by ship or rail was approximately 1/10 of the rate for horse and wagon transport. The economic activity was directly linked to cheap freight, and since people needed to walk to work, concentration of workplaces created concentration of residential buildings. The water/rail-serviced sites were very valuable and the builders tended to maximize the floor space ratio of industrial, residential and commercial structures. The results were, by today's standards, simply appalling. *"The residence of the worker in New York City and other large industrial cities in 1850 was frequently the "railroad flat", a walk up structure that was generally 5 to 7 storeys high, 25 feet wide and 75 feet long on a 25 by 100 foot lot. Constructed solidly in rows across entire block faces, these units had four apartments on each floor surrounding a common staircase. The rooms (....) were constructed as*

tandem, with just one room in each apartment provided with a window or two for light and air. No sanitary facilities or water supply were provided for.(...) The small rear yard contained a multi-seat outhouse and often a well, resulting in deplorable conditions of sanitation and public health" (Frank S.) The effect was housing of well over 100 people on a site of 1/20 so an acre. A few other features of 19th century technology made the contribution to density of cities: power was generated by a steam engine and transmission of power over the distance was limited. Practically every industrial building had its own power plant which created compact loft buildings, where transmission belts, pulleys and shafts distributed the power between the storeys. The invention of the elevator and steel-frame technology shortly after the Civil War made the skyscraper economically and structurally possible. The concentration and density were far more dangerous then just aesthetically unappealing. The lack of water treatment, modern sewage disposal and antibiotics created the natural growth. The population growth was only supported by constant immigration. *"Few municipalities have planned intelligently for this rapid urban growth. Buildings have been crowded upon land and people have been crowded within buildings. Urban living has become in many ways inconvenient, unsafe and unhealthful.(...) Transit facilities fail to develop much in advance of demonstrable need, so the population becomes crowded within a limited area. (...) It becomes used to living a life quite divorced from nature.(...) The sense of citizenship and the sense of moral responsibility for evils suffered by neighbors become weak.(...) The tenement house may thus at once reduce vitality, through absence of sunlight and fresh air, and may provide abundant opportunity for transmission of prevalent and dangerous diseases"* (James Ford) Such scenario became so critical, that late 19th century steps toward decongestion and decentralization were made. The invention of streetcar in 1880's was a powerful factor in decentralization. In the few short years the effective radius of the cities was doubled. The process of suburbanization has begun. *"The social history of the middle and later thirds of the 19th century (...) has been the history of a gigantic rush of*

population into the magic radius-for most people-of four miles, to suffer there physical and moral disaster (...) But new forces (...) may finally be equal to the complete reduction of all our present congestion (...) What will be the forces acting upon the prosperous household? The passion of nature (...) and that craving for a little private imperium are the chief centifrugal inducements. The city will diffuse itself until it has taken many characteristics of what is now country (...) We may call (...) these coming town provinces "urban regions" (H. G. Wells)

As many other late 19th and early 20th century reformers, Wells perceived the congestion of the city as quintessential evil, and the only countermeasure was decentralization and, what is called today, "suburban sprawl". By the end of the 19th century the industry started to relocate along the railways, as these locations offered lower land prices and taxes. Population densities at the central core of the cities begun to grow at the slower rate and even in some cases decline. The rise in income fueled the decentralization, as people were able to spend more on land, house and transportation. The rising productivity caused shorter workday, offering people more time to travel.

URBANIZATION IN THE 20TH CENTURY

Urban trends in the twentieth century proved to be the total opposite than the ninetieth century ones. The big force behind decentralization of the metropolitan areas was the car. The first wave of suburbanization began in 1920's when mass produced Ford model T started to be more affordable to the public. The invention of the truck created the same impact on retail, wholesale and light production as passenger automobile to the population. It allowed the large-scale commercial decentralization, by terminating the symbiosis with the railway. There was a domino effect: the decentralization of population caused the decentralization of retail and manufacturers, which in turn decentralized wholesaling. The advancing technology also influenced the suburbanization. The improvement of the telephone reduced need for face-to-face contacts, the radio and movie theaters shifted places of entertainment from city to suburbs and

construction of the highways; originally seen as easy access to the countryside for the middle class; made easier commuting to work from the suburbs. Despite of process of suburbanization and decentralization, the big cities grew rapidly in terms of absolute population and as a percentage of total population during the first 30 years of 20th century.

The Great Depression of 1930's created a short-term brake in steady urban sprawl. But one Depression era innovation would to this date have the profound impact on North American housing. The average, middle class person had a very limited chance of obtaining a bank mortgage. Banks were protecting themselves against the risks of non-payments by requiring large downpayments, usually one-third to half of the property value. Also the mortgages were short term, usually up to 5 years, after which the whole unpaid balance was due. Thanks to the introduction of mortgage insurance, the demands for real estate grew, which in turn restored construction industry, stimulating the economy. The financial procedure of low-down payments and fixed long-term mortgages played a critical role not anticipated: it reshaped forever the urban and metropolitan areas.

World War II briefly stalled the suburbanization process, residential construction and civilian car production. At the war's end America again entered a constantly rising suburban housing boom. High employment, rising salaries, readily available mortgages, and car production were the factors driving the urban sprawl. Federally subsidized network of highways and roads was created, making both commuting easier and increasing distances. The baby boom, beginning in the late 1940's and lasting well into the mid-1960's was actually the enormous driving force behind suburban sprawl. The concept of owing the new house and the yard in the "family estate" was very attractive and a powerful decentralization force.

EVOLUTION OF THE CONTEMPORARY URBAN SPACE

"Mankind is engaged in a kind of race for survival, between the inner and outer boundaries of social pressures and physical constrains, while the doubling of population and the emergence of a half urban world takes place. These overlapping contexts of violent demographic, social, and environmental change all meet - one could say collide - in human settlements" (Geddes xviii). There are two major and seemingly contradictory issues threatening the urban form and growth: extreme separations and concentrations. The first one: the concentration of vehicles, buildings and people is causing ecological and environmental upheaval **(Fig. 19, p. 72)** and the second one: the separations in economic terms creating alienation, social inequity and lack of communities. **(Fig. 20, p. 73)**

THE MODERN MOVEMENT

The evolution of the present day North American City is a direct result of the "Functionalism". The movement originated from the small group of European theoreticians in 1920s. Created a program for architectural design *"based on ideals of pure form and unbounded, democratic, or flowing space."* (Trancik 21) **(Fig. 21, p. 74)** The main approach toward design was to ignore environmental identity, context and regionalism, in favor of a "clean slate" start. **(Fig. 22, p. 74)**

The exploitation of the emerging Modern Movement contributed greatly to creation present chaotic cities. The Modern Movement was entirely subservient to the machine; the human entity was replaced by the group entity, as craftsmanship was replaced by mass production. The needs of the individual were disregarded to satisfy the mass. But masses are impersonal, generic, and indistinct hence the architecture and urban planning became impersonal, generic, alienating. **(Fig. 23, p. 75)** The design canons stressed out the importance and aesthetic side of a free standing building, totally disregarding and denying the street space, urban squares, landscape and outdoor amenities. In the old European cities *"streets and squares*

are carved out of the building mass, giving direction and continuity to urban life and creating physical connections, meaningful places" (Trancik 9).

In case of most large American cities *"the urban form consists of separate buildings floating among parking lots and roadways."* (Trancik 10) **(Fig. 24, p. 76)** The street does not function as a gathering place. Everybody is a stranger and potential aggressor since he is an unknown person. People do not know their next door neighbors, the fear for children's safety is almost hysterical. The large modern cities are certainly not created for children. They seem to be a mixture of steel and concrete buildings without outdoor amenities such as playgrounds or parks. Even if a playground exists in a large city, a high fence often surrounds it in order to discourage a potential aggressor. The street is no longer a place of social gathering. The average person must limit his social life to an enclosed, personal territory instead of taking part in a communal existence in the street. **(Fig. 25, p. 77)**

THE TOOLS OF LAND USE PLANNING

"ZONING"

The zoning policies and urban renewal programs introduced in 1950s and 1960s were supposed to *"clear the ground, sanitize and promote human welfare through the segregation of land uses into discrete zones and the substitution of highrised towers for ground level density"* (Trancik 12). The spatial solutions of new developments rarely take the spirit of the community under consideration. New zoning by - laws separate the functions that used to be unified - for example workplaces from living spaces. Residential subdivisions on the outskirts of large cities are composed of tens of identical, meaningless, dull houses. **(Fig. 2, p. 60)** The policies of government relocating people to the suburbs in 1950s and 1960s created deserted downtowns. The satellite cities were supposed to be the dormitories for people working in the large cities. Eventually people started to develop mental illnesses, psychological ailments, which were later

called "sarcellites" and were linked to a life in a dormitory type of urban development and daily commuting to work.

Zoning by - laws were created in order to enhance people's "health, safety and welfare". The example of Pruitt - Igoe Housing Project in St. Louis, Missouri can be used to illustrate how people's behavior is stimulated by wrong design, misunderstood social needs and poorly conceived public spaces. The whole development consisted of standardized, prefabricated boxes poorly placed on site. Millions of dollars were spent on renovations of the complex, but vandalism was stronger. The buildings were demolished with dynamite after 17 years of existence. The above mistake shows how large city's style modern housing affect its inhabitants psychologically. **(Fig. 26, p. 78)**

The modern, large cities often become grounds to create image buildings. The design and form of each building is governed and influenced right away by the municipal planning regulations and by the developer's ego. The design guidelines attempting to define urban space are often disregarded. Buildings are being developed without consideration for public spaces. Unlike the Renaissance city, where *"standards for the integration of architecture and urban spaces were set by the patrons and builders"* (Trancik 17), the large cities are loosing *"the unity of the total environment."* (Trancik 17) **(Fig. 27, p. 79)**

"The city is not built for one person, but for great numbers of people, of widely varying backgrounds, temperaments, occupation and class.(...) Analysis indicate a substantial variation in the way different people organize their city, in what elements they most depend on, or in what form qualities are most congenial to them. The designer must therefore create a city which is as richly provided with paths, edges, landmarks, nodes, and districts as possible, a city which makes use of not just one or two form qualities, but of all of them. If so, different observers will all find perceptual material which is congenial to their own particular way of looking at the world" (Lynch 111).

The urban land use planning has to identify the broken important pedestrian links and reconnect them with a premeditated framework of buildings and landscape features. *"People tend to think of path destinations and origin points: they like to know where paths came from and where they led. Paths with clear and well - known origins and destinations had stronger identities, helped tie the city together, and gave the observer a sense of his bearings whenever he crossed them"* (Lynch 54).

The architects, landscape architects and urbanists have the ability to influence the urban structure by their designs. The successful urban design must integrate three theories of urban design:

- Figure - ground theory: the analysis of relationships between building mass and open space
- Linkage theory: the study of circulation: connection and movement.
- Place theory: awareness of historical, cultural and social values in urban open space (not always an easy task in a multicultural society)

"The approach should not, however, be merely conservative or myopic. The designer should integrate new elements with old in order to express the concept of time. An integrated approach is not static but must incorporate change and innovation to give added meaning for contemporary users" (Trancik 219). The integrated approach toward urban design can also be a very successfully applied to urban renewal because the total, large-scale redevelopment often segregate the land use zones.

Residential and commercial zones are very often separated in large cities, which causes transportation problems, wasted land around freeways and pollution. **(Fig. 28, p. 80)** Zoning by-laws do not promote mixed land use, which reduces parking requirements for downtown area and changes a lifeless and static at dinnertime downtown to a vital and vibrant space.

Zoning is a very crude instrument of land-use planning. *"It essentially tells one what cannot be done but it cannot make anything happen. It's very rigidity may lead to less than optimal*

results" (Levy 127). Zoning is a very powerful tool limiting architect's creativity, which in turn reflect on the whole of urban design. Uniform regulations applying to the whole city blocks are not capable of creating optimal design solution pertaining to the specific site.

"Zoning saturation" studies have shown how zoning by-laws fail to recognize the fine structure of the city. New York City, having the largest development density in the United States, has population of about 7 to 8 millions. Recent "zoning saturation" study revealed, that if developed to fully as per by-laws, the city's population would reach whooping 30 millions. The population would be far beyond what people would tolerate and there is no chance of such development happening. Obviously the zoning fails to recognize the fine detail of the city's structure and lacks the precision.

Zoning policies are creating a sterile, lacking diversity and liveliness environments by nonchalant and extreme separation of uses. **(Fig. 29, p. 81)** There are quite a few examples of successful developments at the scale of few city blocks created without ever-present coldness and rigidity of Zoning By-law. The West Village, part of Manhattan's Greenwich Village consists of very irregular city blocks and variety of uses. The buildings are typically 2 to 6 storeys, with diversified mix of residential and commercial uses. The streets are very lively and full of people well into the late night hours. The ground level of buildings is usually occupied by a variety of cafes, restaurants, shops, and galleries with residential above. The diversity, charisma and activity are achievable only without cold by-law regulations and planner's obsession with separation of uses. Another very good example is Granville Island in Vancouver, British Columbia, where former federal land was successfully redeveloped. The former industrial buildings were adopted for a variety of commercial uses: ranging from kayak shops, brewery, restaurants, art collage to offices. The architects managed to create a coexistence of pedestrians and vehicles. The whole island lacks curbs; the pedestrians are mixed with traffic, creating an atmosphere found very often in European cities. The every planner's nightmare of

traffic mixes with pedestrians has been operating successfully for some time. *"Purposely slow-moving traffic mixes with pedestrians to reduce the velocity of vehicles, and to reduce the ensuing danger to pedestrians while they are shopping on the island"* (Kemble 89)

In spite of some advantages - mainly cultural in nature (theaters, concerts, quality shows with good performers), which are hardly used by the average working person; life in a large urban system exerts far more pressure on human beings than living in a bucolic environment, primarily because the larger urban system, the more dysfunctional it becomes, defeating the purpose of urban agglomeration, which may be described as community or social group.

CASE STUDY: TORONTO AND ITS METROPOLITAN REGION

AN ALTERNATIVE MODEL FOR URBAN FORM AND GROWTH

"Toronto is often hailed as a North American urban anomaly. It is safe, clean, and healthy city, with a vibrant urban core and a strong, diversified economy." (Geddes 93) In order to understand better Toronto's *"unique urban success and pathologies"* (Geddes 93) three aspects will be examined: city's urban structure, form and creating of community.

Toronto's urban tissue consisted of four regions and 35 municipalities. *"Generally the regions handle policing, ambulances, solid waste management, pollution control, social services, public transit, and regional roads. Cities take care of fire, water, local streets, development control, public health, and garbage collection. Each has a sometimes conflicting role in providing public housing, parks, economic development, and planning."* (Geddes 93) Toronto is not only Canada's economic center, but according to the United Nations, the most multicultural city in the world. There are more then 66 ethnic communities and over 100 languages are in use. The United Nations Human Development Index voted Toronto as the city with one of the highest standard of living on North American continent. One cannot see often the physical ghettos so regularly present in the American city and even the public housing seems to be in the better then average state. Although the city core is densely populated, many of the Toronto's downtown

residents migrated to the suburbs during the last 50 years. *"It is now a dense, transi-oriented core surrounded by a rainbow of automobile-dependent suburbs"* (Geddes 94). In spite of this typical scenario, Toronto's downtown is still one of the most livable in North America and there is a continuing interaction between the suburbs and downtown. *"But recent cracks have developed in this veneer of urban success"* (Geddes 93) and Toronto's urban success could be in danger. Toronto's contribution to the gross national product is the highest in Canada and despite of *"representing about 50% of the provincial tax base and about 25% of the national tax base"* (Geddes 94) it does not receive back money needed. The main danger is from a present crisis of local government. Provincial government reformed Toronto few times in the past:

First in 1953, as the Municipality of Metropolitan Toronto (Metro) was created as a solution to post-war immigration and baby boom population growth, it laid down a very strong framework of urban planning. *"This framework was based on rapid transit (particularly subway), the rigorous preservation of public spaces, and a clear definition of the public domain. The result was a compact, pedestrian-friendly, major urban center"* (Geddes 95).

Second in 1972 when a plan "Designing for Development" containing 3 reforms was created:

- growth management plan
- municipal tax reform
- creation of four municipalities around the Metro.

The only reform ever materializing was creating of the four municipalities. The new four governments were not guided by tax reform or growth management strategy. *"Instead of growing from a pedestrian- and transit-centered city, the Toronto region suddenly discovered the realities of urban sprawl and the real estate industry"*. (Geddes 95)

Toronto's urban form has been analyzed recently with the help of transect studies. A transect is a selected area of land where ecologists and botanists observe and analyze the life of ecosystem. Transect studies have been recently applied to urban context. The history, land use and

demographic data collected in the area of a few city blocks provide very valuable information regarding the urban form of the city.

The Waterfront Transect stretches a few kilometers along Toronto's Lake Ontario shoreline. There was a proposal for pedestrian esplanade along the lake Ontario in the late 1880, but instead the commerce prevailed and the railway corridor was built. The residents of Toronto were automatically separated from the waterfront. The area became strictly an industrial zone, which was growing constantly during first half of the 20th century. In the 1950s Metro planners decided to address the vehicle congestion created by a post-war boom. As usual the simplistic and myopic solution was adopted: an elevated, six-lane highway was built parallel to rail corridor, further alienating the waterfront. As the economy of 1960s drove the heavy industry and railways and into the suburbs, a very valuable waterfront land became vacant. The federal government acquired 80 acres of abandoned land, which became the famous Harbourfront. Although with mixed success and financial problems, the Harbourfront managed to transform the lost space of waterfront *"into a recreational, cultural, residential, and commercial urban park."* (Geddes 100) attracting some 3 millions visitors per year. Harbourfront set the precedents for a major revitalization and redevelopment of vacant waterfronts. There are however very strong criticisms of the Toronto's waterfront developments: *"That parcel of land has been very difficult to plan from the start.(...) Yet the badly conceived plan layout cannot be attributed to the site, difficult as it may be, because none of the existing site characteristics have been used to advantage. Indeed the site has been ignored in favour of a development conception that could be anywhere. Clusters could have been arranged in spatial groups around the pier indentations, but this is not the case. Instead the road cuts the piers off at their most disadvantaged location. The layout is just another exercise in conventional planning, no spirit, no imagination."* (Kemble 12) The new development uses the existing road system, which serviced industrial uses in the past. It seems that *"traffic, transportation and the traffic engineer have first priority, as always."*

(Kemble 12) Instead of placing the Queens Quay West under the existing six lane highway, with branching off access roads, it only further emphasis *"the relentless linearity of the development"* (Kemble 12) Buildings are randomly placed on site, rather then clustering with correct proportions around each pier. *"The high-rises are not what is wrong for there is no well thought out plan for living. There are no spaces, no plazas, no places that become naturally recognizable."* (Kemble 12) **(Fig. 30, p. 82)**

Yonge Street Transect is a historic spine of Toronto oriented along North-south axis. Although no longer geographical center, the street still divides Toronto into west and east part. The south part of Yong Street is a diversified mix of residential buildings and incomes. Fine street grid, created at the beginning of the 20th century, allowed for lower and upper class to construct houses back to back. The variety of ethnic groups continued to grow for some time after the 2nd World War. A new mixed-income development grew east of Yonge Street in 1970, creating a successful community thanks to re-introduction of Toronto's old block figure and creative architecture. "Yonge Street Strip" is further north, with university, three theaters and high-density retail. Many of the vacant offices built in the boom of 1970s and 1980s are now being redeveloped into residential buildings preserving a variety of land uses.
A new urban node has been created between Highway 401 and North York civic center. As work places have migrated to older suburbs, the commercial and residential developments closer to work shortened the trips.

The Northern Fringe Transect, blocked north by the Oak Ridges glacier moraine (a provincially protected area), continually spreads west east, fueled by highway developments and urban sprawl. Don Mills, *"a hybrid of the low density, automobile-dependent American suburb and British new-town planning"* (Geddes 102), was created in 1960s. Five new suburbs follow shortly, creating Canadian version of the American dream. Thousands of single family dwellings occupy Canada's best agricultural lands. The sad experiences of over thirty years of

"Leviton reality" are fortunately influencing new developments in this Transect. Markham is a new town with developments with density of three to four times greater then traditional suburb. The town's *"compact developments modeled on the urban form of the central core."* (Geddes 102)

Three Transect described above certainly attempt to create a better urban experience however: *"it seems that Toronto still maintains a degree of cognitive dissonance between the trade-offs of creating compact urban form and a continuing reliance on the automobile."*

ENVIRONMENTAL ISSUES

DEFINITION OF SUSTAINABILITY

"Sustainability is the ability of a system to sustain the livelihood of the people who depend on that system for an indefinite period."

Otto Soemarwoto, 1991

"Although the environment has been abstracted from by standard economics, the concept of sustainability has been recognized and incorporated into the very definition of income as 'the maximum amount that a community can consume over some period and still be as well off at the end of the period as at the beginning' (Hicks 1946). *Being as well off means having the same capacity to produce the same income in the next year—i.e., maintaining capital intact. The criterion of sustainability is thus explicit to this Hicksian definition of income."* (Daly 34)

KEY PROBLEMS, CHARACTERISTICS AND CAUSES

Since the urban revolution of the Neolithic age, cities always had a special, usually destructive relationship with the environment. There are three major phases of urban/ecosystem relations:

Phase 1- Early Urbanization (5000 B.C.-1800 AD)

Daily consumption of energy per capita: 26000 kcal.

Urban revolution started approximately 5000 years ago in Mesopotamia. Advancing agricultural techniques could support non-agricultural urban areas. Social divisions became more drastic as density of communities increased. Diet usually contained single staples (rice, wheat, maize etc.) increasing famine and diseases. The population and size of an urban settlement were directly dependent on the ability to gather food and other goods from rural areas without significant degradation of the environment.

Phase 2-Urban Industrialism (1800 AD- 1950 AD)

Daily consumption of energy per capita: 50000 kcal.

The Industrial Revolution in Europe and North America increased dramatically energy expenditure. Cities increased rapidly both in population and size. Exposure to pollutants and urban waste was growing rapidly. Cities developed by seizing the carrying capacity of other areas and by sending their waste out.

Phase 3-Global Interdependence (1950-present)

Daily consumption of energy per capita: 300000 kcal.

Cities became the elements of global flow of goods and services, labour, resources and waste. Environmental issues increased from local and regional to global.

The cities of the 20th century were created based on function, rationality (or cold calculation) and visions of profit.

The Intergovernmental Panel for Climatic Change verified, using scientific reports that the climate of our precious planet is rapidly changing. The Earth is warming up as a direct result of burning fossil fuels producing growing amounts of carbon dioxide in the upper atmosphere. It is also true that buildings of the Industrialized world-both their construction and use-account for approximately 50% of total harmful emissions creating the greenhouse effect. Greenhouse effect is a phenomenon of sun's heat being trapped on the Earth's surface thanks to high levels of carbon dioxide.

The Green movement is involved, among other agendas, with the re-evaluation of the design, construction and use of the buildings. The oil crisis of the 1970's and the First Oil War of 1990 confirmed the danger and shortcomings of relaying solely on fossil fuels.

"*The 'drop-out' society of sixties had grown into the 'alternative' society of the seventies, absorbing along the way the doctrines of radical philosophers and scientists. From these and other influences, and from the worrying results of the first scientific studies monitoring conditions on Earth, the Green movement was born.*" (Jones 12) "Green architecture" is a rather unconvincing name for radical changes in building design, construction and use. It suggests that

it be simply and exclusively based on empirical and utilitarian dogmas, beyond the scope of conventional architecture. And since the "Green Movement" is associated with the outer limit politicians and intellectuals, the green architecture received the same classification. *"The design of any building derives from considered responses to climate, technology, culture and site. Architecture is born when, through intellectual deliberation, an inspired and appropriate balance between these four constituents is reached and a singular physical entity is created."* (Jones 13) The global sustainability and energy conservation is directly linked to these four issues and they are at the center of architectural design. Consequently, Green Buildings meeting the demands of the next millennium will not be created by *"applying the remedies of revivifying building physics to the architecture of the last decade."* (Jones 9) After all, the relationship of the built environment to natural environment has been an active aspect of our lives until approximately 1940s, when this dialogue was disrupted. Hopefully the common sense will prevail and sustainable architecture will emanate as a symbol of environmentally conscious era. Being "environmentally friendly and sensitive" for most people means sorting garbage into colour coded containers, returning bottles to the store and refusing "junk mail". In reality by far more radical measures are required in order to simply save our lives. Architecture has to response to these needs in a much more holistic way, not just in specifying energy efficiency in a few buildings in a metropolis, but it has to change on a global scale. Architecture, just like any other design field, relies on successful agreement between intuitive and rational. A built structure has to be simultaneously a poem and a machine. Only a handful of buildings reach this harmony. Those architecturally interesting often lack environmental responsibility and those with sound construction lack sensual stimulation. Most of them are short on both aspects. *"Axiomatic to arriving at an inspirational balance between sense and sensibility are two relationships – that of building to site, and both of these to nature itself."* (Jones 8)

CHARACTERISTICS OF CONVENTIONAL AND ECOLOGICAL DESIGN

ISSUE	*CONVENTIONAL DESIGN*	*ECOLOGICAL DESIGN*
Energy source	Fossil fuels or nuclear power, non-renewable, destructive	Whenever feasible, renewable: solar, wind, small-scale hydro, biomass and geothermal
Materials use	Quality materials are used irresponsibly, and as a result toxic and low-quality materials are discarded in soil, air, and water	Materials are recycled and reused:, flexibility of use, durability
Pollution	Generous, uncontrollable	Minimized, controlled, quantity and type of pollutant conforms to the ecosystem ability to process them
Toxic substances	Common and lethal, present everywhere	Used as a last resource and sparingly
Ecological accounting	Limited to mandatory environmental impact compliance reports	Wide spectrum sophisticated all ecological impacts over the life cycle, from extraction of materials to recycling and reuse.
Ecology and economics	Perceived as in opposition, short term view	Perceived as compatible, long term view
Design criteria	Economics-max. Profit, custom, convenience, unexploratory, myopic, conventional	Human and ecosystem health, long-term ecological economics
Sensitivity to ecological context	International style: disregard to local context, culture and site conditions.	Respond to local conditions: integration with local vegetation, climate, soils, materials, culture, topography. Site-specific design
Sensivity to cultural context	Creates homogenous global culture, destroys local	Respect the local culture, traditional materials and technology
Biological, cultural and economic diversity	Standard design with high energy and material's waste, eroding biological, cultural and economic diversity.	Maintains & supports biodiversity and the locally adapted cultures and economies that support it
Knowledge base	Narrow disciplinary focus	Comprehensive, integrates multiple design disciplines and sciences
Spatial scales	Usually works at one scale at a time	Design is integrated across different scales, explores relationships among different scales
Whole systems	Divides systems along boundaries that do not reflect the underlying natural processes	Works with whole systems; creates design that provide highest degree of internal integrity and coherence
Role of nature	Design must be imposed on nature to provide control and predictability and meet narrowly defined human needs	Treats nature as a partner: whenever possible, substitutes nature's own design intelligence for a heavy reliance on materials and energy
Underlying metaphors	Machine, product, part	Cell, organism, ecosystem
Level of participation	Reliance on jargon and experts who are unwilling to communicate with public limits community involvement in critical design decisions	A commitment to clear discussion and debate; everyone is empowered to join the design process
Types of learning	Nature and technology are hidden; the design does not teach us over time	Nature and technology are made visible; the design brings us closer to the systems that ultimately sustain us
Response to sustainability crisis	Views culture and nature as inimical, tries to slow the rate at which the environment is degraded by implementing mild conservation efforts without questioning underlying assumption	Views culture and nature as potentially symbiotic; moves beyond triage to a search for practices that actively regenerate human and ecosystem health

THE ROOTS OF GREEN ARCHITECTURE

"It is not an exaggeration to say that primitive and vernacular building and the natural setting in which it exists forms the backdrop, indeed the leitmotif, of architectural history. Looking back over its epochs and movements, it is possible to trace a trail of architectural responses and reactions to this common folk heritage, where architecture, at critical stages of social and cultural change, has been invigorated by day-to-day construction and inspired by natural forms; a continuing dialogue between architecture and nature. Within this dialogue the strands that today comprise a Green sensibility can be identified." (Jones 15) The affinity between architecture and environment is a very complex and diverse. **(Fig. 31, p. 83)** Analyzing different aspect of the history of Green consciousness in architecture four things has to be looked at: response to the climate, resources, and historical context and man-nature coexistence.

Climate:

Since the very first shelters were erected, people were very creative in terms of designing the best internal conditions in context of climatic constrains and possibilities. The wind towers of the Middle East were design to cause evaporative cooling of the interior by advancing airflow through the buildings. **(Fig. 32, p. 84)** Direct sun was not allowed to enter the buildings, further reducing internal temperatures. Also the mass of the exterior wall was gaining the heat during the day, insulating interiors, and releasing it during the night when temperatures usually drop by 25 C. The Roman public in the Colosseum was protected against the sun by system of huge fabric canopies **(Fig. 33, p. 84)**, moveable screens and shutters in traditional Japanese houses allowed for air-circulation and flexibility in internal layout. **(Fig. 34, p. 84)** Of course not all buildings were designed to harness natural forces in order to provide internal comfort. Prime objective of large, complex buildings: sacred architecture and palaces for example, was to convey a symbolic and spiritual message, rather then using nature to inhabitants' advantage. A similar conclusion can be drawn looking at contemporary buildings: shopping centers, airport

terminals, office towers etc. *"where recourse is made to technological rather than natural forces, to provide comfort for the occupants* and *heighten...the corporal experience."* (Jones 16)

Resources:

Resources, as well as a climate, played a great role in the differences between monumental and vernacular architecture. Vernacular buildings were constructed using sparingly local materials in the past. Together with the increase in people's wealth and power, builders were able to utilize more remote resources. As history shows, power and wealth almost always decided the amount of resources applied to any given building. The main streets of Gdansk, Poland could be used as a good example of the practical use of resources. **(Fig. 35, p. 85)** Buildings are few storeys high with the small footprint, conserving land. The main constructing material, brick was manufactured locally. Contrasting with that scenario, the estates of the aristocrats are usually very elaborate and spread over great areas. Materials not available locally would have been imported from abroad together with laborers. The natural environment surrounding the buildings was usually completely changed. **(Fig. 36, p. 85)**

The recycling had its precedence long time ago. Ayyubid and Mamluke Cairo were built using the outer castings of the pyramids, Rome's Forum was dismantled for construction of new buildings and North African mosques used stone from Greek and Roman temples. Early building materials were processed at the limited scale. Brick were usually sun-dried and sometimes fired by husks and stalks of crops. Limestone and chalk were baked to become cement and gypsum plaster. Metals use was limited to decorative functions. Nineteenth century industrialization introduced techniques greatly improving production of building materials. As side effect industrialization created great social disproportion, hardship, destruction of environment and pollution did not seen yet in human history.

Man and Nature:

So-called primitive cultures (as perceived through western society standards), always

lived close to the nature. Environment ruled their lives in almost every aspect. *"They depended on benign aspect of the seasons, augmented by their own endeavors, for survival. Nature had both a practical and supernatural influence."* (Jones 17) The Anasazi Indians of North American southwestern region are a perfect example of symbiosis with nature. The Chaco civilization of the San Juan River basin existed for a short period of 300 years approximately around 10th century AD. The Anasazi Indians created a complex and sophisticated society *"representing the first integrated experiment in social, political and economic cohabitation in the American south-west"* (Jones 17) The society was not self-contained and the size of settlements and everyday needs promote contacts with remote tribes. *"Communication with other societies may have been one of the factors which led to their cultural, scientific and architectural sophistication."* (Jones 17) The community contained 13 cities, usually with stone multistorey residential buildings facing south with their backs against the north cliff. **(Fig. 37, p. 86)** The Inhabitants were using the harsh desert climate and local material for construction and *"judging by their ability to calculate the seasons precisely through astrological observation and from archeological finds, had a dynamic and inspirational relationship with the cosmos, the climate and the landscape."* (Jones 17) As recorded history shows that all early societies had a close affinity with nature. Feng Shui, an early Chinese science of relationship between a site and buildings, is a clear demonstration of the most developed human relationship with nature. Decisions are made based on natural factors such as: site's conditions (shape, size and topography), building orientation in relation to sun and wind, presence of water and the metaphysical level. The art and science of Feng Shi is still practiced in the Far East, but its European equivalent of *"symbiotic relationship between nature, culture and building was brought to an end by the Renaissance."* (Jones 18) The best expression, which would summarize the Renaissance, is by the Greek philosopher Protagoras: "Man is the measure of all things". *"It celebrated the primacy of man; his intellect and physical prowess."* (Jones 18) Classical

architecture was based on geometry and mathematics, not on symbiosis with nature. The Classical canons are based on a polarity of nature and man-made structure and establishing a balance between them. *"Renaissance architects (...) sought to tame and manipulate the natural setting to create a harmonious, integrated and awe-inspiring man-made entity. The desire to rearrange and enhance the landscape was taken still further in the Mannerist, Baroque and Rococo periods."* (Jones 18) Renaissance was also the beginning of the Green movement: the philosophers based their theories on morality of the Roman Republic. This new approach was taking into an account everybody and their place in natural environment. Rousseau believed that relationship with nature was people's opportunity to maintain or loose their identity. Late 18th century brought ideas of individual wellness, rights and equanimity with nature. *"However, few at the time realized that these technological developments would lead to the problems we face today - of industrial sprawl, pollution and despoliation."* (Jones 19)

Two French architects: Claude-Nicolas ledoux and Etienne-Louis Boullee played a crucial role in the evolution of a green architecture. Their designs expressed the most essence of the Age of Enlightenment. Neo-classicism, removing the veneer of Baroque from the Classic architecture, established the new approach reflecting Newton's scientific concepts about the cosmos. The concept of building's form representing its function was close to Enlightenment philosophy. *"This idea anticipated the Modernist maxim of form following the function. (...) Indeed French Neo-classicism is viewed by many as the precursor of the puritanism of the Modern Movement."* (Jones 20)

Mid-nineteenth century Europe was "ruled" by industrialization. New construction technologies emerged: use of steel and glass, also heating, sanitation and artificial lighting technologies were developed. John Ruskin became one of the firsts to openly criticize unmanageable industrialization. *"The reforming propositions Ruskin put forward for the arts and crafts were, beside much else, the first systematic reaction we would now call Green."* (Jones 21) He stated

that the earth belonged not only to present inhabitants, but also to the future generations and people have no right to deprive them of clean and healthy environment. British Arts and Crafts movement was the first group to promote the Green approach to architecture. The scope of work of the Arts and Crafts group was almost entirely residential. Designs were based on traditional methods of construction and use of native resources. *"It represented a quiet revolution against the assumption that the products of industrialism were superior to hand-crafted goods, and the technology offered the only possible way forward."* (Jones 21) The movement adopted planning ideals of Ebenezer Howard and presented *"an attractive and life-enhancing alternative to the dehumanizing back-to-back housing of the expanding cities."* (Jones 21)

Modern Movement is usually associated with antagonistic approach to environment and regionalism. It is perceived as being totally preoccupied with a ubiquitous reply to socialism and technology. This is true in case of *"more mechanistic and 'classically' focused practice of architects from the Germano-USA axis (pioneered by Walter Gropius, Mies van de Rohe and Marcel Breuer, continued by Philip Jonston, Skidmore Owings and Merril and other large American corporate architectural practices, and finally debased into a ubiquitous international vernacular, in the same way that the Arts and Crafts house became debased into the formulaic cherry-lined ribbon development housing."* (Jones 23) This does not apply to architects like: Le Corbusier, Alvar Alto, Frank Lloyd Wright and Eric Mendelsohn and Taut. *"Indeed, parallel Green strands of sensibility to nature and reference to the vernacular can be found in much Modern Movement architecture - albeit embedded within a complex architectural language and set of relationships."* (Jones 23) Nature was always a main focus in Le Corbusier's work, often portrayed as an opposing force to the activities of humans or as the basis in the system with people as a part of it. Le Corbusier's design principles were developed as a response to *"Beaux-Arts academicism."* (Jones 24) His architectural language has reinvented the traditional affinity of the building and environment. His early villas were elevated in order to achieve a continuity

of a natural base plane. The nature became an object of contemplation from the interior of the building and the building itself was hovering over the ground. **(Fig. 38, p. 87)** The environment was used *"as a foil to heighten the architectural experience and (...) the machine age experience."* (Jones 24) The Second World War was probably the decisive factor in the shift of Le Corbusier's design philosophy: *"from idealistic preoccupation with void and solid contrasted with nature, to a more poetic concern with natural forms and integration with nature."* (Jones 24)

Poetic aspects and mythology of Le Corbusier's architecture, especially the symbiosis between man and nature, *"were devalued and ignored in the subsequent unifying efforts to make from Modernism's creative diversity a homogenous and consensual architecture; what came to be known as International Style."* (Jones 25)

TOOLS OF SUSTAINABILITY

The term "alternative energy" applies to energy sources, which are not exploited at the large scale on the American continent. These include wind energy, solar energy, biogas, biomass, tidal energy and geothermal energy, which are essentially inexhaustible.

Solar energy

The solar energy utilization techniques can be classified as passive, active and hybrid systems. The term solar architecture is applied to the buildings, which take advantage of climatic conditions; rather then depending on fossil-fuel energy that is damaging to the environment. Unlike the conventional approach, which treats climate as an enemy, keeping it out of the building, solar architecture endeavors to use climatic factors to the inhabitants' advantage and utilizing the sun's energy to achieve required comfort levels.

Passive solar energy

The design of the building creates indoor climate control by way of natural thermal conduction, convection and radiation. The basis of solar passive design were developed and

used through the hundreds of years by many civilizations all around the world. Many of the early structures were better suited to their climate than contemporary architecture. This is largely due to the still cheap fossil fuels allowing for artificial control of indoor environment at the cost of solar energy. In fact, the substantial portion of Earth's non-renewable fuels is exploited in HVAC systems.

Passive heating

The concept is based on absorption and storage of solar energy, which is then used to heat the indoor spaces. The energy is typically stored in thermal mass: concrete, brick, rock or water. There are three basic solar systems:

1. Direct gain: the wall or floor within the occupied space absorbs sunlight.
2. Indirect gain: where selected parts of the building serve as the heat storage, which is then transferred to the rest of the building by conduction, convection or radiation.
3. Isolated gain: solar energy is absorbed in the separate structure such as greenhouse or solarium and is then transferred to the destination via ducts.

Passive cooling

Passive solar technology is also successfully used for the opposite purpose: the cooling of the building. These systems can either shield the building from direct sunlight or transfer excess energy outside. Heat transfer is achieved through ventilation or conduction, where heat is absorbed by walls and floors. Water could be used as one of the method of building cooling: fountains, sprays, ponds provide substantial temperature reduction

photovoltaics

Although incorporating photovoltaic cells into the building's design seems like a noble idea: environmentally friendly electricity is produced on site and emission of the greenhouse gases is reduced, it presents a few challenges. At present time the PV are not very efficient. The PV industry has to develop better ways of energy storage and also panels themselves must be

more mechanically stable, durable and watertight. Standard building integration details have to be developed. The big barrier to invest in PV wide usage at present is its cost, which could be lowered in time, as volume production will decrease the price tag. The end user: public have to change the attitude towards the PV: they are concerned about the risk of use, reliability (lack of sun), safety problems with live panels, safe disposal at the end of life cycle. The problem of storage could be solved if the power companies agreed to buy the surplus energy at an economic price. This seems to be the only way for the PV revolution to happen. The incentive could be established if the whole neighborhoods or major development would provide wall/roof space to power companies which in turn would invest in PV panels and charge a lower fee for electricity. *"Low energy design should be seen as a coordination of many factors. Development of building concept and environmental strategy ought to be part of the same process. The object is to produce a building in which orientation, zoning and structure - including thermal mass and facades - work with environmental systems to achieve optimum efficiency and comfort. PV's have the potential to be a key aspect of low energy designs."* (Price 66)

The PV use could be encourages by new tax breaks for green developments. Grants provided for experimental PV installation are simply not enough. PVs could be a standard part of a low energy building and if the running cost would exceed an agreed level, penalty could be applied.

"As cell efficiency increases, unit size will decrease and greater variety and subtlety emerge. The future should therefore show designers not having to make such obvious trades-off between how buildings perform and how they look. PV's, as highly efficient bespoke glass laminates, will be part of the vocabulary of energy efficient design without dominating it" (Price 66) The new technology would open new possibilities: PV panels could simultaneously serve as *brise-solei,* or even could be incorporated into a glazing.

There are few goals and challenges for architects and engineers in the coming future:

-Keep up with the technology.

-Advocate the PV use, so the demand increases.

-At the design stages assess the potentials for future PV use: building orientation and structural integration of panels.

-Integrate the different industries: glazing systems & curtain wall manufacturers with PV developers.

<u>geothermal:</u>

The Earth crust contains the abundant thermal energy, estimated to be *"50,000 times the energy of all oil and gas resources in the world."* (Geothermal Energy Program) The geothermal (meaning: "Earth" + "Heat") energy is the most environmentally friendly and renewable resource. There are five forms of geothermal energy, out of which only two are used today: hydrothermal reservoirs and earth energy. In order to utilize the other three: geopressured brines, hot dry rock and magma, more advanced technologies must evolve.

Hydrothermal Reservoirs:

Hydrothermal reservoirs are pools of steam or hot water within porous rock. The steam or hot water is pumped to the surface plant, where it propels a turbine that is connected to an electric generator.

1. In a Dry Steam Power Plant steam is connected directly to the turbines, eliminating the boilers used by conventional coal and natural gas power plants.
2. Flash Steam Power Plants, the most common today, makes use of water over 182°C. The water is pumped under pressure into surface equipment, where the pressure is dropped, converting some of the water into a steam, which in turn powers the turbine and generator. The remaining water and used steam is pumped back under the surface.
3. Binary Cycle Power Plants utilize water between 107°C to 182°C. The hot water heats up iso-butane (characterized by a low boiling point), that is vaporized in the heat exchanger and

directed into a turbine. The organic fluid and subsurface water are circulating in separate closed loops and geothermal fluids are not released into the atmosphere.

Earth Energy:

In direct-use system underground hot water (20°C to 150°C) is pumped to the surface and mechanical systems: pipes or heat exchangers transfer the heat to the space or industrial process. The cooled water is then pumped back to the source. The entire western third of the North American continent has plenty of low-to-moderate temperature underground reservoirs. The estimated savings in energy costs are 80% reductions from traditional fossil fuels.

The geothermal heat pump, another way of using geothermal energy, uses electricity to transfer thermal energy between the building and the ground. The heat pump draws thermal energy (ranging between 10°C to 21°C) from the shallow crust during winter. During warm months the process is reversed and the systems transfers the building's heat into the ground. The system is an energy saving technology used for space heating/cooling and water heating. Overall energy consumption *"is reduced 30% to 60% compared to traditional heating and cooling systems, allowing a payback of system installation in 2 to 10 years."* (Geothermal Energy Program) These systems require a very little maintenance and expected life span is approximately 30 years. Some geothermal heat pumps are also used in heating domestic water. *"An analysis by the EPA* (Environment Protection Agency) *found these systems to be among the most efficient space-conditioning technologies available - with the lowest environmental cost of all that were analyzed. (...) Surveys show that the number of satisfied geothermal heat pump customers stands at 95% or higher."* (Geothermal Energy Program).

Wind energy

Approximately 1% to 2% of sun's energy reaching the earth is converted into wind energy. This is estimated to be 75 times more than the energy converted into biomass by all earth's flora. Winds occur as results of uneven sun heat distribution in the atmosphere, the

earth's rotation and different terrain. Wind turbines convert kinetic energy of the wind into mechanical power, which in turn is converted via generator into electricity. **(Fig. 39, p. 88)** Contemporary wind turbines fall into two categories: the horizontal-axis variety (like an aircraft propeller) **(Fig. 42, p. 88)** and the vertical-axis group, like the "eggbeater" style Darrieus type, named after its inventor. Individual wind turbines are often group together creating wind farms, which supply the local utility grid with electricity, similarly to conventional power plants. **(Fig. 40, p. 88)** The power rating of the wind turbine is proportional to the diameter of the propeller. The largest ones are often 70 meters in diameter, producing 2000 kW **(Fig. 41, p. 88),** medium-sized 600 kW turbines are 39 to 48 meters in diameter and small home-size wind mills have propellers 2.5 to 9 meters.

Large, megawatt-sized machines are delivering power at a lower cost than smaller machines. The cost of construction, grid connection and components of the turbine are somewhat independent of the dimensions of the turbine. Larger windmills are often used in the offshore wind farm, where winds have greater speeds than on land. **(Fig. 43, p. 89)** The energy output of the offshore wind turbine is often 75% greater then the land one. The offshore environment offers more stable and less turbulent winds and less wind shear, contributing to design cheaper turbines with longer life span. In areas where it is difficult to place a number of wind turbines, a tall turbine with large propeller utilizes wind power more efficiently.

Wind speed varies greatly around the globe, with high winds being rather seldom and low winds occurring almost always. Wind distributing statistics show that wind force coincides with peak electricity use: winds tend to be stronger during the day and winter. It is of course an advantage to have an invariable power output from wind turbines. Total calm weather at seashore is quite rare and usually short, therefore wind turbines are less effective on land then on sea.

CONCLUSION

"There is no such thing as a sustainable city. The important question is not whether cities can be sustainable but how they can better contribute to overall sustainable development." (Leitmann 21)

World War II created a model of the American Dream: *"The nuclear family in the suburban landscape"* (Calthorpe 15), which is still a paradigm of development in the North America today. The concept of that model and its tangible articulation is totally obsolete in our present reality. The family model does not consist any more of 2 children, a housewife and a father - commuting breadwinner. The wealth of the middle class is diminishing, the workplace scenario has evolved and changed, suburban sprawl is often going beyond its physical and mental limits, and critical environmental issues: pollution, climate changes, ozone depletion, dwindling non-renewable resources and shrinking green areas; are more and more important. The American Dream is being transformed into the American Nightmare. If people are to maintain both: mental and physical health, our built environment has to: bring back the public domain, the scale of developments has to be human friendly and neighborhoods: urban blocks and suburban *cul-de-sacs* must reintroduce a mixed use, diverse population and consist of "smart", green buildings. *"The form and the intensity of the metropolis must integrate historic context, unique ecologies and a comprehensive regional structure."* (Calthorpe 15) As a countermeasure to our sad reality we have to introduce *"neighborhoods, rather then subdivisions; urban quarters rather then isolated projects; and diverse communities rather then segregated master plans."* (Calthorpe 16)

Pedestrians should be a main focus of this approach. They form the essence and the meaning of the neighborhoods. Public places without pedestrians: parks, plazas, squares, sidewalks etc. are just an irritating obstacles in the vehicle's way. People will not abandon their cars; they are a symbol of independence, status and privacy. Mixed-use walkable

neighborhoods, a contemporary version of old American town would help to balance pedestrians and vehicles and mixed-use could make a real difference when introduced at a larger scale. They could grow around the existing transit systems: highways and railways. The whole built environment evolves today around the vehicles. Traffic engineers are prescribing the form of our cities, number of lanes per street, amount of parking and setting the speed for experiencing the world from a fast moving car. The car became a perfect tool of cultural segregation: it divides new from old, residences from workplaces and shopping centers, rich from poor. There is a clear distinction between the needs of the car and the needs of pedestrian and successful transit system. Private vehicles require multilane, non-intersecting highways with gentle sweeping turns and vast parking. Our surroundings prove that everything is created to suit the car, not human needs. On the other hand, an efficient and wisely constructed transit system basically demands riders. This condition is achieved by: *"higher-density land uses (housing at 10 units per acre min.), dedicated rights-of-way (for easy movement), infrequent station stops (one mile minimums), frequent headways (no more than 15-minute intervals) and big-mixed-use job destinations (like city cores). Most importantly, its destinations need to be varied and walkable so that riders are not stranded when they arrive."* (Calthorpe 27)

Contemporary transit systems are either too "shy": targeting the carless poor with insufficient schedule, slow speeds and wrong destinations, or to grateful: servicing high density, single use downtown, with fast speed over great distances through underground tunnels. Unfortunately neither of those two scenarios is serving people well. People want destinations within an easy and a pleasant walking distance and hassle-free, short rides on a convenient transit system.

The streets should be narrow with trees and human-scale buildings directing them to their destinations: workplace, store, school, kindergarten etc. They should avoid being connectors of the *cul-de-sacs*, leading to multilane, congested highway offering long and monotonous ride.

Modern version of the traditional American town could be an alternative to our present reality. *"The traditional American town had walkable streets. Streets that led to close and useful destinations rather than like our modern collectors and high traffic arterials only to other streets. Elm Street led to Main Street or to the neighborhood park, or daycare or an elementary school. Such a street pattern is actually cheaper to build and results in shorter trip distances even if people don't walk. The streets were narrow, with sidewalks, and tree-lined. They were fronted by porches, balconies, and entries rather than garage doors and driveways. They allowed through traffic but slowed it with frequent intersections and frugal dimensions. There were no collector streets, complete with soundwalls, and cul-de-sacs. Privacy was maintained through layers of space rather then barriers. Security was provided by eyes on the street rather than gates and patrols. Today, such streets would be practical, not merely nostalgic; practical for single parents in need of some mobility for their kids; for the elderly without a car; for the single person looking for accessibility; and for the working family looking for a stronger community."* (Calthorpe 21) There was a variety in both use and people. Although physically divided, the interaction between users was close, direct and within walking distance. They were all sharing the same public domains, which were in close walking distance. Close public building and spaces were a magnet and a soul of the neighborhood.

It is impossible however to simply convert our cities and suburbs into pre war old American towns, *"where people walked, the shopkeepers lived upstairs, and neighbors were all on first name basis."* (Calthorpe 21) The fine grain of the old town would not work in our reality. Our present institutions are centralized and converted to global corporations. Average supermarkets have floor areas exceeding 60000 sq. ft. Although small stores still remain, but the overall trend is toward *"one stop shopping"* (Calthorpe 22) The big name companies require the area and visibility accessible directly from the major highways in order to attract consumers. The scale of the buildings and developments is now measured in thousands of square feet of retail use

and tenths of units in a residential building. *"Rather then the architectural diversity of incremental growth, we have large blocks of development with formula configurations dictated by the past successes of each developer and by conservative financing criteria."* (Calthorpe 22) These developments, lacking individualistic approach, are based on "theme" qualities. The new neighborhoods demand a contemporary architecture, which would create a sense of place within the community without nostalgically repeating (and often creating "facadism") the architecture of the old American town. *"So hybrid town centers should combine the intimacy of Main Street configuration with the accessibility of strip centers. From the neighborhood side, the commercial center must be pedestrian-friendly, from the arterial it must be auto convenient."* (Calthorpe 22) New developments should convey a tradition set in present times. There is a fundamental difference between nostalgia and tradition: *"Traditions are rooted in timeless impulses while being constantly modified by circumstance. Tradition evolves with time and place while holding strong to certain formal, cultural, and personal principles. Nostalgia seeks the security of past forms without the inherent principles."* (Calthorpe 23)

The convenience of the car and the chance to walk/use transit could be embedded into a natural environment with all the necessary amenities. If, in addition new neighborhood is environment sensitive, we could address most of our daily problems: reduce and for some even eliminate a commute, create affordable homes and gradually reverse the overwhelming destruction of the natural environment. Applied at the scale of the region, the new neighborhoods could balance our dysfunctional cities.

We reached a point where only 20% of middle class can afford a new suburban house. Our current patterns of development are dangerously close to the environmental and economic limits. The current dysfunctional land use patterns create a sky-high cost of infrastructure, land, road maintenance and services. The cost of the new development is judged and calculated on the basis of "first cost" or systems design criteria and not "life-cycle cost". The life-cycle cost

considers not only *"values of the present expenditures of a system, building or institution; but factors it in its long term maintenance, resources supply, replacement expenses and clean up/demolition cost."* (Calthorpe 29) Many current projects, when life-cycle cost is actually considered, turn out to be non-feasible-for example a nuclear power station. Similarly many too expensive in a short run and seemingly unnecessary components of a new development prove to be cost-saving factors in a long run. Street trees can serve as prime example: usually they are omitted from the medium- and low-end developments as being too expensive. And actually matured trees can lower air temperature by as much as 10° comparing to treeless areas. This simple measure can significantly lower air-conditioning bills in the scale of neighborhood over the years. It is a novelty to developers and planners, but *"an ecological urban pattern will be economically sound, and a truly economic metropolitan structure will be ecological."* (Calthorpe 29)

Communities, which provide proximity to: workplace, shops and services are actually affordable for people and also are less costly for government and more environments conscious. Unfortunately "affordable house" is usually associated with government subsidy and low construction quality. It will not be true if affordable neighborhood concept becomes reality. A neighborhood which offers a convenient public transport, inhabitants can walk/bike to services and amenities, where children can play safely, everybody has extra few hundred dollars monthly saved on extra cars and most important: parents can spend more time with their children instead feed them with Prozac. The concept of affordable living, simple as may seem, it's rather not possible with our current zoning policies, inconvenient transit and traffic engineers in charge of urban planning. Government policies choose to subsidize highways, not transit; wipeout mixed use areas and sponsor *"housing types in two large categories: low-density unaffordable or high-density undesirable."* (Calthorpe 30)

Infill and redevelopment present a good approach toward a mixed use neighborhoods. It is the best way of utilizing existing infrastructure, preserving open space. It can not, of course, absorb all new developments, simply because there is not enough land *and "no-growth neighborhood groups inhibit development of infill sites."* (Calthorpe 31) Most urban centers have tried an urban infill for the last three decades with some success, but most of them failed to perform. The problems causing this are: *"racial tensions, economic stagnation, gentrification, ossifying bureaucracy, cheap suburban alternatives, deteriorating schools, and red-line appraisals."* (Calthorpe 31) There has to be a clear approach for eliminating and solving these constrains, *"a regional political force to balance the larger economic and environmental needs against the anti-infill tendency of individual communities."* (Calthorpe 31) The City of Portland, Oregon can serve as a prime example of a region breaking beyond common guidelines for urban infill and redevelopment. The Urban Growth Boundary (UGB) was established in 1972. The state-mandated policy limits the development around the core Portland. Also the clever and convenient Regional Light Rail System is spanning throughout the region, maintaining a healthy proportion of growth between Downtown Portland and suburbs. *"A site on the light rail line in the downtown recently captured a major regional shopping center. A good example appropriate infill, the design of retail center respects and reinforces the traditional urban fabric of Portland, rather then interrupting its pedestrian-scale city blocks with a typical mall configuration."* (Calthorpe 32) Approximately 40% of families living in Portland do not own a car (!) and a major, 4 lane through city highway was converted into green public spaces. It is a prime example of sensible, humane developments in the country, where more money is spent on annual car advertisement then on public transit.

There is one more factor, which would certainly help in reinventing our cities and suburbs back into "humane" environments. This factor is an expanding "Digital Revolution". It

is by far much more powerful factor influencing the direction of our future than fundamental change in planning policies, enlightened developers, conscious and informed people.

The phenomenon named World Wide Web (WWW) took off some time in 1993. It was the lightening bolt which ignited the new era of the Information Age. Similarly to the past milestones changing our world forever - the agricultural revolution and following urban revolution ignited by the invention of the wheel and the plow, and the industrial revolution conceived by the Renaissance -*"the post revolutionary social dynamics have gathered seemingly unstoppable momentum. They are rocking our institutions and rolling our surroundings. They are creating new opportunities and closing off some old ones."* (Mitchell 12) The new digital information infrastructure will eventually be capable of collecting and delivering any information through a single digital channel. Rather than creating a new relation between a man and a machine (just like in the industrial revolution), this global network will reconstruct affinity of man and information. *"It will increasingly become the key to opportunity and development, and the enabler of new social constructions and urban patterns."* (Mitchell 15) Just like the past technological inventions changed many cities and nations - network of roads and aqueducts in the ancient Rome, steamship in 18th century, railroad in the 19th century and the electricity in the early 20th century - the latest networks of digital telecommunication will play a similar role. Furthermore, similarly to the past transformations, the digital infrastructure will not create a totally new urban pattern from "the clean slate". It will rather transform existing fabric. *"Generally in the past, new urban networks have started by connecting existing activity nodes that had been possible and sustained by earlier networks. (...) Then, like parasites taking over their hosts, they have transformed the functioning of the systems on which they were superimposed, redistributed activities within these systems, and eventually extended them in unprecedented ways."* (Mitchell 15)

The new unfolding Digital Revolution will offer us new choices, often attractive, which will compete with a traditional, site-based businesses and institutions. Will people still physically commute to workplace or start telecommutes from home base office? Will we go shopping or order on-line? Will we go out to theatre to see a movie or download from the Net? Will people gather at café or have virtual friends? Even if this takes place, it will not happen overnight. Our social relations and long-established settlement stereotypes will change gradually, erratically and incompletely. So the result of this emerging reality will not be overnight, "out-of-the blue", overwhelming "Land Of Digital Tomorrow". The major change for the individual will be in reconfiguring the basic aspect of our lives: our places of living. Regardless of changes people will still need a place they can call home and will live with smaller or larger groups of people of their choice. Homes, although transformed, will maintain to be the main place in our lives. It will become a focus of architectural design and modification induced by the new order. Just like the Industrial Revolution separated home from work, the Digital Revolution will reunite them again. There will be increasing number of digitally and electronically enabled home & work hybrids. Of course it does not mean that everybody will be transformed to "@home" employees & employers, and that the conventional workspace will simply vanish. The new, electronically equipped home of the 21st century will need more than just a transformed garage or den into a digital home office. The whole space planning will require a fresh approach. There are two basic conflicts: home as a refuge and home as a workplace and an agreement between private life and networked virtual reality equipment. Temporary and quick solutions of converting the bedroom into sophisticated electronically equipped workspace will not last in the long run. New housing type, a modern version of Japanese *machiya* has to be invented. The original *machiya* were carefully design townhouses placed on long and narrow city blocks, where craftsmen sold their products on the display in front of their home. Contemporary *machiya* consists of a mixed use city blocks: restaurants,

homes, offices and small workshops are tangled into colorful communities. Such approach is of course in direct conflict with zoning policies, which promote single use blocks with prescribed architectural solutions. Zoning policies require separation between uses, presuming that commute create noise and pollution. In the digital era there will be a great reduction in number of people travelling to work, so the rigid zoning policies based on reality which existed years ago have to be abolished. Telecommunication based employment offers the merger of work-live spaces. It has to be assessed in the scale of floor plan, not the colorful map portraying general land use patterns. The shift in the workforce composition will create a great demand for the digital homes. If, for example, more women fill high-end professional positions, the traditional spatial and mental differences between professional and domestic part would be difficult to maintain. People will have to become more elastic working both shorter/longer and flexible hours. On the other end it seems that the employers would benefit the most from such arrangements. The change of workplace location frees up the company from providing space for employees and it also makes difficult to ensure employment standards. Home based workplaces could transform into home based sweatshops.

For better or for worst, the role of our places of living will increase significantly. Our primary social relationships - direct interactions with spouses, children, parents etc. will likely remain close and face-to-face. The urbanist Melvin Webber foreseen the live/work communities as a direct consequence of advanced electronic technology. He wrote in 1960: *"For the first time in history, it might be possible to locate on a mountain top and maintain the intimate, real-time and realistic contact with business or other associates. All persons tapped into the global communication net would have ties approximating those today in a given metropolitan region."* (Webber 1092) This quote creates an unattractive vision of urban centers becoming an endless, bleak and alike looking suburbia. But since the Digital Revolution creates a location freedom, what would make people live in the particular settings? *"The advantages (or disadvantages) of a*

particular residential site are a compound of its local physical, economic, and cultural attractions together with the costs-including time cost-of gaining access to related destination or necessary service." (Koopmans 53) People are forced to compromise between: an unattractive residential area offering easy employment access or increased commute time & cost as a penalty for attractive residential neighborhood. Virtual workplace creates an opportunity of great freedom to choose a living location. If one is free to go anywhere and still maintain an attractive career, why settling down in a heavily polluted industrial region? Cities like Venice for example, with unique history, settings, architecture and culture could actually profit from the Digital Revolution. Venice's population has been declining for years now since there is not enough space for industry or commercial space and the city does not bring enough revenue to support itself. Digital infrastructure however could be applied to city's fabric much more gently then adapting it to the demands of the industrial age. The Digital revolution does not unfortunately help much the areas with no natural qualities or people forced to stay in underserviced areas.

The new work/live environments of 21st century will create neighborhoods open 24 hours. And since the attractive areas are not evenly distributed throughout the world, there will be communities adjacent to them. There is a great possibility of achieving a whole variety of new "24-hour" communities: contemporary suburbs, mostly empty during the day and similarly empty downtown at night, will be revitalized by introducing full-time residents into their surroundings.

Another effect that the Digital Revolution creates is the shift in *secondary social relationship:* people we encounter on the regular basis: their faces and names are familiar, but we are not interacting with them as close as in the *primary relationships.* This group includes our co-workers, salespersons, friends etc. Until Industrial revolution secondary relationships were consolidated locally within the neighborhoods. Industrial Revolution diffused them beyond the

immediate community; mobile dwellers could interact on the daily basis with people at work and other institutions important to their routines. The new 24-hour neighborhoods will alter the social patterns yet again. Some will gradually simply disappear: retail workers, bank tellers etc. Some of the new secondary relationships will be within the community and the others will form as a distant virtual reality interactions and sporadic face-to-face encounter. They will be a hybrid of industrial era social associations, but both at much smaller and larger scale.

The Digital revolution will allow (at least to some extent) to divert everyday activities back to home. The birth of the 24-hour neighborhoods abundant in diversity and activity will potentially create a window of opportunity for a healthy, interacting community. Given a chance, they will achieve what Jane Jacobs praised in *"The Death and Life of Great American City"*: diversity, small-scale blocks, mixed use, lively neighborhoods and green refuges. It is most likely the best case scenario in the argument between advocates of globalization and Guardians of local identity and culture. The Digital revolution will create of course not only winners, but also failures. Most houses will prove to be impossible to adopt to changes, a lot of suburbia/downtown will not be attractive enough for a new telecommunication infrastructure: especially low-income areas, which usually draw less investment. Many areas will lack the population with sufficient education or the nature of their profession will not allow them to benefit from the changes. There is a strong possibility that transforming urban patterns will further alienate run-down and neglected neighborhoods. In the worst case scenario the chosen urban district could transform into gated community within the sea of neglected, underserviced, underdeveloped and lacking digital infrastructure neighborhoods. We could end up with a hybrid named "dual city": urban sectors *"that are spatially and socially polarized between high value-making groups and functions on the other hand and devalued social groups and downgraded spaces on the other hand."* (Castells 28) Nevertheless *"in the hot spots of new development that emerge as the twenty-first century unfolds, there will undoubtedly be*

opportunities to create neighborhoods, and even whole new cities, that are organized to take advantage of emerging opportunities for dematerialization, demobilization, mass customization, and intelligent operation." (Mitchell 154) The alterations and renovations to the existing buildings, both private and public, will be a main focus of the future transformation. It will be however much "softer" than changes demanded by the industrial revolution. There was a demand for vast zones industrial zones, complex transportation systems, compacted residential buildings and downtown office towers. Cities, which fulfilled the requirements of the industrialization, grew and brought prosperity for some. The changes were often harmful to old neighborhoods, workers lived in horrific conditions, pollution and noise became a problem and highways and railways abruptly divided city's fabric. Luckily the Digital revolution does not requires such sacrifices. The physical effect of the telecommunications infrastructure is much more kind and less visible in terms of its physical aftermath. Digitally serviced work areas do not have to be consolidate in large, single use zones; but can be dispersed through mixed use neighborhoods without altering and destroying natural environment.

The truly "green" urban experience of the 21st century will depend less on gathering of things and more on the flux of information; less on geographic location and more on the digital coherence. The existing places and buildings will be adapted to changes by *"rewiring hardware, replacing software, and reorganizing network connections rather then demolishing physical structures and buildings new ones."* (Mitchell 155) The particular qualities, which can not be digitally transported: climate, culture, settings of a particular place and what is more important - face-to-face connection; will predominate. Physical qualities of life will be interwoven with digital ones, rather then being replaced by them. *"Sometimes we will use networks to avoid going places. But sometimes, still, we will go places to network."* (Mitchell 155)

Historically communities used to create a meaningful dialogue with nature. Local conditions set the physical limits to the built environment and created an identity.

Contemporary built environment is threatening the natural environment with a deadly effect: within the approximately last 100 years we managed to destroy more than in our whole 20000 years of *Homo sapiens* existence. We created a phenomena on a global scale: polluted water, air and soil, depleting ozone layer, greenhouse effect, acid rain, deadly toxic waste - list could go on and on. Our planning policies create vast areas of heat generating, water diverting, valuable land consuming parking and highways. Our architecture is creating buildings ignoring site conditions; climate non-conscious cubes consuming excessive amounts of energy and discharging toxic vapors.

Nature should form the natural order and structure of the built environment. It should help to create the unifying identity of the neighborhood. Different types of the natural systems and space should define the city: mountains, rivers, bays, lakes, forests, agricultural land and parks. Each component is working at a different scale, some shaping the region and some giving the unique features to the neighborhood. *"The effort to create more compact, walkable communities must be complemented with three orders of open space: those that define the edge and limits of the region, those that form a large scale connecting network within the region, and those that provide identity and recreation within the neighborhood."* (Calthorpe 26) At the scale of the region, built environment should be composed into the natural system. Growth boundaries should be balanced between next generation growth and sponsor identity, infill and redevelopment. Natural features should promote regional network of parks, trails and bike paths. At the neighborhood scale nature should not be used as a buffer zone between single uses. Green areas should be a *"formative element, providing the focus and order of the neighborhood."* (Calthorpe 26)

ARCHITECTURAL PROGRAM

This part will establish a set of guidelines and information, which will be the "driving" force behind the design of a block in Victoria. It is rather a suggestion in terms of proportion and type of uses. I felt that a rigid list of building types with pre-set areas, densities and number of parking stalls would create a new "zoning by-law", so I would be in a point of departure. This approach will hopefully allow for the creation of a contemporary, mixed use and environmentally sensitive downtown block. However the city block cannot exist and function as a separate entity-"a Black Hole" taken out of its context, so the overall concept and solutions will provide for the "symbolically supported" adjacent areas. The guidelines will set a departure point for the project, which will mature within the design process.

The Transit Oriented Development (TOD) seems to offer a good approach toward abolishing single use blocks and drive only environments. The concept behind urban TOD is to establish an area with medium to high residential density-*"minimum 12 units per net acre and an average of at least 15 units per net acre."* (Calthorpe 83), public building and spaces, retail, services and workplaces compacted in a mixed-use neighborhood within an approximate walking radius of 600 meters and located at transit access. TOD will provide an alternative to mostly unsuccessful urban infill or redevelopment practice by providing an opportunity for some residents to live and work within one neighborhood and for others to commute via a convenient rapid transit system. A desirable mix of uses for the urban neighborhood should contain approximately 5%-15% of public use, 30%-70% of commercial/retail use and 20%-60% of residential buildings. The street system has to be inter-connected, simple, identifiable and easy to 'remember' and lead to meaningful destinations such as: transit stop, public area, school, stores etc. Bicycle paths have to be a standard ingredient of each street, so people could move around the neighborhood. The use of *cul-de-sacs* has to be limited in order to avoid excessive vehicle traffic on a single connector street. A public area has to be provided to awake a sense of

community and identity in residents. Overall concept of the neighborhood should promote energy conservation of the entire site, not individual buildings only. Intelligent building design and orientation should promote a balanced mix of environmental design concepts.

Similar concepts were already in existence included: Compact Communities, Urban Villages, Traditional Neighborhood Developments and Pedestrian Pockets. Although calling for a similar mixed-use development, these concepts missed the importance of *"integration of transit on a regional basis."* (Calthorpe 41) The concept of TOD includes a regional perspective which will *"help to define a meaningful edge for the metropolitan area, eliminating the danger of random growth in distant sites served only by highways."* (Calthorpe 41)

Transit stations should be designed as a focal point of the neighborhood and strategically placed so people are encourage to "walk & ride" or to "bike & ride" and not to "park & ride". "Lost space" - parking should be planned in order to achieve less dominance within built and natural environment. They should not limit in any way the pedestrian/bike access to the commercial/retail buildings. My first presentation was an overall attempt of integration of different uses within a city block. I have selected a standard block located in Victoria, B.C. The area is best described as a "passing through zone". It is a transitional zone between downtown commercial core (offices and tourist-oriented retail) and purely residential zones stretching east. Buildings of every sort are randomly placed throughout the area. Residential towers are juxtaposed with one and two storey heritage buildings, surrounded by cheap "park-while-you-work" asphalt parking. Multi-lanes wide, one-way streets, serving as commute routes to and from downtown, enclose city blocks in that area.

In consideration of the fact that pedestrians and bicyclists are one of the components of a lively, diverse neighbourhood, I decided to break-up my block with a series of pedestrian/bicycle paths. The paths would be placed over and into an existing grid. Most importantly, they would change elevations: going over a four lane street; bringing life to abandoned 2nd storey commercial space;

become a top part of an outdoor amphitheater seating, going through a building and changing elevation to connect with an existing sidewalk on the other side. The paths would create important linkages between blocks. These linkages would not only bring back life to streets, but would also gradually force a shift in our present regulations: no setbacks, no Floor Space Ratio, no parking calculations, no height limits.

During the discussion, which followed my first presentation, both the jury and I came to conclusion that I could dissolve a traditional city block. There was no need to maintain a rigorous rectangular site. Since the pedestrians/bicycle links were no longer confined to a street level, I could create a whole new scenario. The traditional street plane could be divided into different levels and even warped, leaving only some streets following the existing grid.

The jury recommended that I increase the scope of my study and attempt to present a larger area, measuring a few city blocks, and investigate how it might look given the new findings.

My second presentation was, as described by the jury, very poetic and full of metaphors. I selected a larger area, consisting of a few blocks and created an image of a pedestrian friendly, lively neighbourhood. The jury recommended that now I concentrate on a smaller area of my choice and explain it in more detail for the next presentation in order to define the 'experience' of living/working at a more tactile level.

I have selected an area, which represents approximately a standard city block. I tried to integrate and incorporate a variety of uses in order to create a diverse and ecologically friendly city "block". I tried to explain, through the series of slides, what makes it "work" and why it is different from the status quo - an 'enhanced' urban experience.

In my study, I have researched contemporary attempts toward changing the North American City block. Each of them concentrated specifically on selective issues, but they failed to recognize the holistic approach:

-Urban infill & renewal: usually works on a scale which is too small to have a wide impact on a whole city, residential units are too expensive for an average family and environmental issues are rarely taken into a consideration.

-Mixed use zones: a "softer" version of a standard zoning by-law, still prescribes solutions and does not leave many options for architects, does not take the issue of rapid & convenient public transit into a consideration, "islands" of vital areas exist out of city context, residents still commute and environment protecting solutions are not implemented on a city scale.

My attempt is to perform a research and study of those approaches.

In my final design I have synthesized a few known solutions and created a holistic approach toward the city block and city itself (since the block does not function as a separate entity). Since it is possible to accomodate only so many uses within a given area, my final project explains in detail a selected part of the new neighbourhood. It is not intended to be the definitive blueprint for a future lively urban experience; rather it represents one of the many possible ways of achieving such feeling. Everybody is different and architects can not please and satisfy everybody's taste and expectations. I believe that my project achieved a goal stated in the abstract.

Is it possible to achieve such an integration and variety in North American cities today? It is certainly possible, but not in the present 'economy of waste' and piecemeal development.

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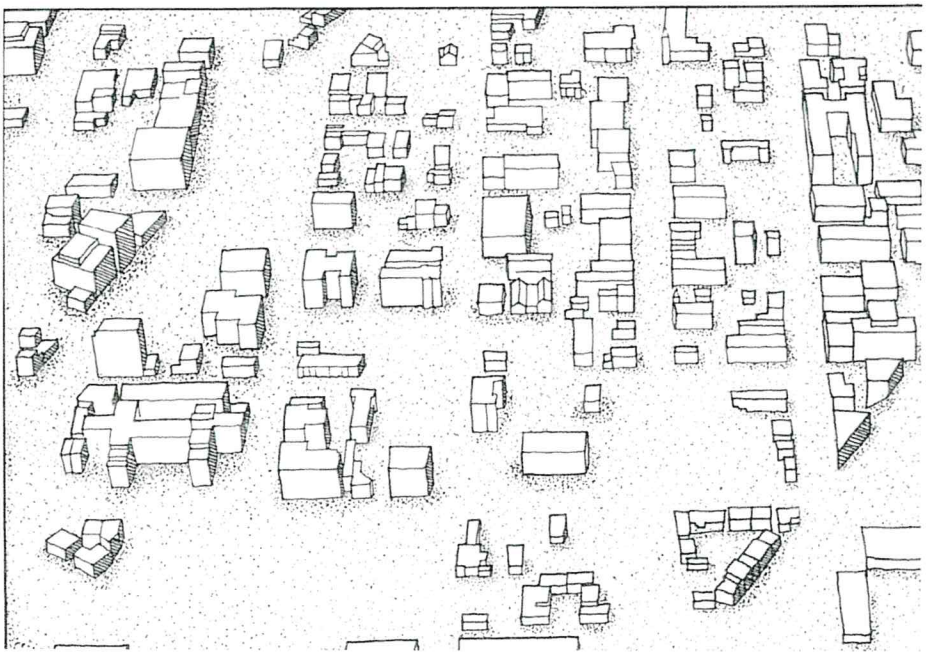
Fig.1 Washington, D.C. Aerial photograph.
Single use downtown blocks require vast areas dedicated to movement and storage of vehicles

Sketch below of the same site clearly shows how "lost space": parkings and multilane streets destroy the consistency of the urban fabric. Individual buildings do not relate to each other.
(Photograph Trancik 6)



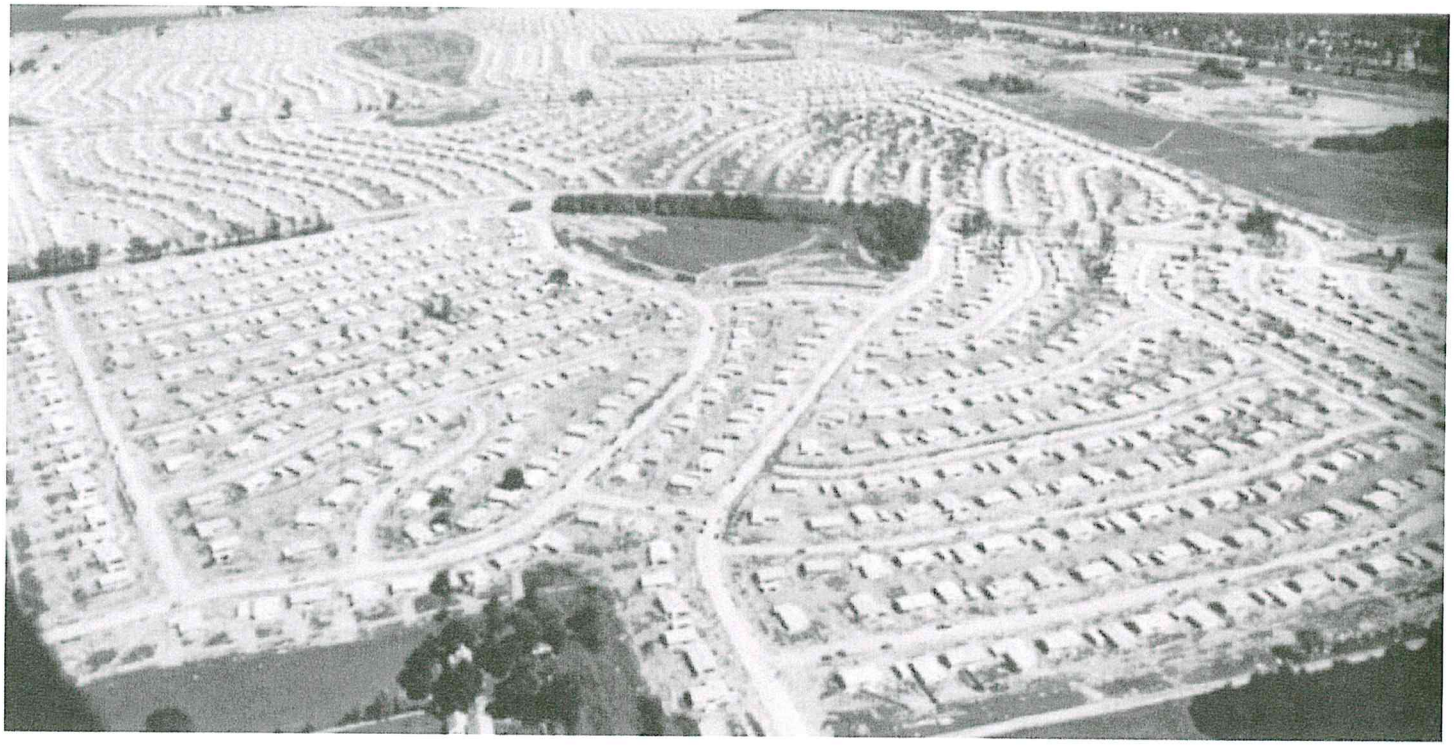


Fig. 2 Levittown, Pennsylvania. 1952-58
Typical North American suburbs. Maximized private space and minimized common public areas.
(Photograph Trancik 54)

Fig. 3.

Fig. 4. Syracuse, New York, 1983
Lost space along the highway.

Fig. 5.

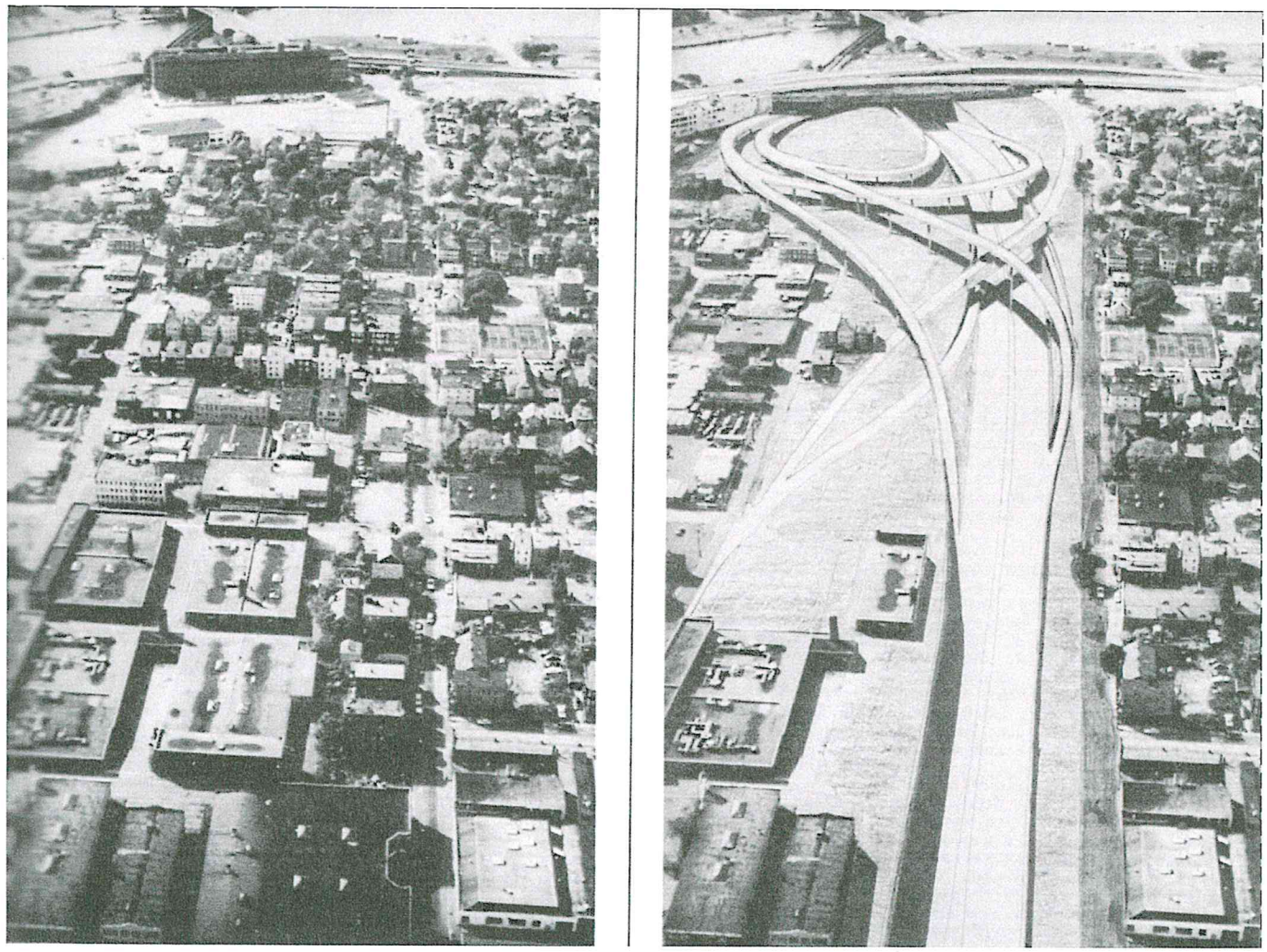
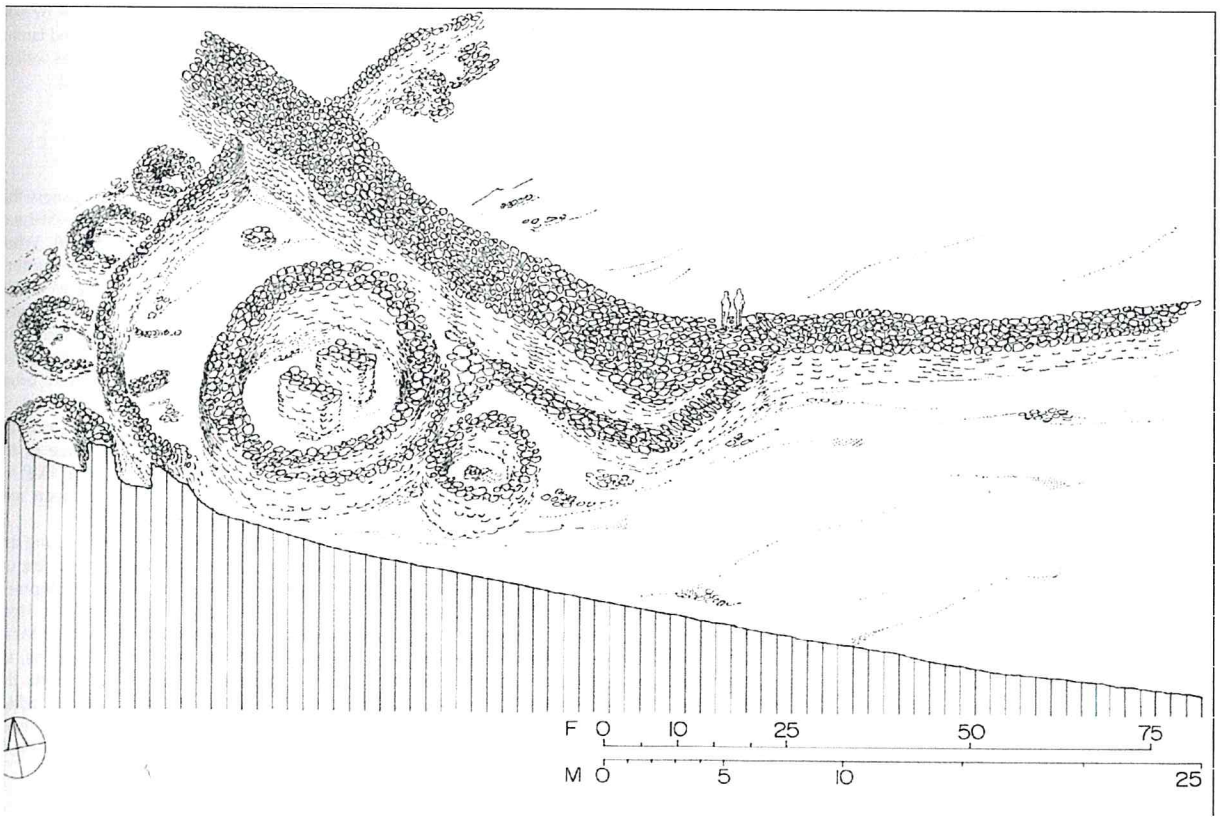


Fig. 6. Cambridge, Massachusetts. Before (left) and after (right) the Interstate highway construction. Fortunately successful neighbourhood opposition halted the proposed highway, which would have destroyed old neighbourhood and divide a vital community into two parts.
(Photograph: Trancik 7)

Fig. 7. Jericho, (Israel). Wall showing superimposed layers, ca. 7500 B.C. And later. (Kostof 42)

Fig. 8. Khirokita (Cyprus), Neolithic settlement, ca. 5500 B.C.; Plan (Above) Below-Village "square"-an enlarged south area of the above plan. (Kostof 48)



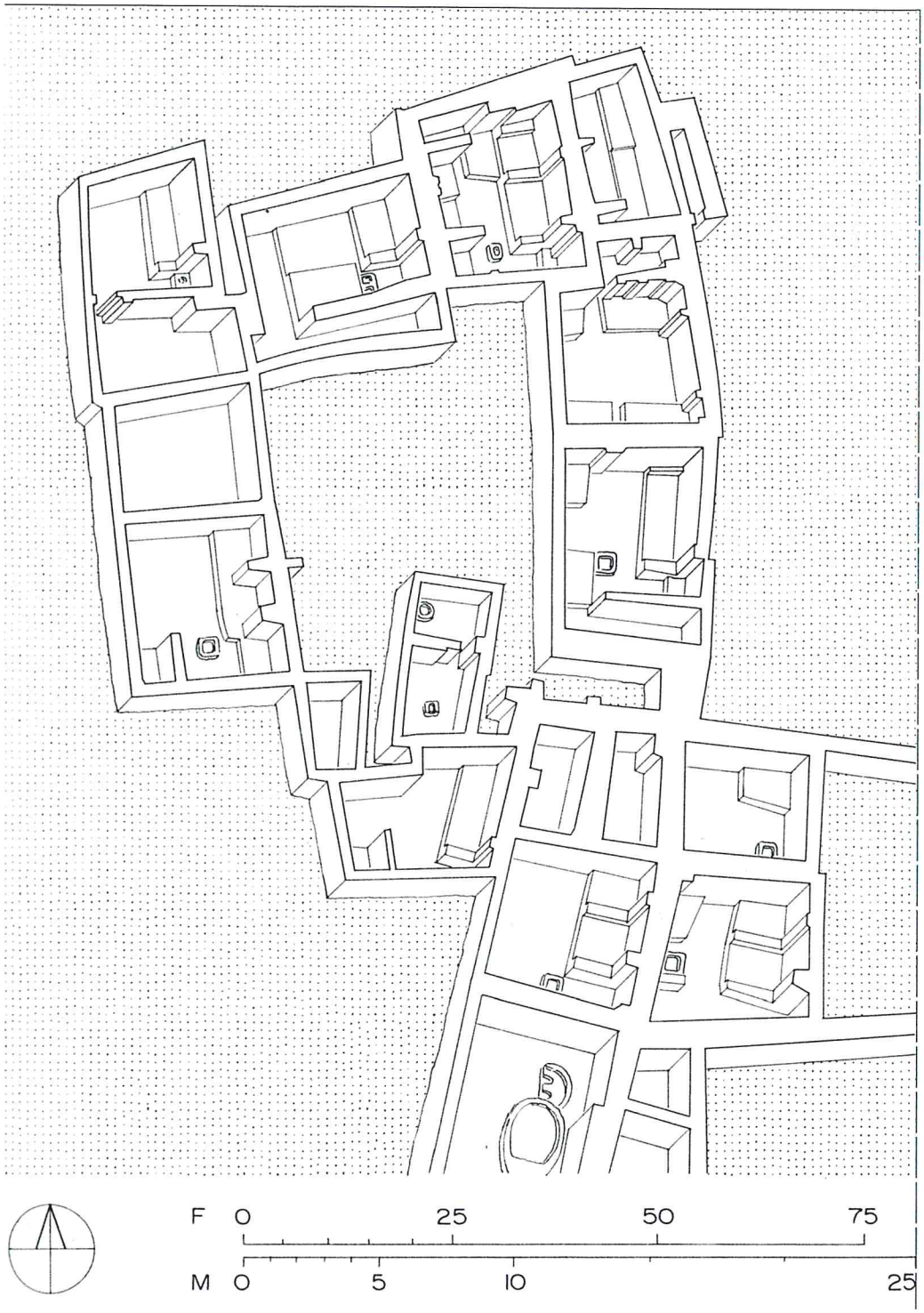


Fig. 9. Catalhoyuk, (Turkey), Neolithic settlement, 7000 B.C., Residential area. (Kostof 48)

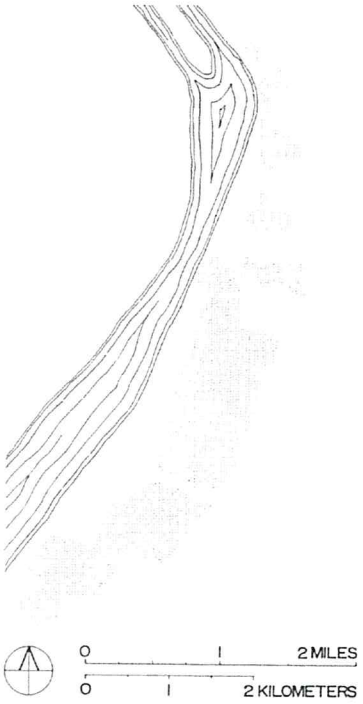
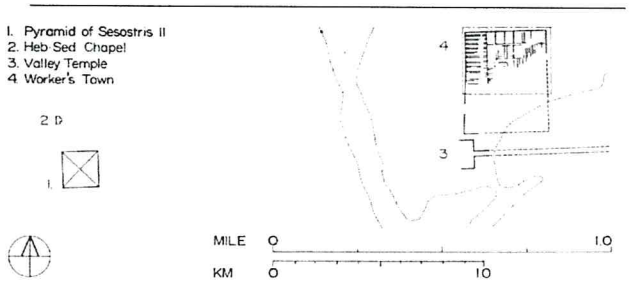


Fig. 10. Amarna (Upper Egypt), diagrammatic plan of layout, showing the relationship to the Nile and the course of the main streets. (Kostof 70)



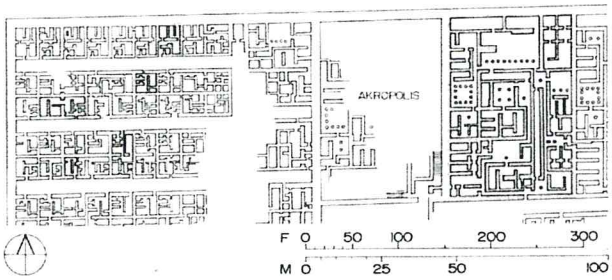


Fig. 11. El Kahun (Lower Egypt), the workers' town at the pyramid site of King Sesotris II (1897-1878 B.C.)
Top: site plan showing the relationship of the pyramid, the temple and the town.
Middle: plan of the excavated section.
Bottom: a detailed plan of the north-west part, showing workers' housing to the left and the ampler quarter for government officials to the right. (Kostof 69)

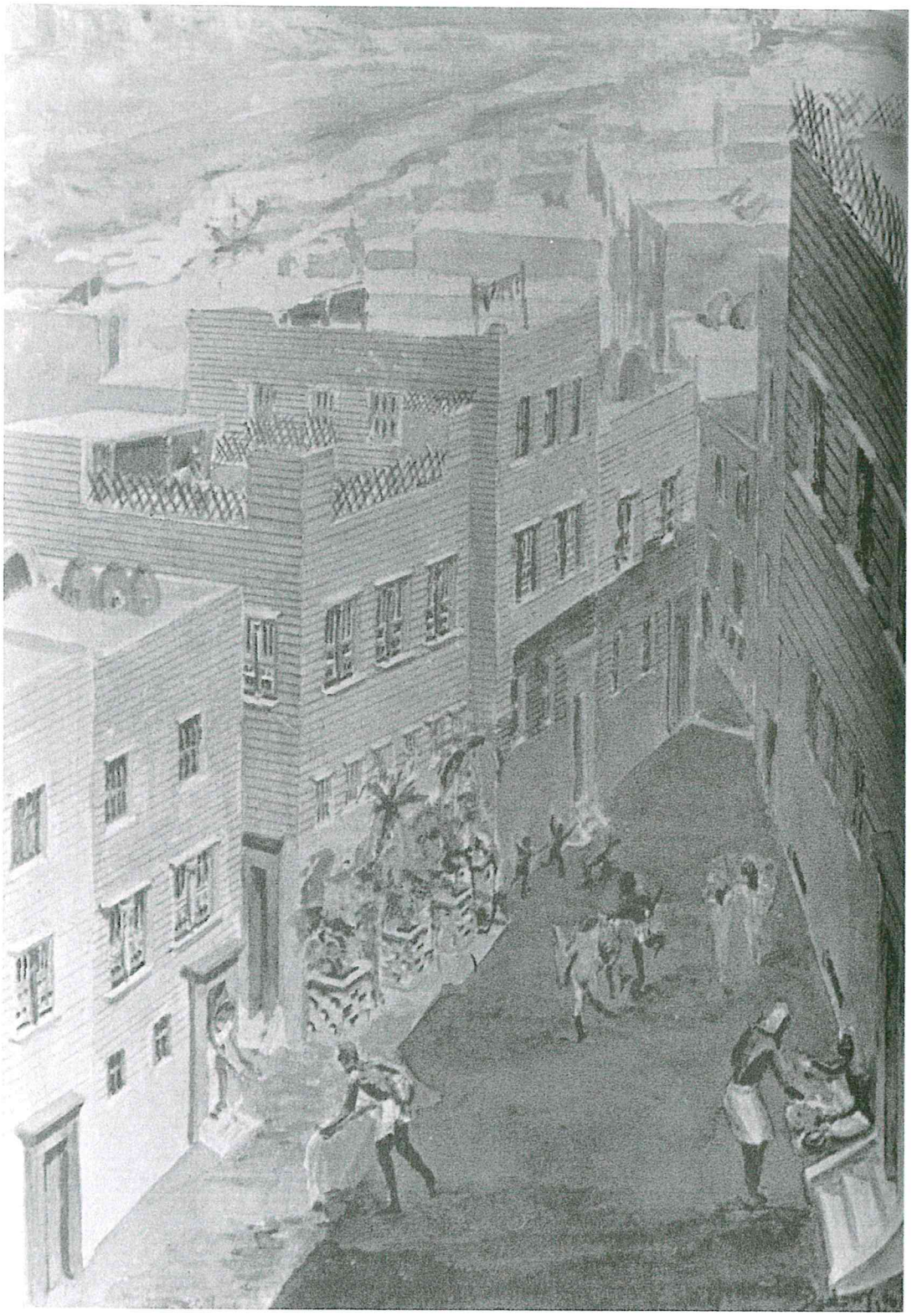


Fig. 12. Thebes, a street, ca. 1500 B.C.; reconstruction, perspective drawing. (Kostof 82)

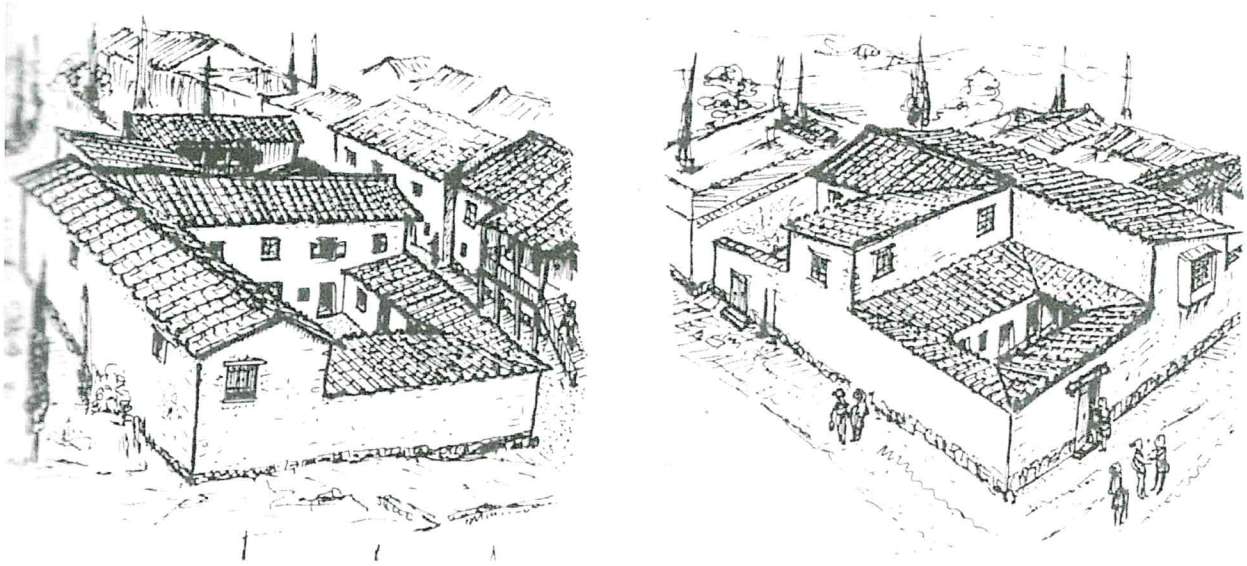


Fig. 13 Athens, houses of the fifth-fourth century B.C., reconstruction view.

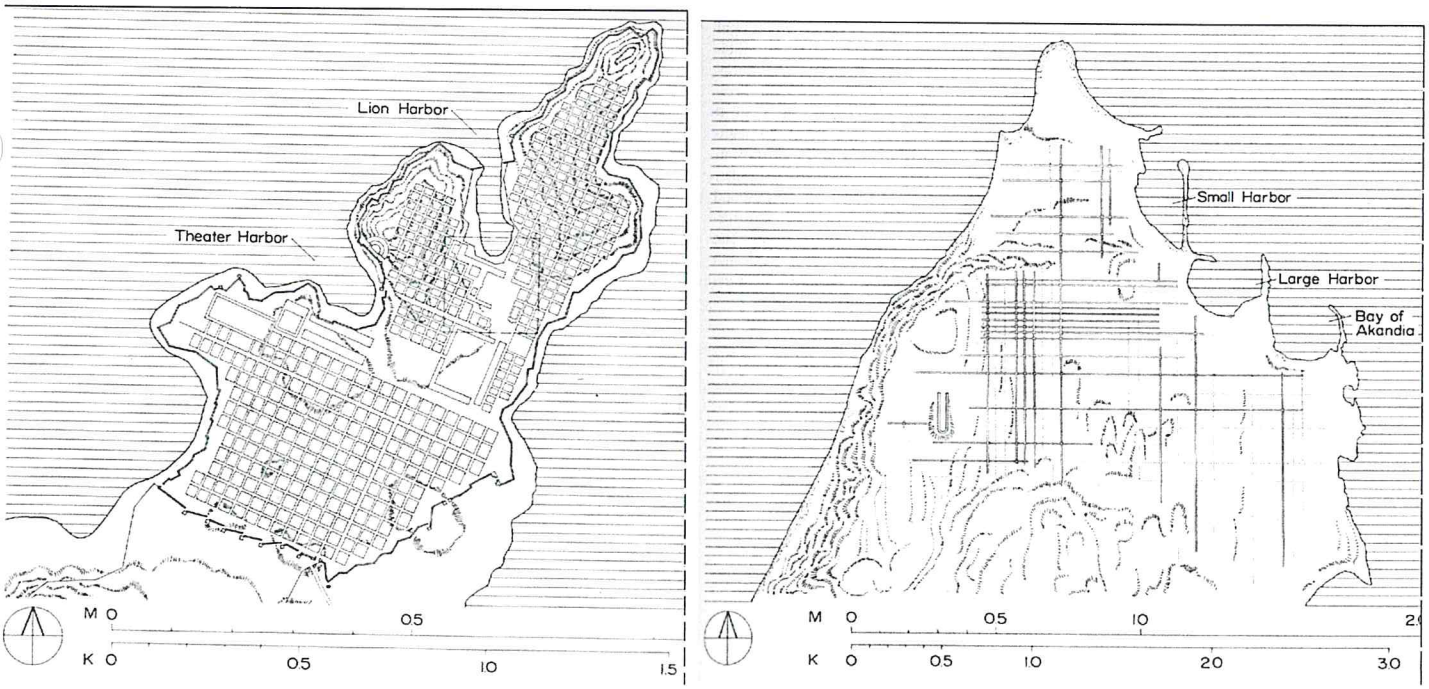


Fig. 14 Above: Miletus (Turkey) ca. 479 B.C. (Kostof 142)
Above rightRight:Rhodes (Greece), founded in 408-407-B.C. (Kostof 143)

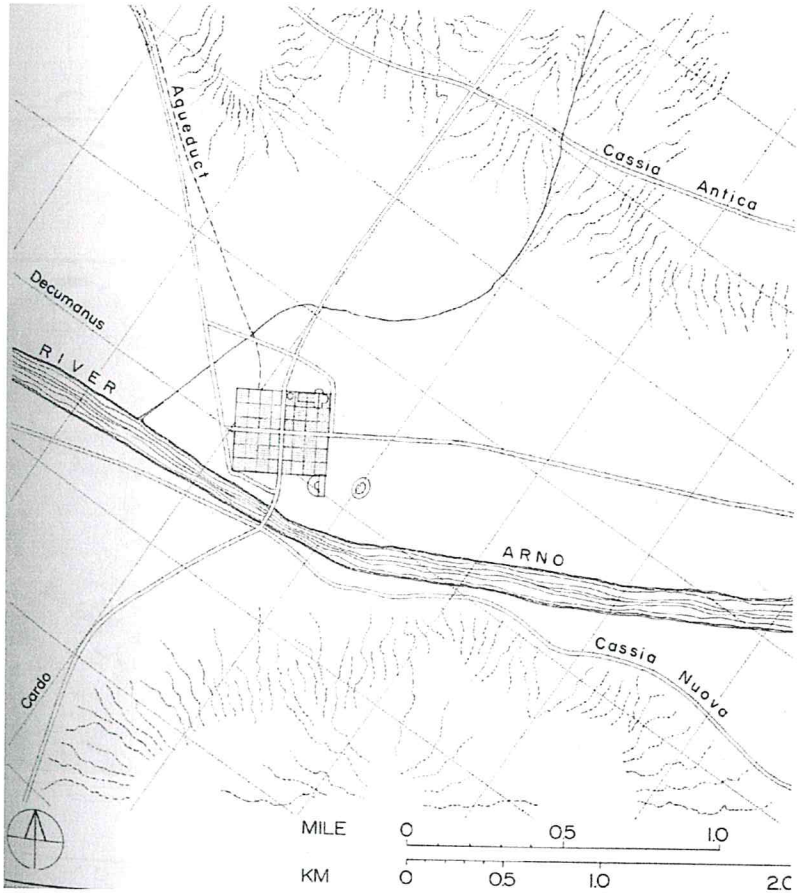


Fig. 15 The Roman colony of Florentia (later Florence, Italy) founded in 59 B.C., Shown in relation to the ancient highway and the centuration grid of the territory. The town is oriented toward the four cardinal points; the centuration is generated by the river course and the land contours.

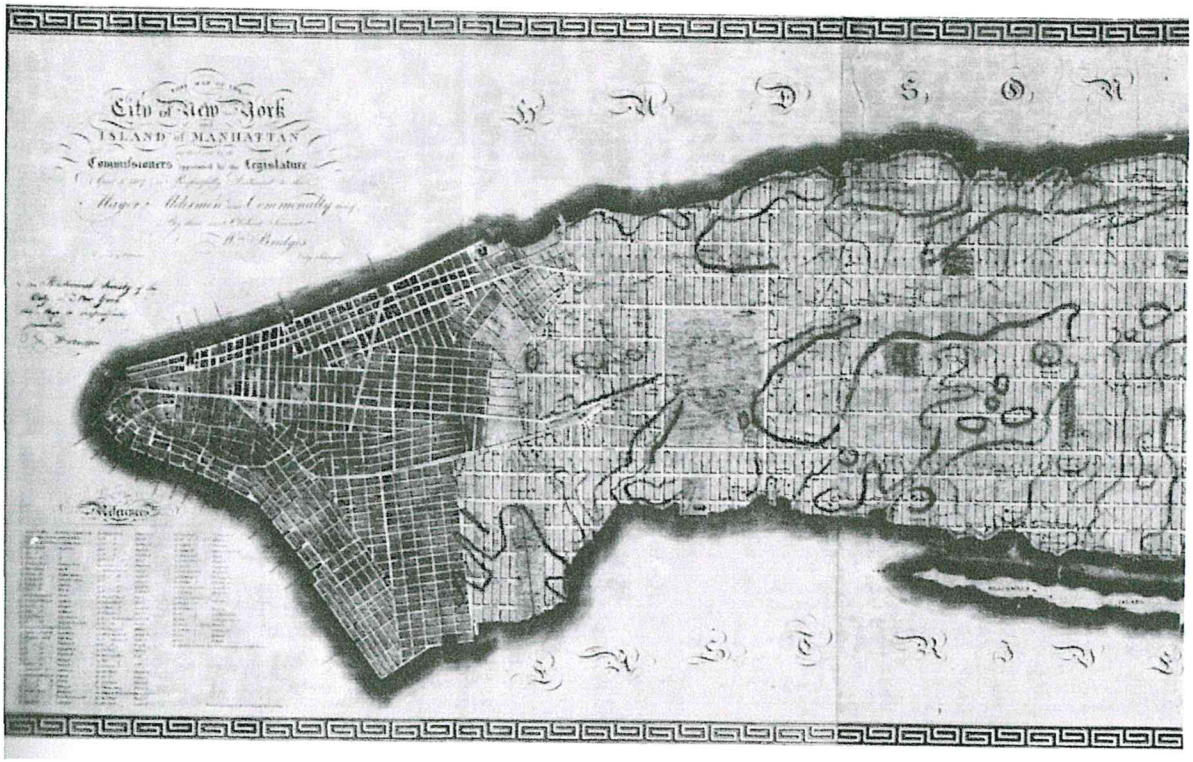


Fig. 16 New York, the Commissioners' Plan, 1811; detail.

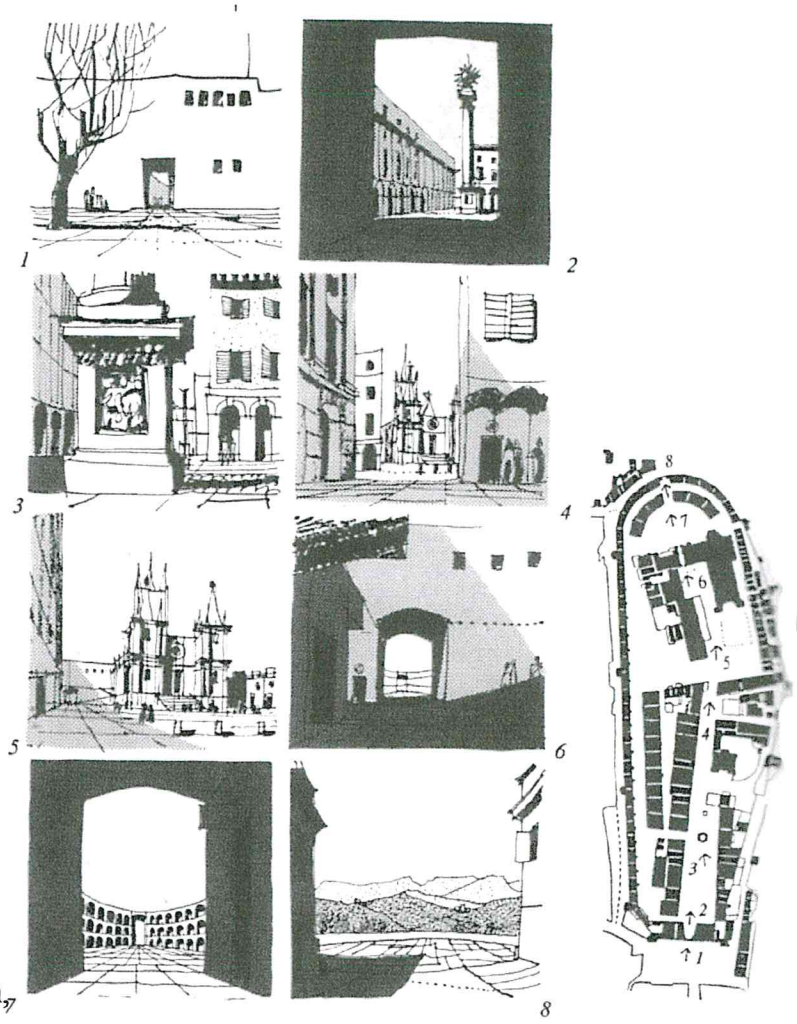
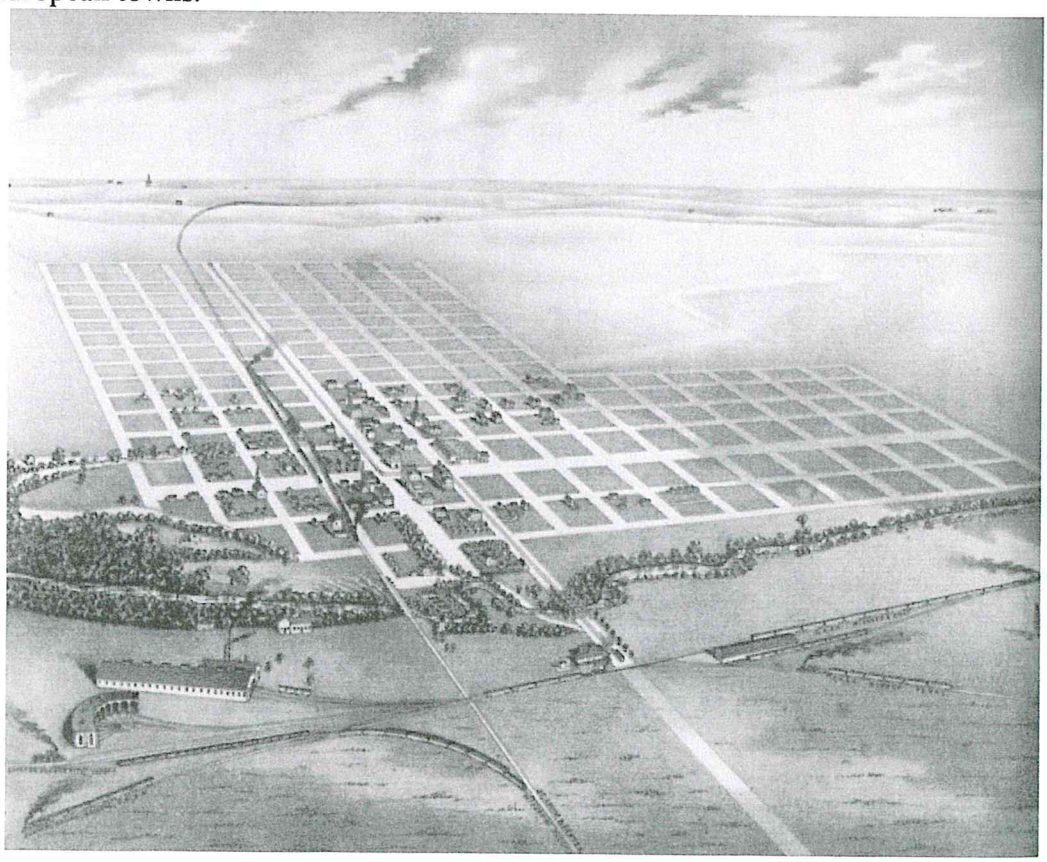


Fig. 17 Gordon Cullen. Perspective sequence of townscapes. Gordon Cullen's graphic illustrations of the experience of moving through urban spaces capture the unique sense of place from street level. (Trancik 122)

Fig. 18 Below: Herrington, Kansas. 1887 Dispersed and piecemeal development was encouraged by this uniform application, and cities rarely developed the compact, organic form of evolved European towns. (Trancik 34)



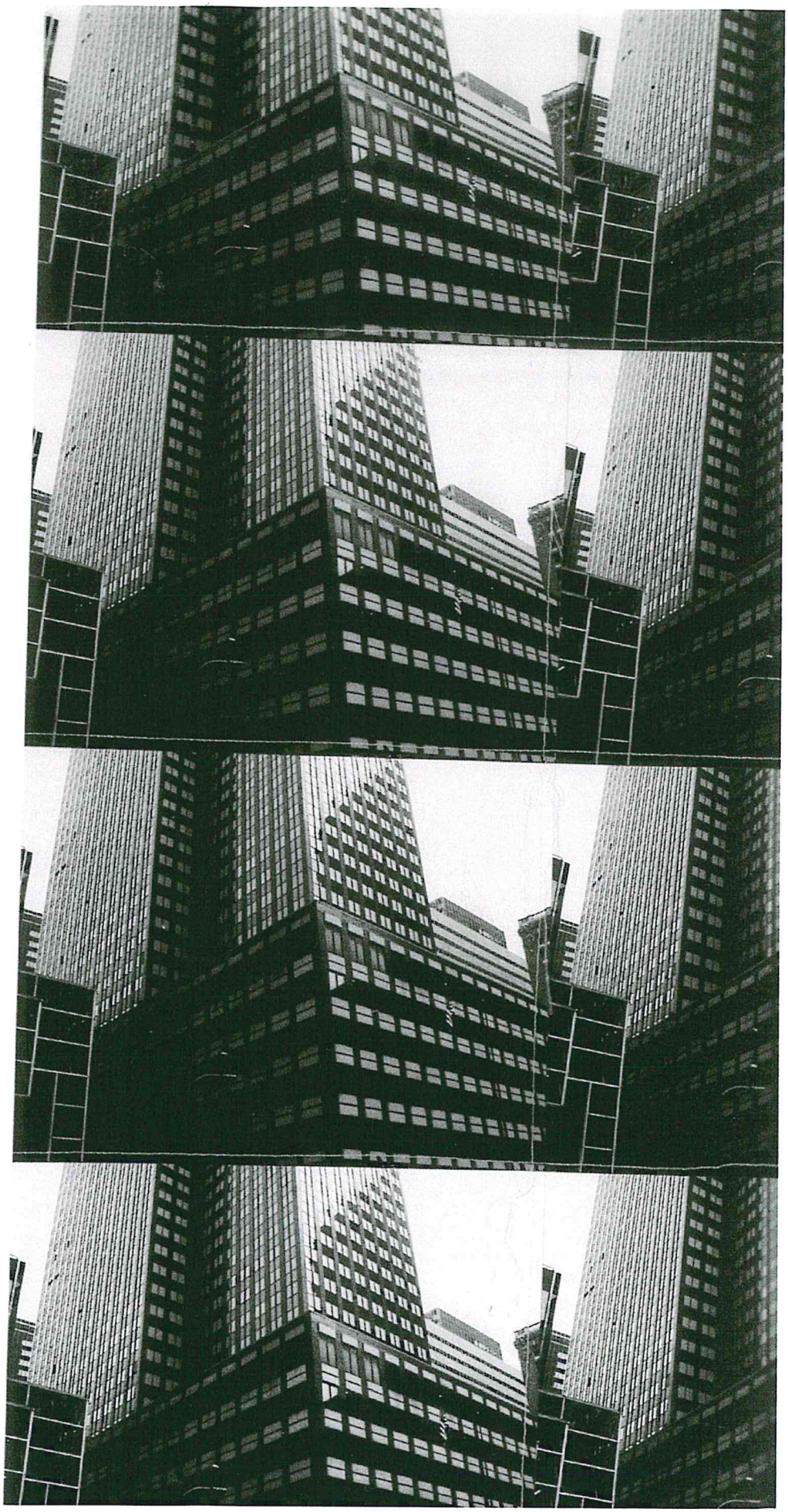


Fig. 19

Fig. 20

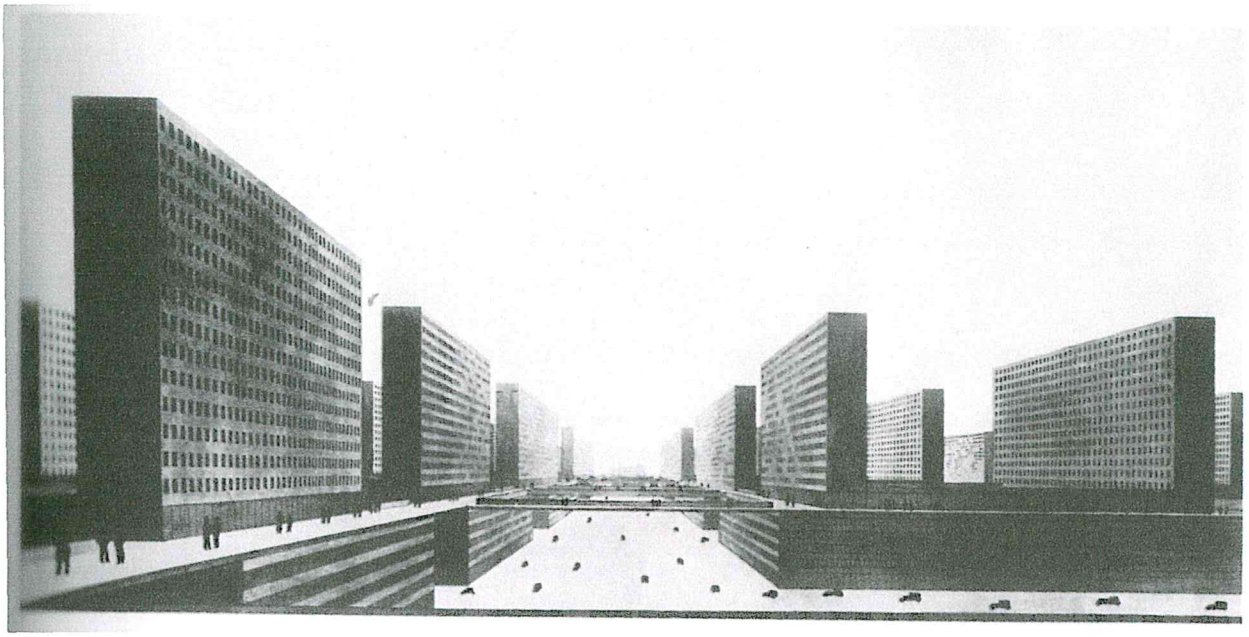


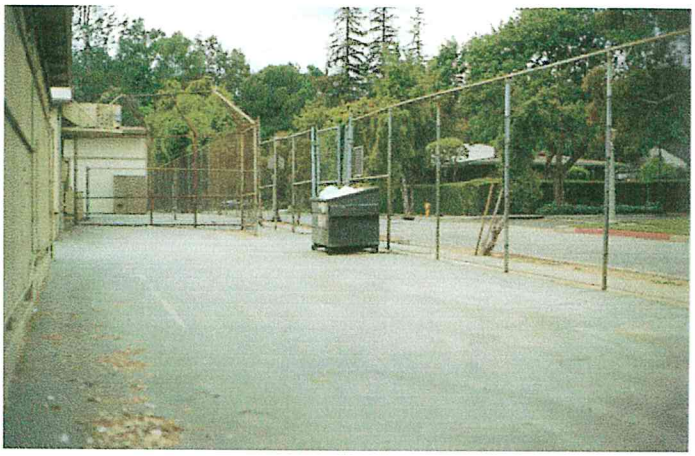
Fig. 21 Ludwig Hilberseimer. The Ideal City. 1920.
The Modernist utopia of high-rise buildings in straight, parallel rows.
Traffic systems are separated and functions are carefully zoned. (Trancik 23)

Fig. 22 Gardsten, near Goteborg, Sweden.
Many communities have been constructed
on the principles expressed in Hilberseimer's images.
Both traditional figure-ground relationships of cluster
or groups and the accommodation of building to human
scale are lost in such environments.

Fig. 23

Fig. 24

Typical and possible.



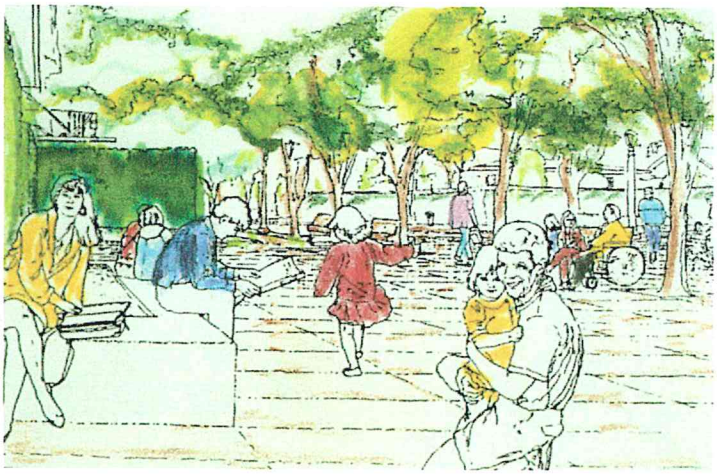


Fig. 25 Urban open space.

Fig. 26 Pruitt-Igoe Housing Project. St. Louis, Missouri.
Known as the most notorious of failed urban housing projects.
The disaster was the result of inappropriate design,
misunderstood social needs, and poorly conceived public spaces.
The only solution remaining after 17 years was demolition.
(Trancik 15)

Fig. 27 Federal Reserve Bank, Boston, Massachusetts.

Fig. 28

Fig. 29

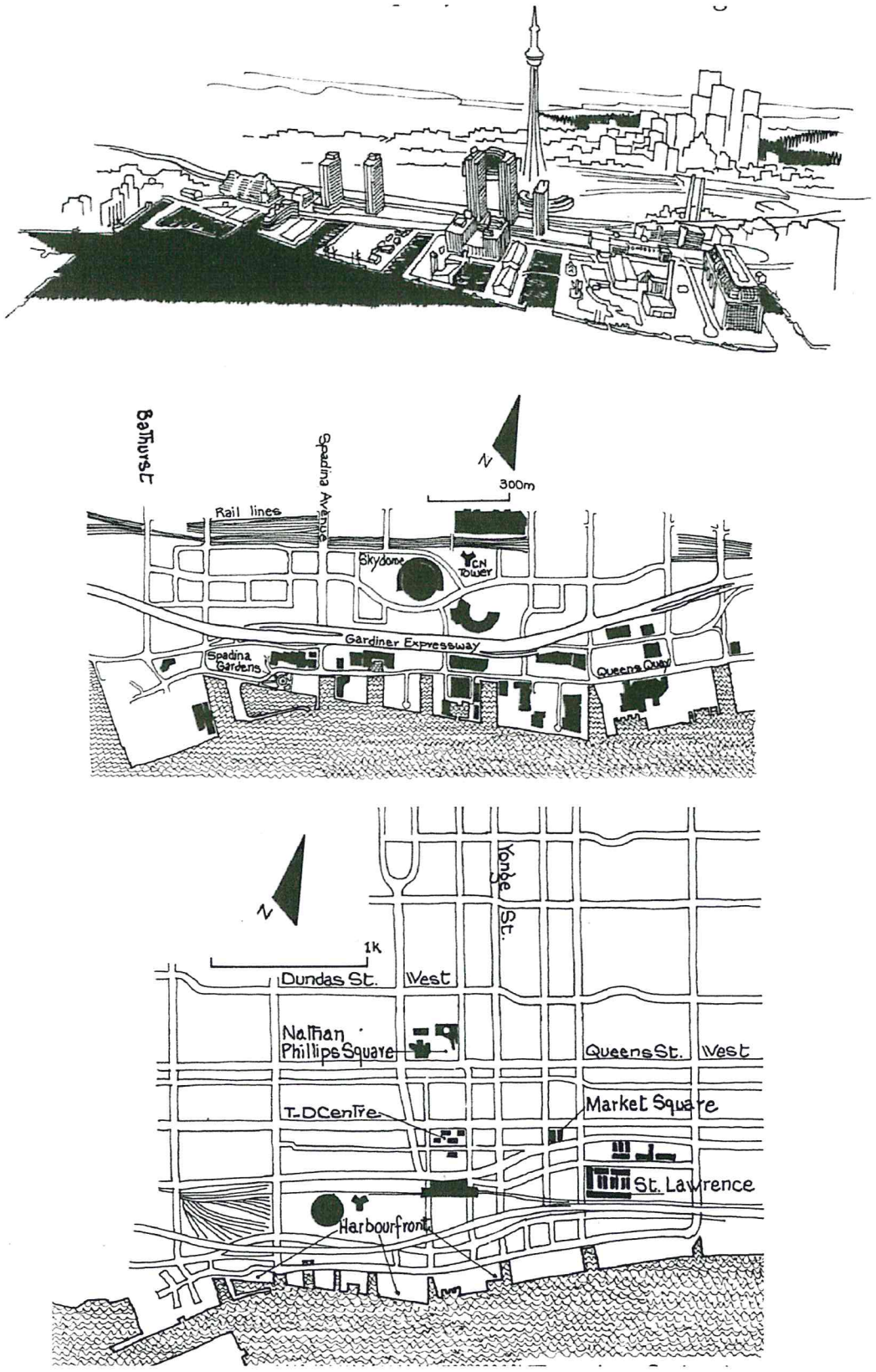


Fig. 30 Toronto's Harbourfront (Kemble 12)

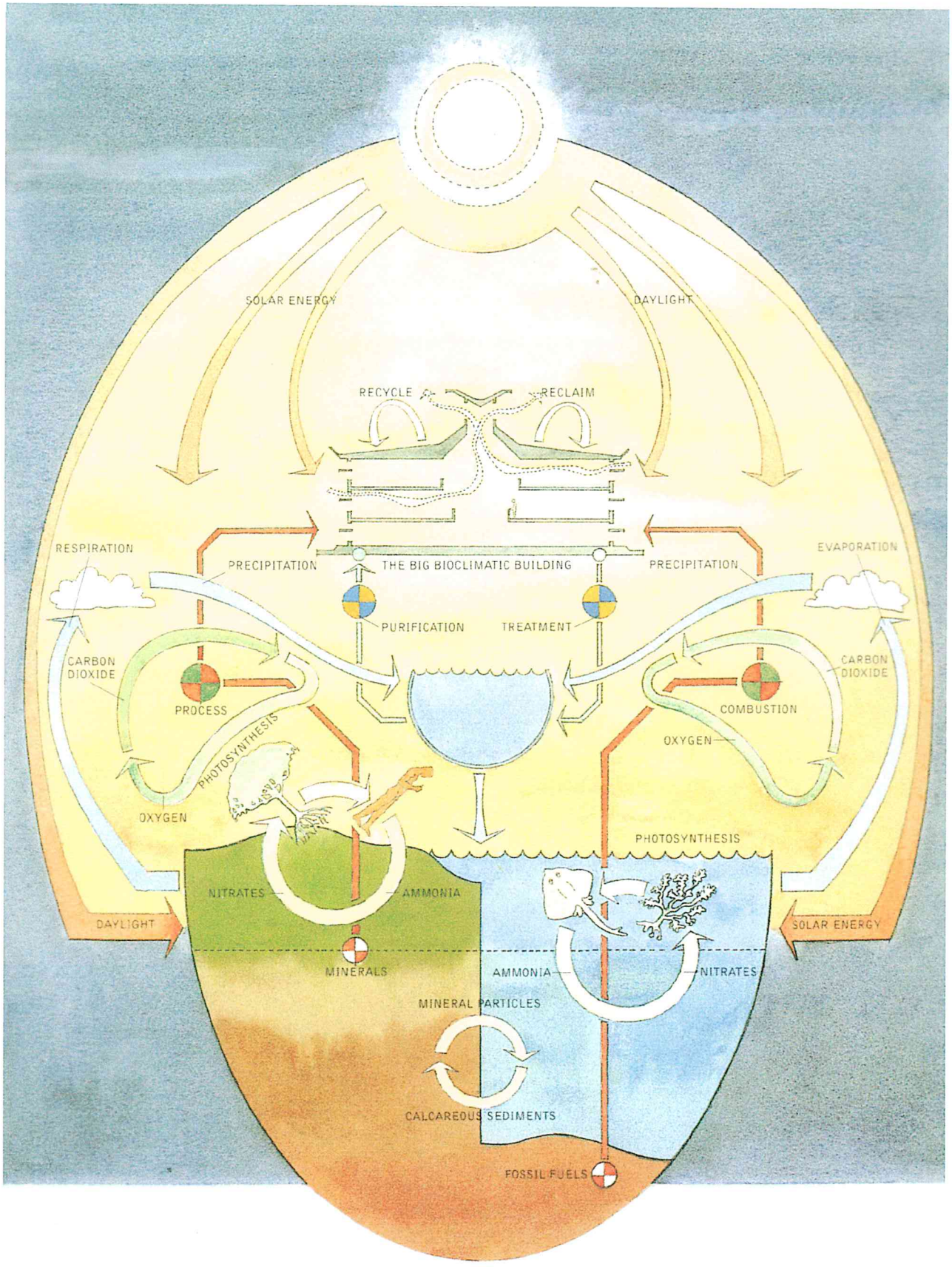


Fig. 31 The Earth is governed by interrelated 'bio-cycles' which at any one time should be broadly in balance, but over periods of time do evolve and change. The bioclimatic building recognizes these cycles and is designed to support rather than undermine them over the course of its life. (Jones 35)

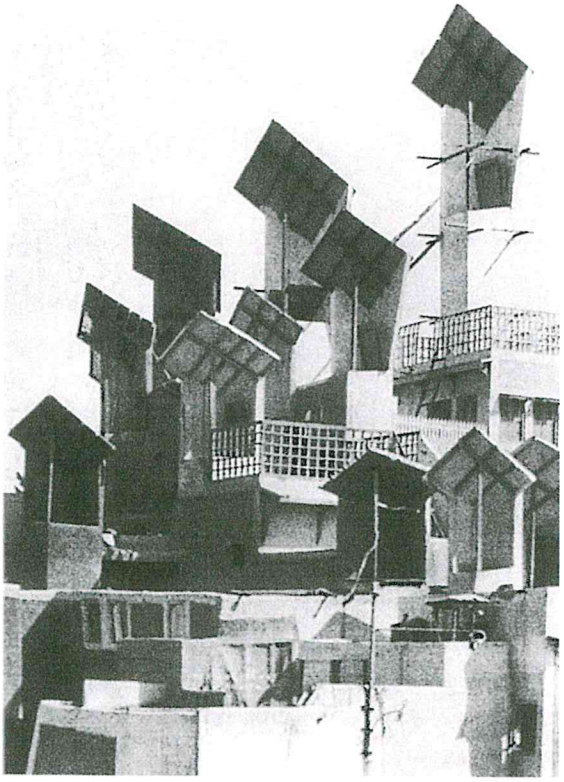


Fig. 32

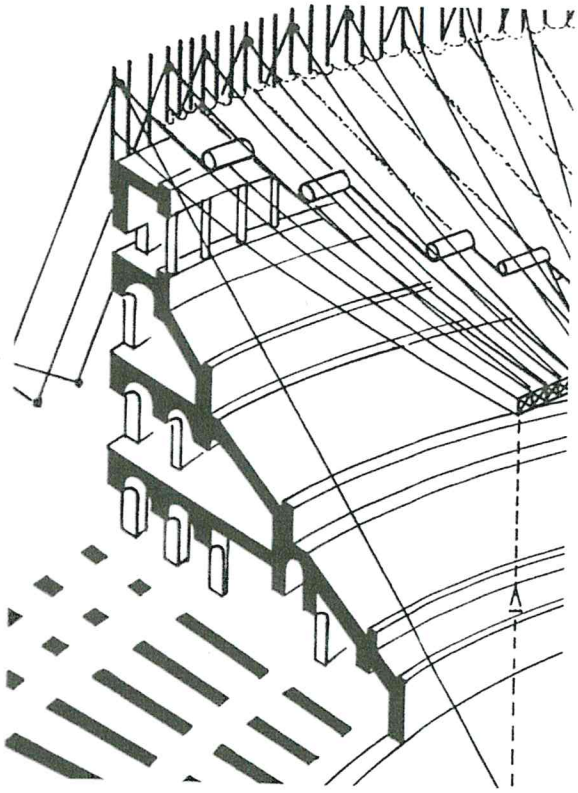


Fig. 33

Fig. 34

Fig. 35

Fig. 36

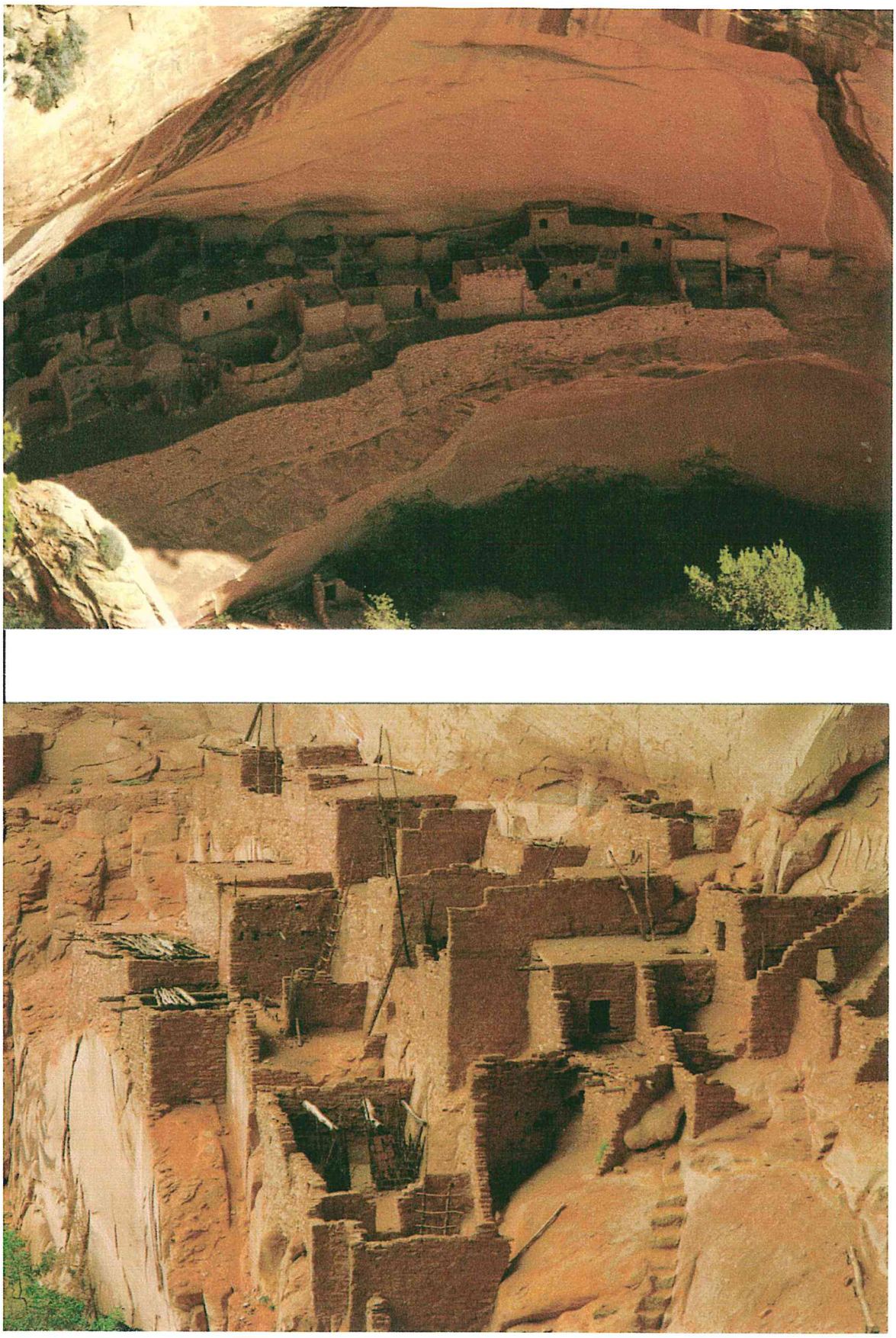


Fig. 37

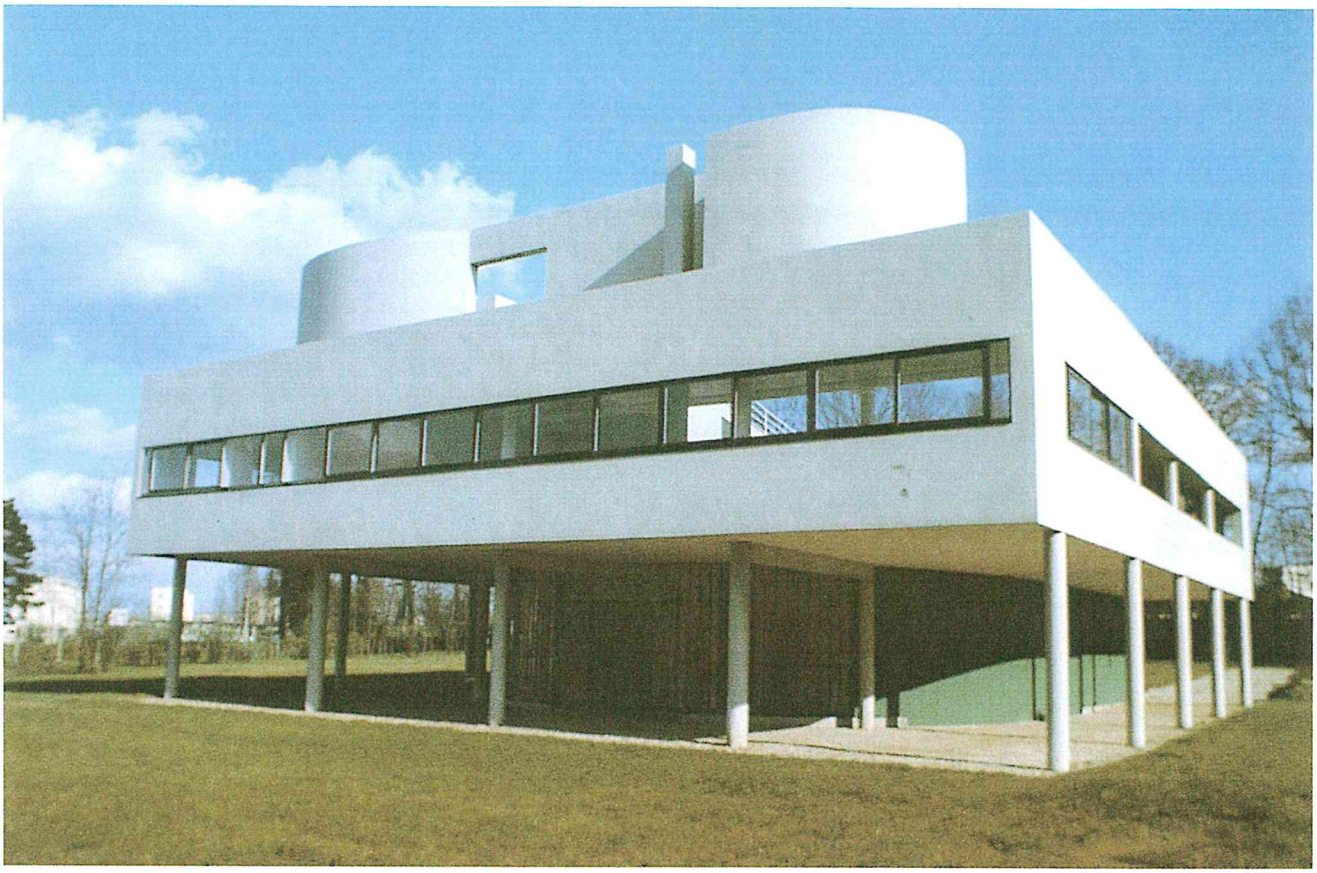


Fig. 38 Villa Savoye, Poissy, France (1929-1931) by Le Corbusier. (Jones 25)

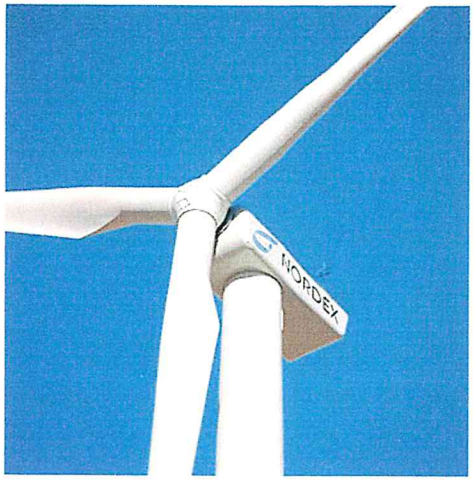


Fig. 39 Wind turbine

Fig. 40 A small wind farm (left) and megawatt wind farm.

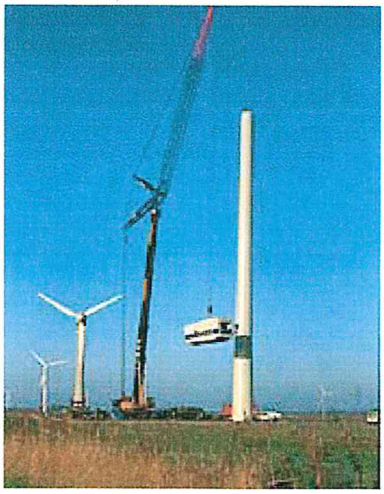


Fig. 41 Megawatt turbine during construction

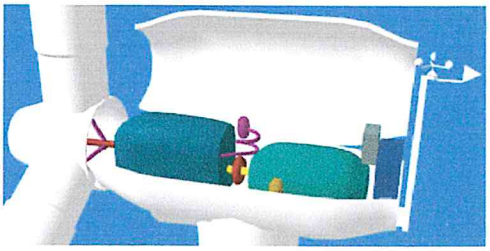


Fig. 42 Wind turbine's components

Fig. 43 Offshore wind farms

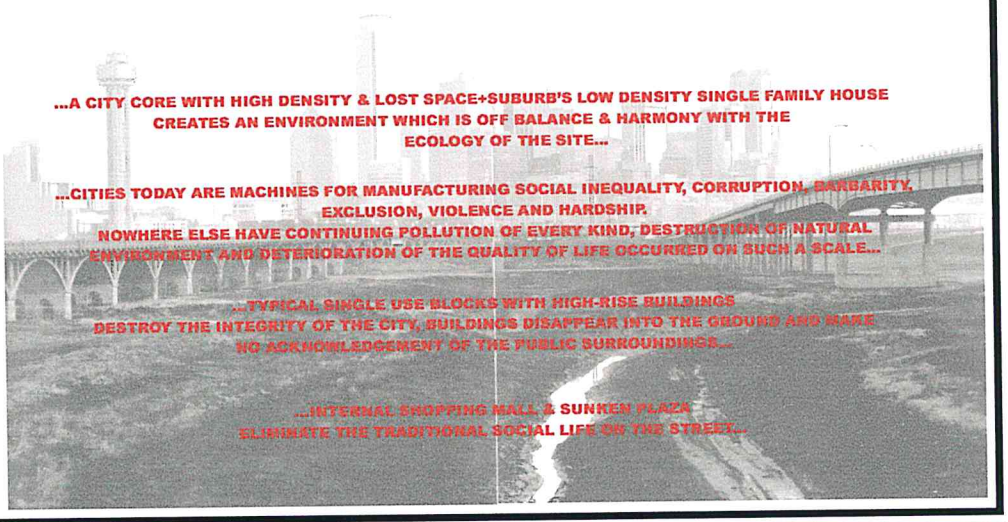
THE FOLLOWING IS A SUMMARY OF
DIFFERENT STAGES OF MY DESIGN,
WHICH FORMS A GRAPHIC PART OF MY DESIGN THESIS.
THE ORIGINAL MATERIAL IS IN DIGITAL FORM
AND
SHOULD BE VIEWED ON A "PC" COMPUTER.

ABSTRACT:

"RETHINKING THE URBAN MATRIX:
A STUDY OF SPATIAL & ECOLOGICAL INTEGRATION OF
DIVERSE ACTIVITIES
AT THE SCALE OF THE TYPICAL DOWNTOWN BLOCK"

Paul Balas student ID#920006
Design Studio D9-Design Thesis
Term 1/2001, Vancouver, B.C.
Studio Coordinator: Nick Milkovich, MAIBC FRAIC
Mentor: Stuart Piets, MAIBC MRAIC
Advisors: Richard Knight MAIBC,
Natalie C. Smith MAIBC MRAIC

STATUS QUO



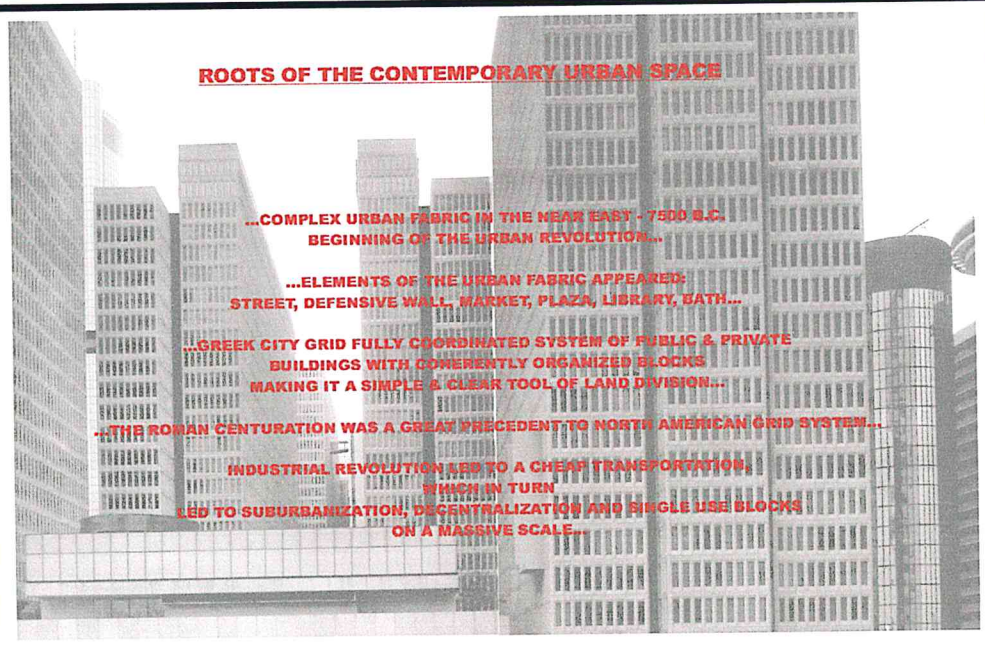
...A CITY CORE WITH HIGH DENSITY & LOST SPACE+SUBURB'S LOW DENSITY SINGLE FAMILY HOUSE CREATES AN ENVIRONMENT WHICH IS OFF BALANCE & HARMONY WITH THE ECOLOGY OF THE SITE...

...CITIES TODAY ARE MACHINES FOR MANUFACTURING SOCIAL INEQUALITY, CORRUPTION, BARBARITY, EXCLUSION, VIOLENCE AND HARDSHIP.
NOWHERE ELSE HAVE CONTINUING POLLUTION OF EVERY KIND, DESTRUCTION OF NATURAL ENVIRONMENT AND DETERIORATION OF THE QUALITY OF LIFE OCCURRED ON SUCH A SCALE...

...TYPICAL SINGLE USE BLOCKS WITH HIGH-RISE BUILDINGS DESTROY THE INTEGRITY OF THE CITY, BUILDINGS DISAPPEAR INTO THE GROUND AND MAKE NO ACKNOWLEDGEMENT OF THE PUBLIC SURROUNDINGS...

...INTERNAL SHOPPING MALL & SUNKEN PLAZA ELIMINATE THE TRADITIONAL SOCIAL LIFE ON THE STREET...

ROOTS OF THE CONTEMPORARY URBAN SPACE



...COMPLEX URBAN FABRIC IN THE NEAR EAST - 7500 B.C. BEGINNING OF THE URBAN REVOLUTION...

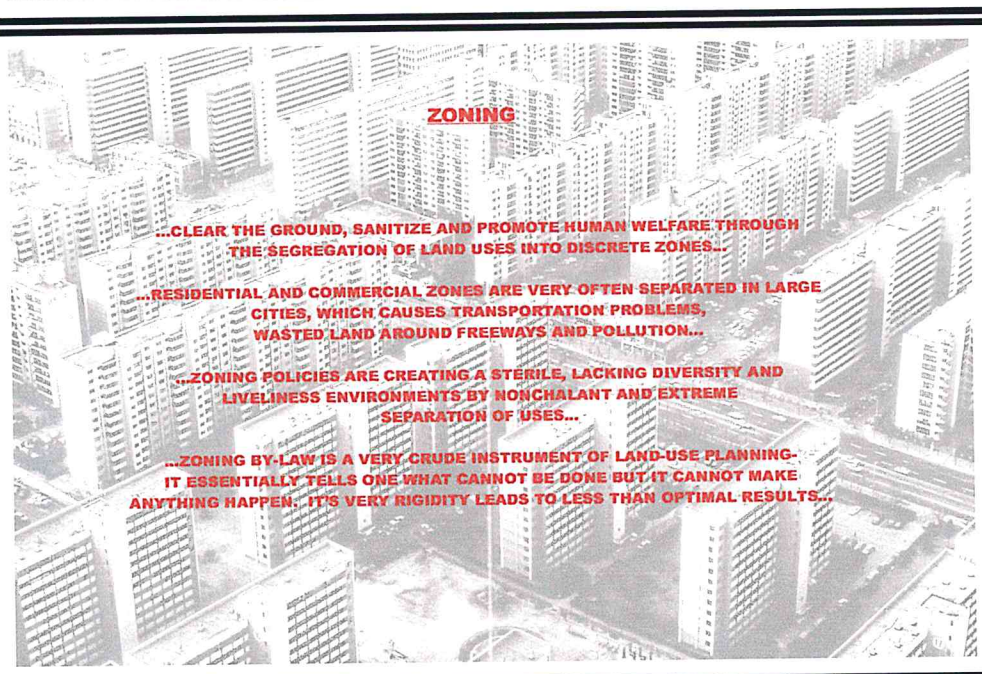
...ELEMENTS OF THE URBAN FABRIC APPEARED: STREET, DEFENSIVE WALL, MARKET, PLAZA, LIBRARY, BATH...

...GREEK CITY GRID FULLY COORDINATED SYSTEM OF PUBLIC & PRIVATE BUILDINGS WITH COHERENTLY ORGANIZED BLOCKS MAKING IT A SIMPLE & CLEAR TOOL OF LAND DIVISION...

...THE ROMAN CENTURATION WAS A GREAT PRECEDENT TO NORTH AMERICAN GRID SYSTEM...

INDUSTRIAL REVOLUTION LED TO A CHEAP TRANSPORTATION, WHICH IN TURN LED TO SUBURBANIZATION, DECENTRALIZATION AND SINGLE USE BLOCKS ON A MASSIVE SCALE...

ZONING



...CLEAR THE GROUND, SANITIZE AND PROMOTE HUMAN WELFARE THROUGH THE SEGREGATION OF LAND USES INTO DISCRETE ZONES...

...RESIDENTIAL AND COMMERCIAL ZONES ARE VERY OFTEN SEPARATED IN LARGE CITIES, WHICH CAUSES TRANSPORTATION PROBLEMS, WASTED LAND AROUND FREEWAYS AND POLLUTION...

...ZONING POLICIES ARE CREATING A STERILE, LACKING DIVERSITY AND LIVELINESS ENVIRONMENTS BY NONCHALANT AND EXTREME SEPARATION OF USES...

...ZONING BY-LAW IS A VERY CRUDE INSTRUMENT OF LAND-USE PLANNING- IT ESSENTIALLY TELLS ONE WHAT CANNOT BE DONE BUT IT CANNOT MAKE ANYTHING HAPPEN. IT'S VERY RIGIDITY LEADS TO LESS THAN OPTIMAL RESULTS...

ENVIRONMENT

...THE EARTH IS WARMING UP AS A DIRECT RESULT OF BURNING FOSSIL FUELS...

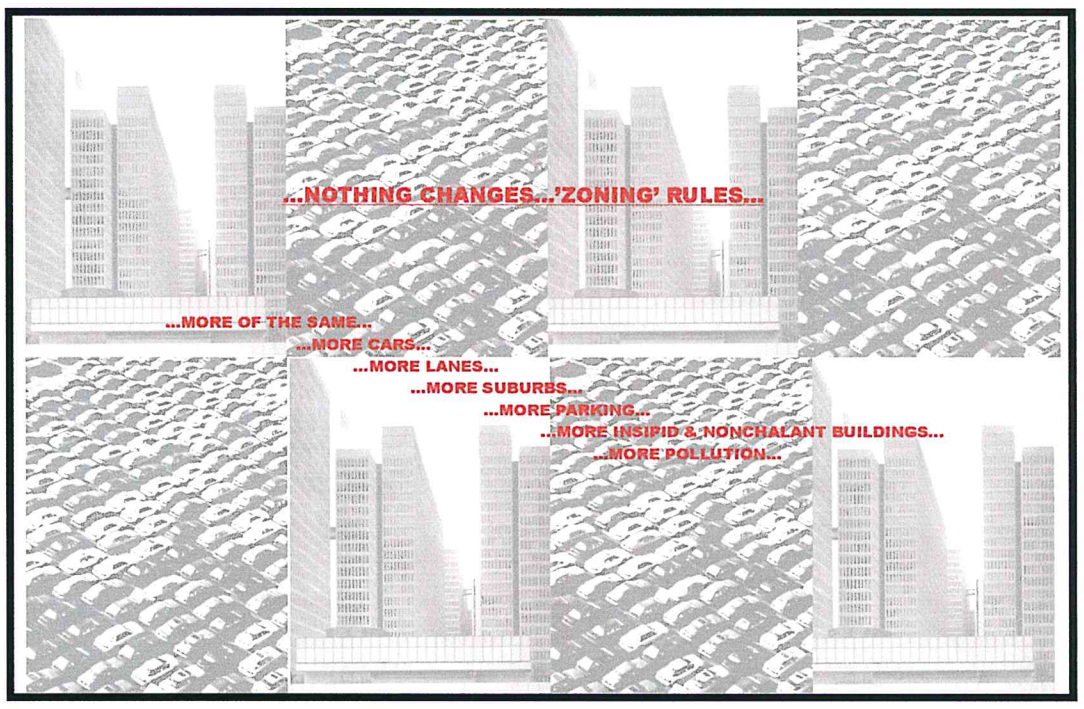
...BUILDINGS OF THE INDUSTRIALISED WORLD- BOTH THEIR CONSTRUCTION AND USE-ACCOUNT FOR APPROXIMATELY 50% OF TOTAL HARMFUL EMISSIONS...

...SEPARATION OF USES CREATES A NEED TO DRIVE- FORCED EVERYDAY COMMUTE HAS A MASSIVE DESTRUCTIVE IMPACT ON OUR ENVIRONMENT...

...40% OF ALL MILES DRIVEN ARE FOR EVERYDAY COMMUTE TO WORKPLACE...
...AN AVERAGE NORTH AMERICAN HOUSEHOLD SPENDS 20% OF INCOME ON TRANSPORT...

...THE PURPOSE OF THE CODE IS TO ESTABLISHED THE WORST ACCEPTABLE BUILDING THAT CAN BE BUILT LEGALLY...

...USA ALONE: 4% OF WORLD'S POPULATION:
CONSUME UP TO 40% OF SOME OF THE WORLD'S RESOURCES,
PRODUCE 30% OF THE WASTE AND EMIT 20% OF THE CARBON DIOXIDE...



...POTENTIAL SOLUTION...

AS A COUNTERMEASURE TO OUR SAD REALITY, WE HAVE TO INTRODUCE
NEIGHBOURHOODS, RATHER THEN SUBDIVISIONS, URBAN QUARTERS RATHER THEN ISOLATED PROJECTS,
AND DIVERSE COMMUNITIES RATHER THEN SEGREGATED MASTER PLANS.

PEDESTRIANS SHOULD BE A FOCUS OF THIS APPROACH
SOCIAL ACTIVITY FORM THE ESSENCE AND THE MEANING OF THE NEIGHBOURHOODS.

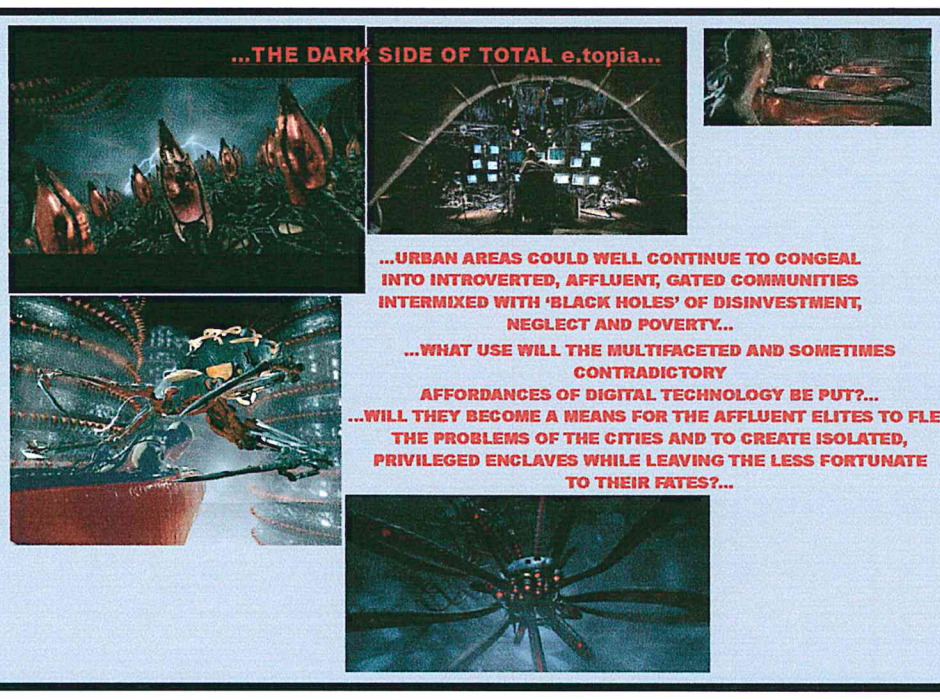
TRANSIT ORIENTED NEIGHBOURHOODS OFFER A GOOD APPROACH TOWARD ABOLISHING
SINGLE USE BLOCKS AND DRIVE ONLY ENVIRONMENTS.
URBAN TRANSIT ORIENTED NEIGHBOURHOOD CONTAINING MEDIUM TO HIGH RESIDENTIAL DENSITY, PUBLIC BUILDINGS AND
SPACES, RETAIL, SERVICES AND WORKPLACES WILL PROVIDE AN OPPORTUNITY FOR SOME TO LIVE AND WORK
WITHIN ONE NEIGHBOURHOOD AND FOR OTHERS TO COMMUTE VIA CONVENIENT RAPID TRANSIT SYSTEM.

COMMUNITIES, WHICH PROVIDE PROXIMITY TO: WORKPLACE, SHOPS AND SERVICES ARE ACTUALLY AFFORDABLE
FOR PEOPLE, ARE LESS COSTLY FOR SOCIETY AS A WHOLE AND ARE MORE ENVIRONMENTALLY
APPROPRIATE AND RESPONSIBLE.

THE "DIGITAL REVOLUTION" WILL INFLUENCE AND INFORM THE DIRECTION OF OUR FUTURE MUCH MORE THAN
CHANGE IN PLANNING POLICIES, ENLIGHTENED DEVELOPERS, CONSCIOUS AND INFORMED PEOPLE.

"E-VOLUTION" WILL INTRODUCE THE DIGITALLY AND ELECTRONICALLY ENABLED HOME & WORK HYBRIDS.
(FURTHER SUPPORTING THE CONCEPT OF WORK/LIVE WITHIN ONE NEIGHBOURHOOD)

THE DIGITAL "E-VOLUTION" WILL ALLOW (AT LEAST TO SOME EXTENT) THE DIVERSION OF
SOME OF OUR EVERYDAY ACTIVITIES BACK TO HOME.
THE BIRTH OF DIVERSE AND ACTIVE 24-HOUR NEIGHBOURHOODS
WILL POTENTIALLY FOSTER AN ENVIRONMENT FOR A HEALTHY, INTERACTIVE COMMUNITY.
GIVEN A CHANCE, THEY WILL ACHIEVE WHAT JANE JACOBS PRAISED IN HER BOOKS:
DIVERSITY, SMALL SCALE BLOCKS, MIXED USE, LIVELY NEIGHBOURHOODS AND GREEN REFUGES.

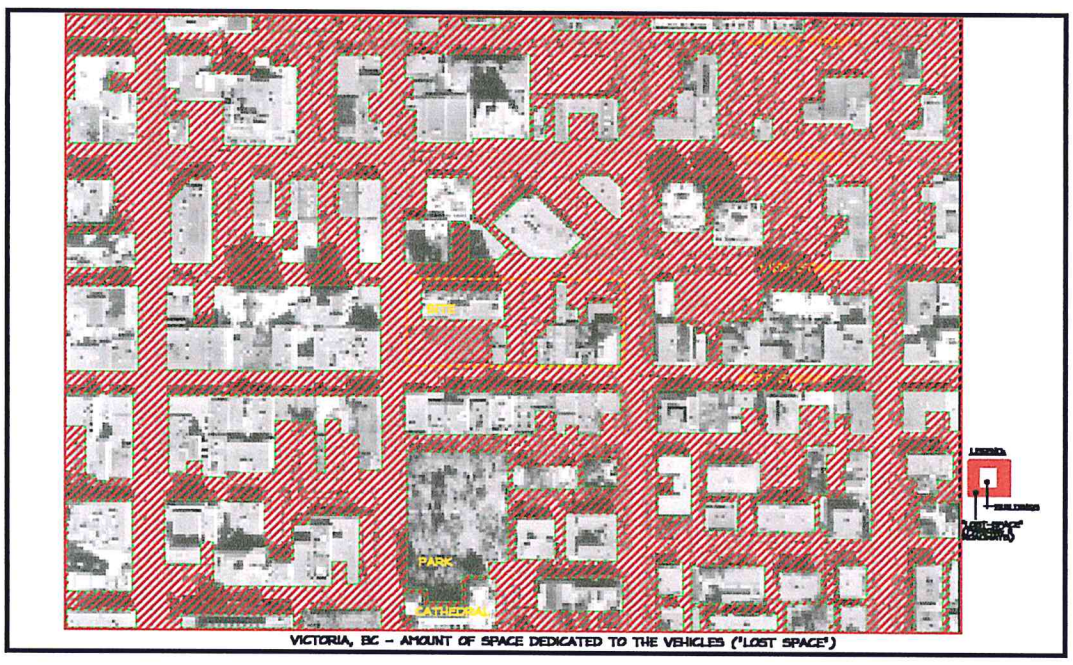


...HOW...

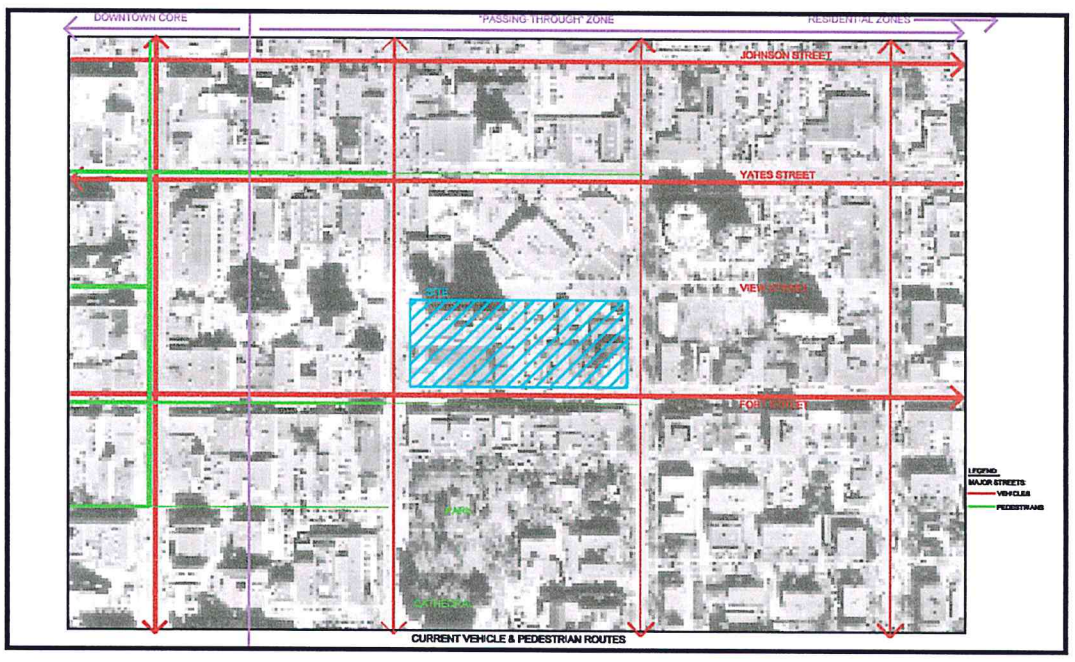
AN URBAN CITY BLOCK SHOULD BE THE POINT OF DEPARTURE.

NEW NEIGHBOURHOODS, RADIATING OUTWARDS WILL
ENHANCE AND FOCUS THE DEVELOPING REGIONAL TRANSIT SYSTEM.

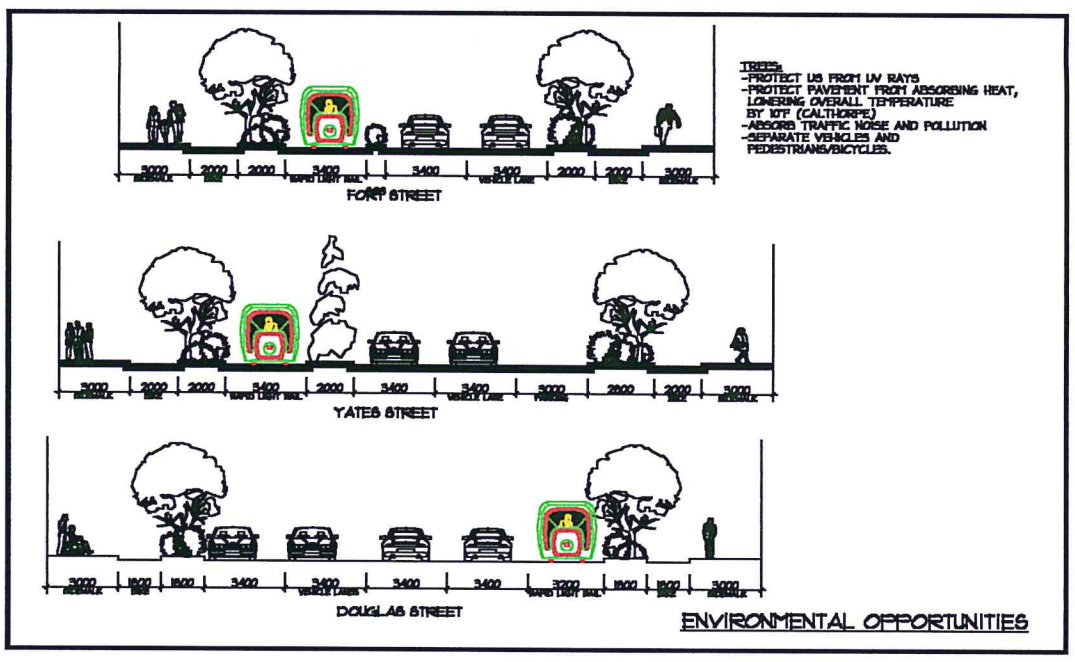
THE NEW TRANSIT SYSTEM WILL CONNECT EXISTING PUBLIC BUILDINGS:
LIBRARIES, RECREATION CENTRES, LAW COURTS, COMMERCE AND
OTHER PUBLIC SPACES,
WHICH SERVE AS A KEY PLACES.



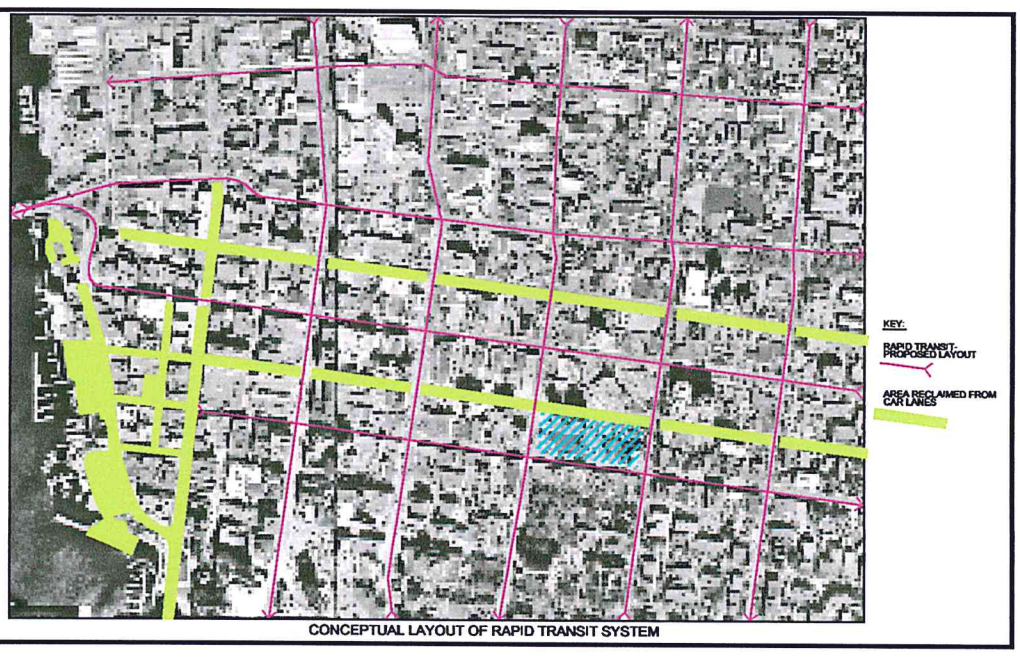
VICTORIA, BC – AMOUNT OF SPACE DEDICATED TO THE VEHICLES ('LOST SPACE')



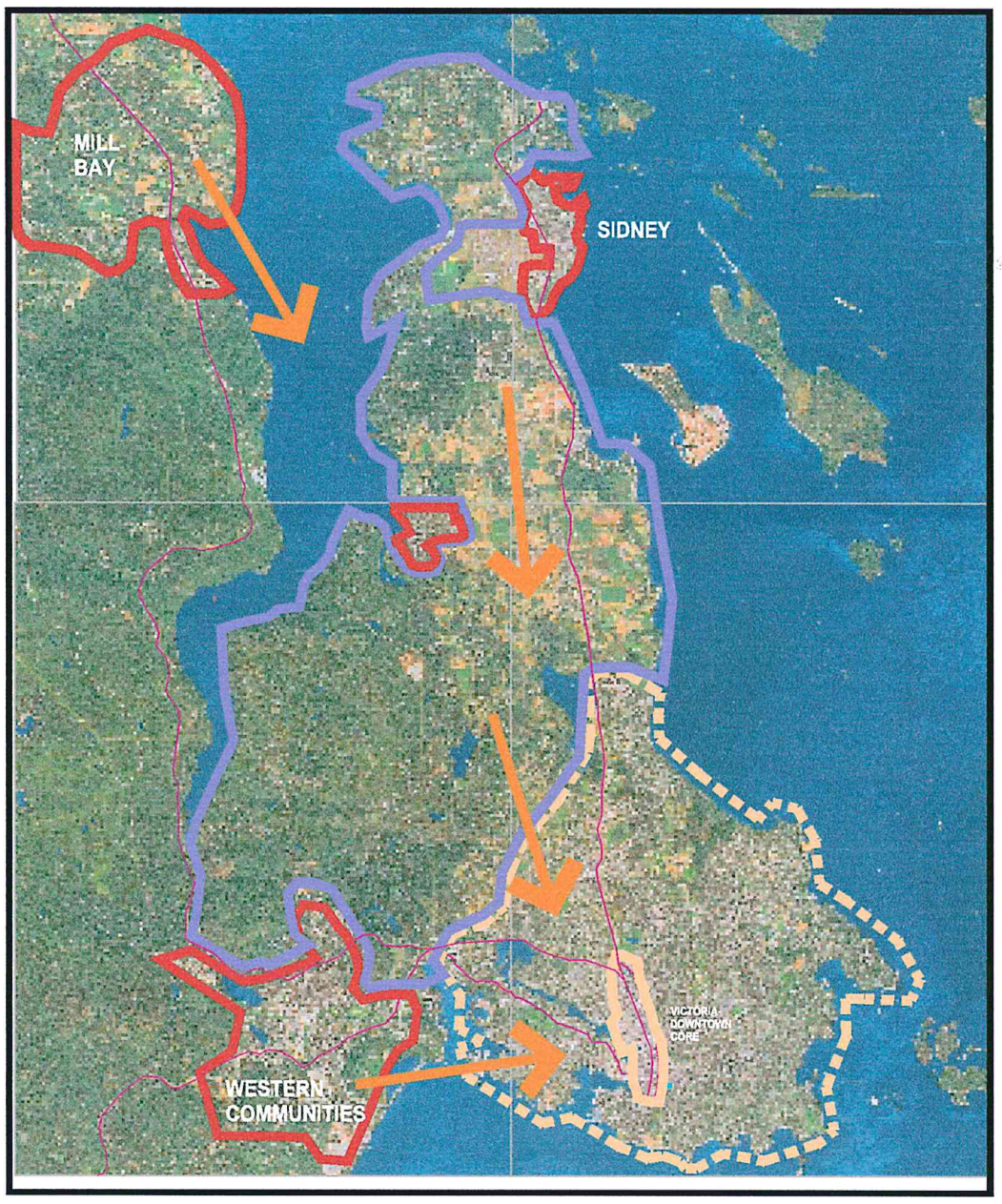
CURRENT VEHICLE & PEDESTRIAN ROUTES



ENVIRONMENTAL OPPORTUNITIES



CONCEPTUAL LAYOUT OF RAPID TRANSIT SYSTEM



GREATER VICTORIA-REGIONAL CONTEXT - STATUS QUO

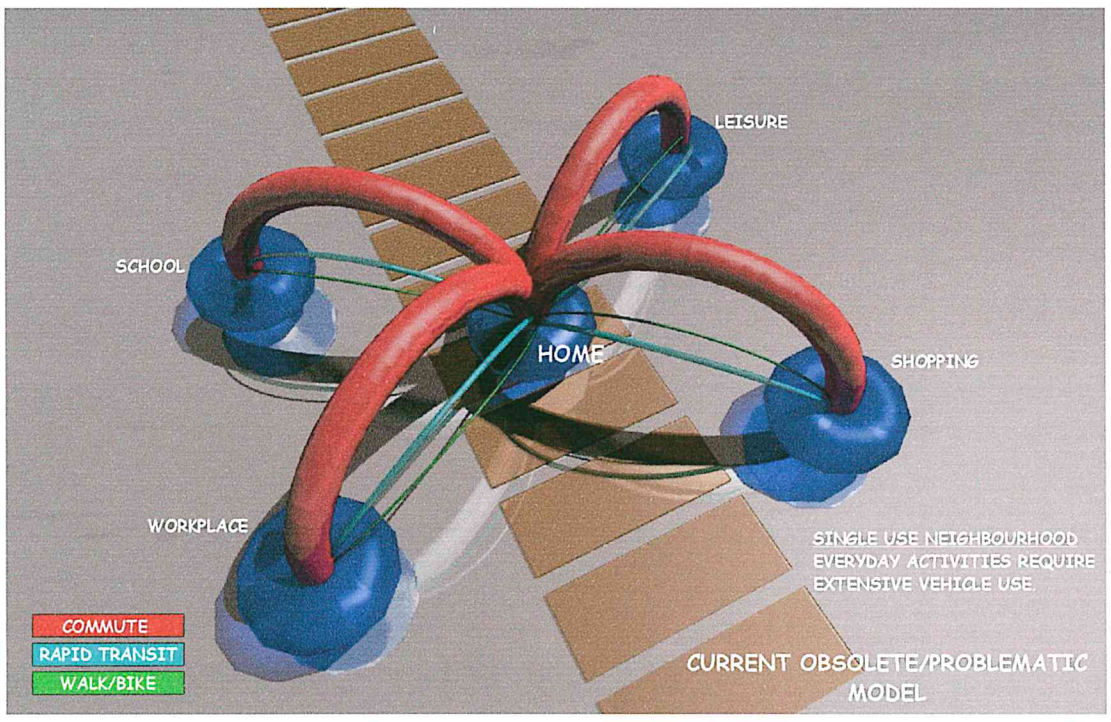
LEGEND:

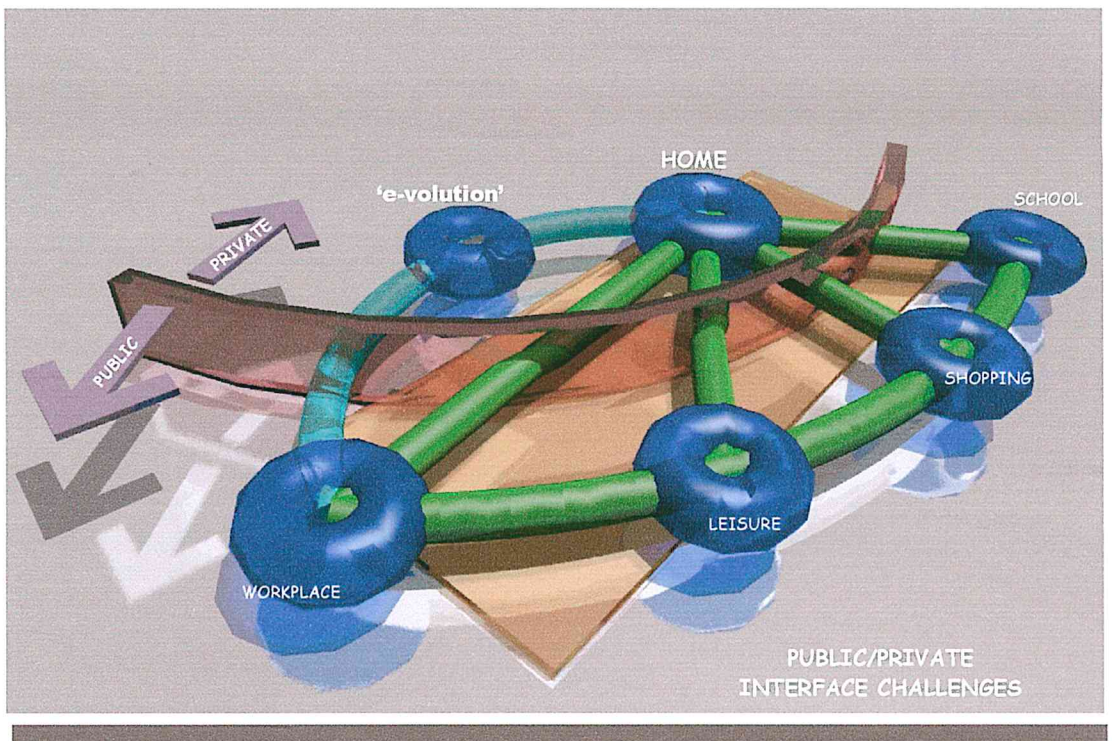
- GREATER VICTORIA - URBAN AREA WITH RESIDENTS COMMUTING TO DOWNTOWN VICTORIA
- DOWNTOWN CORE OF VICTORIA - DESTINATION FOR MOST OF COMMUTING PEOPLE
- SATELLITE COMMUNITIES
- RURAL AREAS - SOME RESIDENTS COMMUTE TO VICTORIA
- MAIN HIGHWAYS

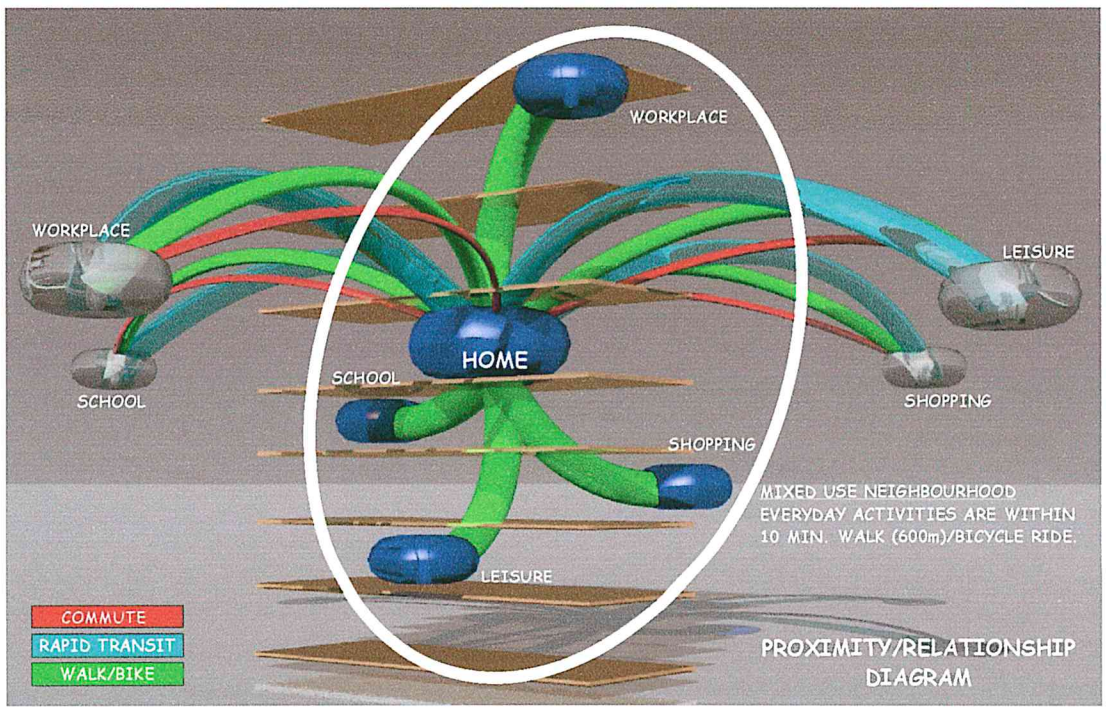
GREATER VICTORIA-REGIONAL CONTEXT - - PROPOSED CHANGES

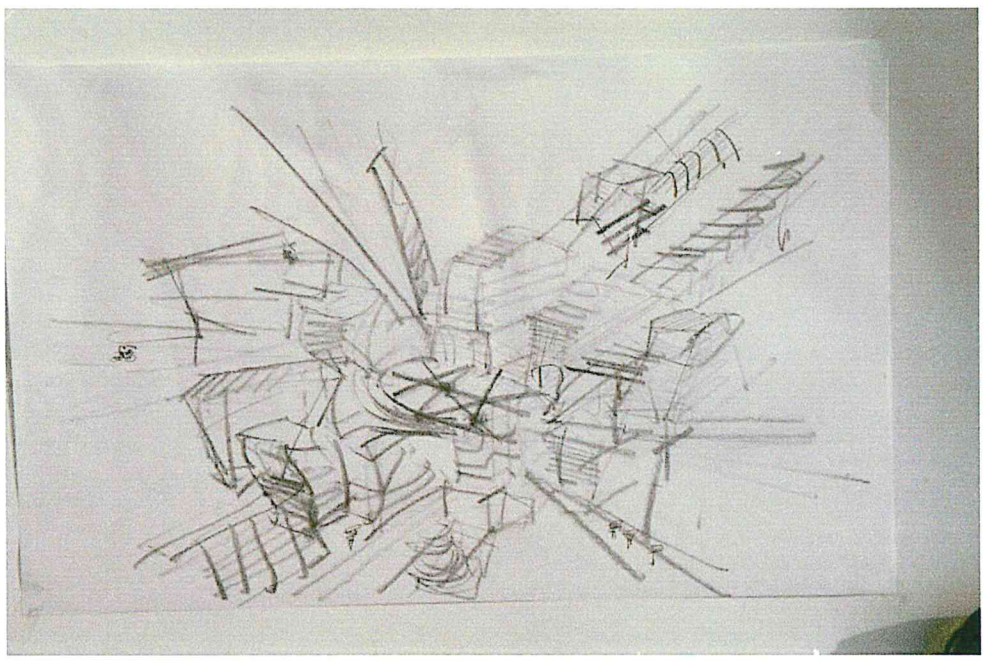
LEGEND:

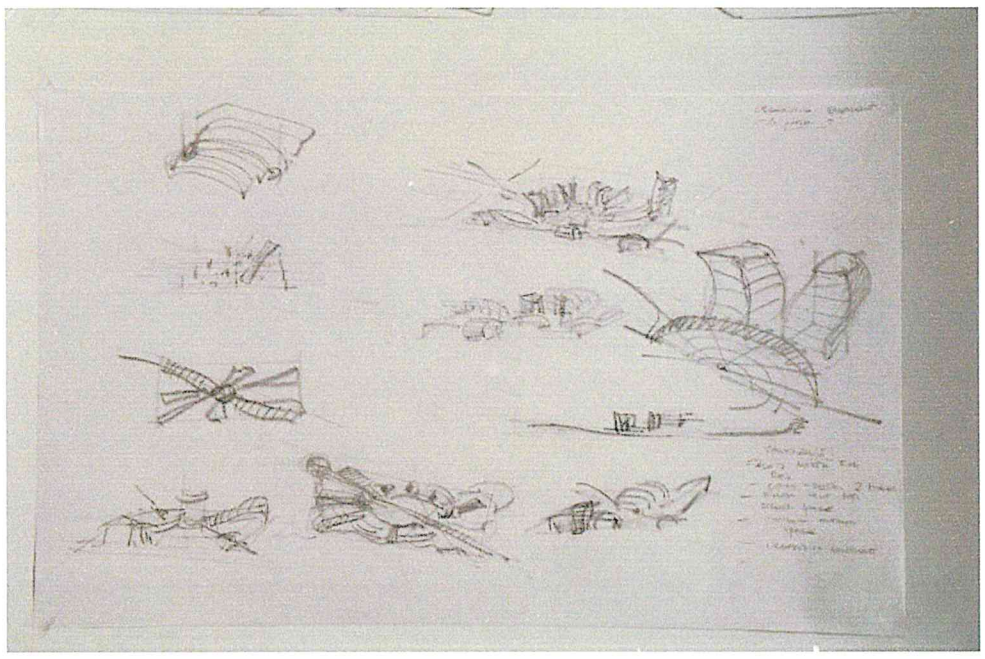
- GREATER VICTORIA - AREA WITH DEVELOPMENT BOUNDARY, CONTAINING 'NEW-TRANSIT ORIENTED NEIGHBORHOODS". ALL NEW T O N ARE SET WITHIN "RAPID LIGHT RAIL TRANSIT"
- DOWNTOWN CORE OF VICTORIA - TRANSFORMED BY 'E-VOLUTION' AND "NEW TRANSIT-ORIENTED NEIGHBORHOODS". REDUCED 'LOST SPACE' AND BALANCED MIXED USE CITY BLOCKS.
- VICTORIA'S FORMER SATELLITE COMMUNITIES - TRANSFORMED BY 'E-VOLUTION' AND 'TRANSIT-ORIENTED NEIGHBORHOODS' - THEY NO LONGER DEPEND TO SUCH EXTENT ON VICTORIA AS A WORKPLACE.
- RURAL AREAS - RESTRICTED DEVELOPMENT AREAS. AGRICULTURAL LAND AND FORESTS ARE PRESERVED
- REGIONAL RAPID TRANSIT (ROUTES FOLLOWING MAIN HIGHWAYS)

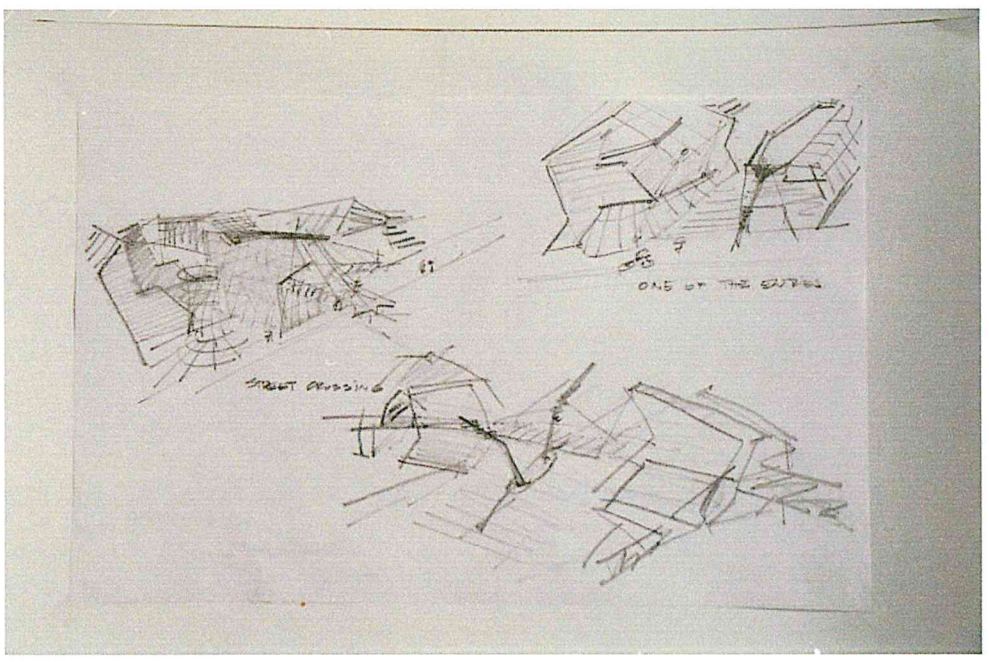

LEISURE
SCHOOL
HOME
SHOPPING
WORKPLACE
SINGLE USE NEIGHBOURHOOD
EVERYDAY ACTIVITIES REQUIRE
EXTENSIVE VEHICLE USE.
COMMUTE
RAPID TRANSIT
WALK/BIKE
CURRENT OBSOLETE/PROBLEMATIC
MODEL

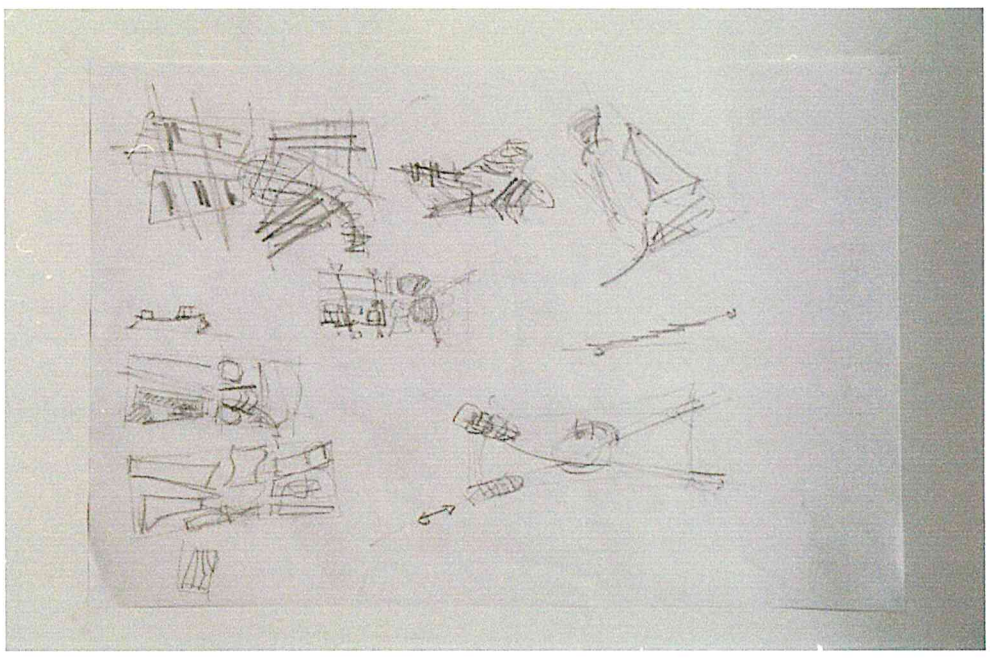

HOME
'e-volution'
SCHOOL
PRIVATE
PUBLIC
SHOPPING
LEISURE
WORKPLACE
PUBLIC/PRIVATE
INTERFACE CHALLENGES


WORKPLACE
WORKPLACE
LEISURE
HOME
SCHOOL
SCHOOL
SHOPPING
SHOPPING
LEISURE
MIXED USE NEIGHBOURHOOD
EVERYDAY ACTIVITIES ARE WITHIN
10 MIN. WALK (600m)/BICYCLE RIDE.
COMMUTE
RAPID TRANSIT
WALK/BIKE
PROXIMITY/RELATIONSHIP
DIAGRAM






STREET CROSSING



ENERGY-SAVING MEASURES FOR THE TEMPERATE REGION

PASSIVE COMFORT MEASURE / ACTIVE COMFORT MEASURE

FREE HEATING - GEOTHERMAL HEAT USED AS AN ENERGY SUPPLY FOR SPACE AND WATER HEATING.

SOLAR HEATING - USING SUN TO HEAT INTERNAL SPACES BY CAREFUL BUILDING ORIENTATION.

DAYLIGHT - INTERNAL SPACES REQUIRE ADEQUATE AND SYMPATHETIC NATURAL LIGHT.

SOLAR CONTROL/SHADING - SHIELDING INTERNAL SPACES OF THE BUILDING FRO THE SUN. BEST ACHIEVED BEFORE SOLAR RADIATION HITS THE BUILDING FABRIC.

NATURAL VENTILATION - THE VENTILATION AND COOLING OF SPACE BY USE OF NATURAL CONVECTION CURRENTS AND TO INDUCE AIR MOVEMENT BY IMPOSED PRESSURE AND TEMP. DIFFERENTIALS. (SINGLE SIDED, CROSS AND STACK VENTILATION.)

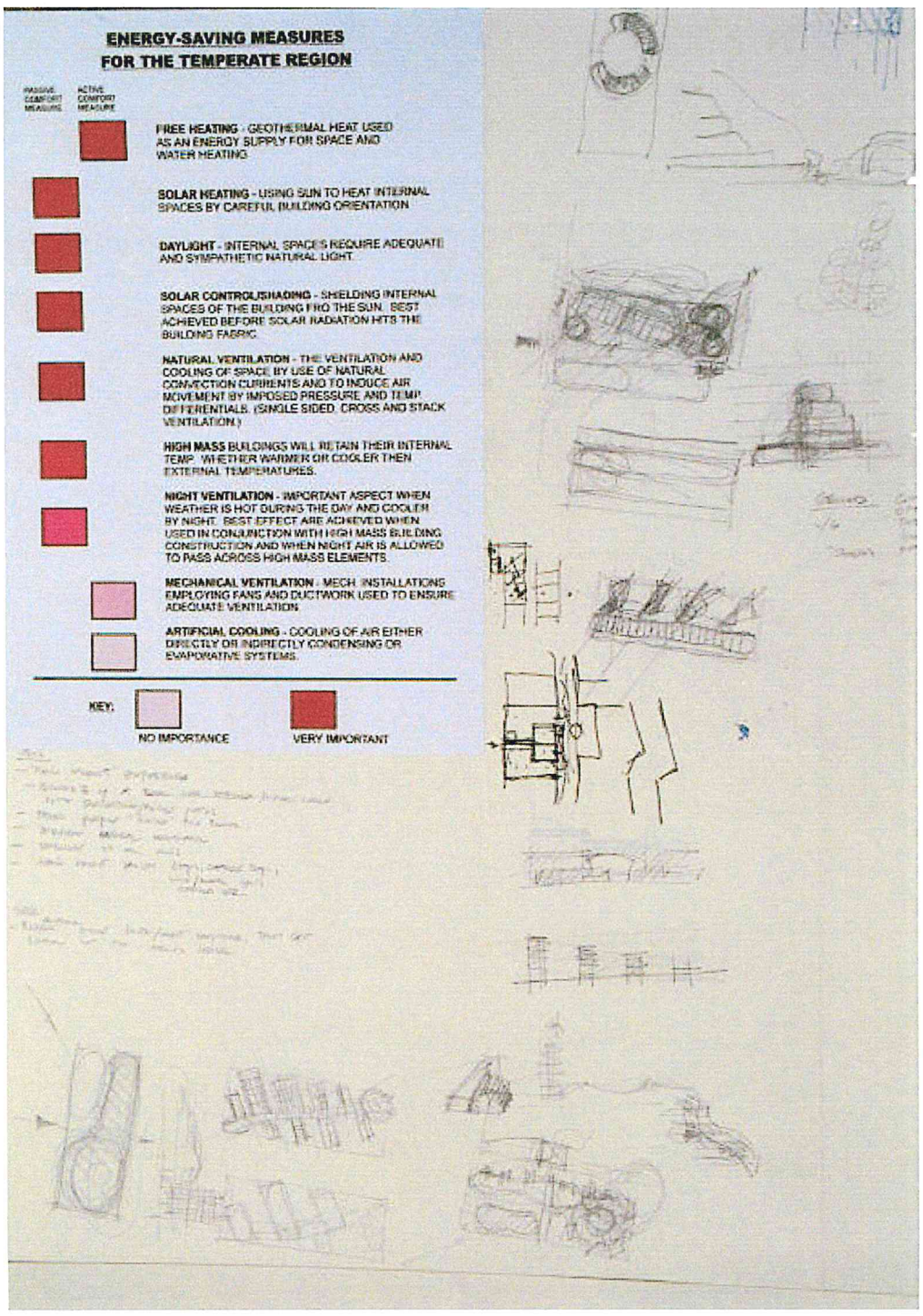
HIGH MASS BUILDINGS WILL RETAIN THEIR INTERNAL TEMP. WHETHER WARMER OR COOLER THEN EXTERNAL TEMPERATURES.

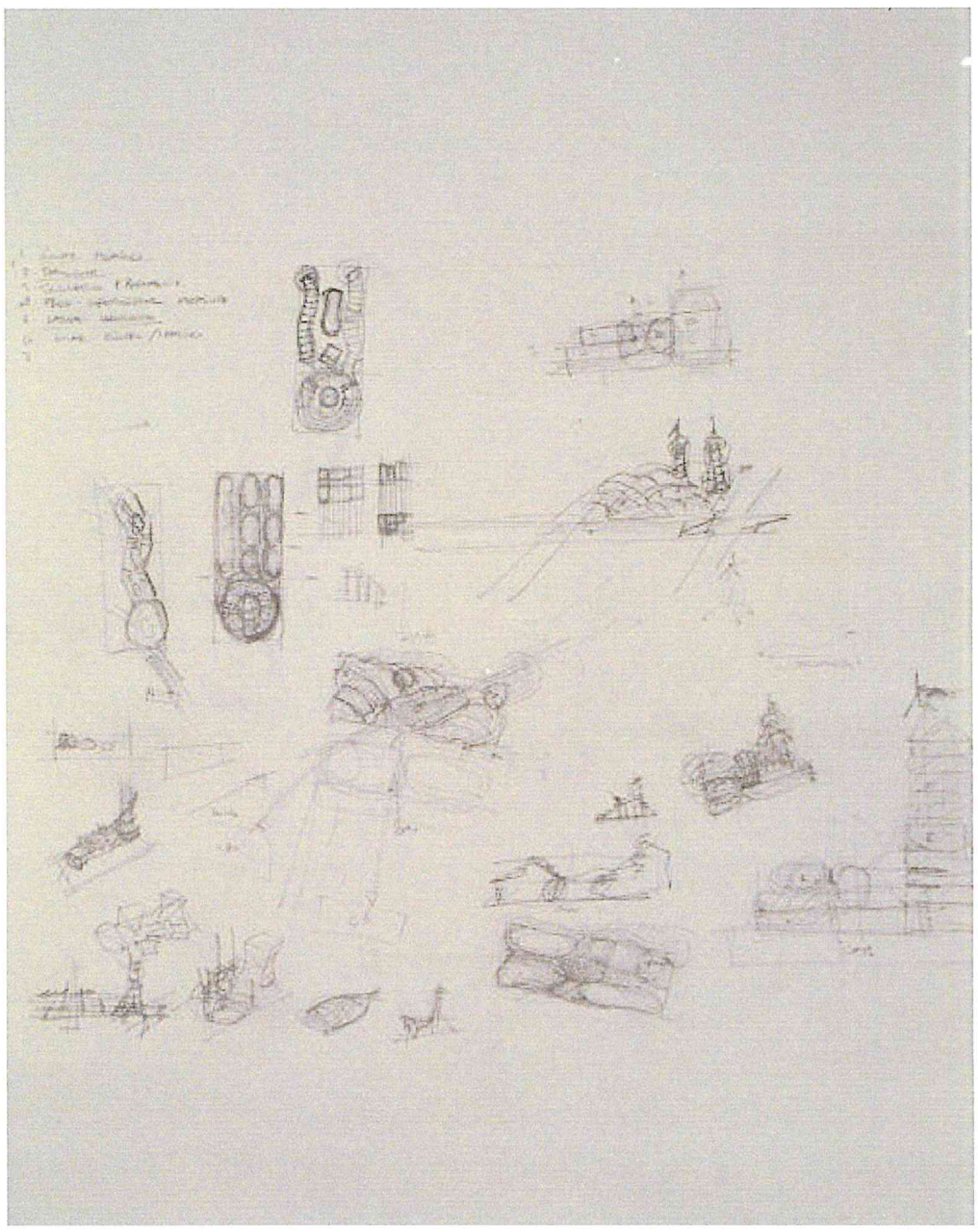
NIGHT VENTILATION - IMPORTANT ASPECT WHEN WEATHER IS HOT DURING THE DAY AND COOLER BY NIGHT. BEST EFFECT ARE ACHIEVED WHEN USED IN CONJUNCTION WITH HIGH MASS BUILDING CONSTRUCTION AND WHEN NIGHT AIR IS ALLOWED TO PASS ACROSS HIGH MASS ELEMENTS.

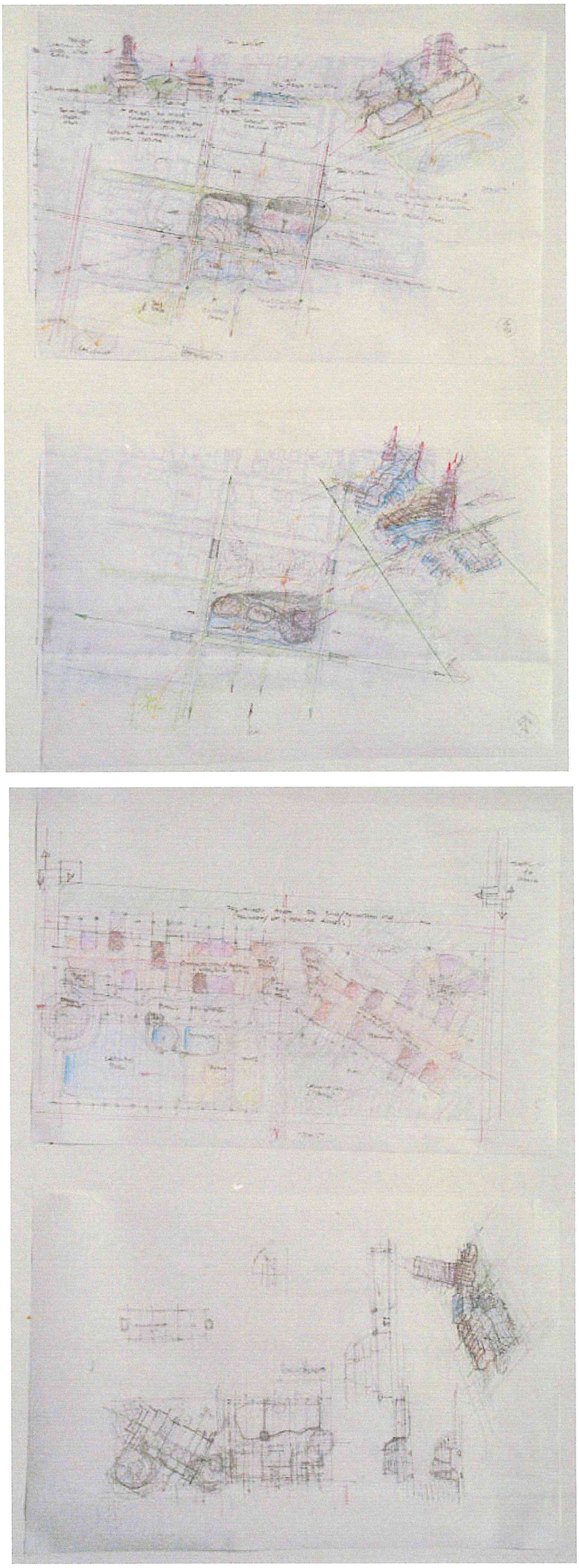
MECHANICAL VENTILATION - MECH. INSTALLATIONS EMPLOYING FANS AND DUCTWORK USED TO ENSURE ADEQUATE VENTILATION.

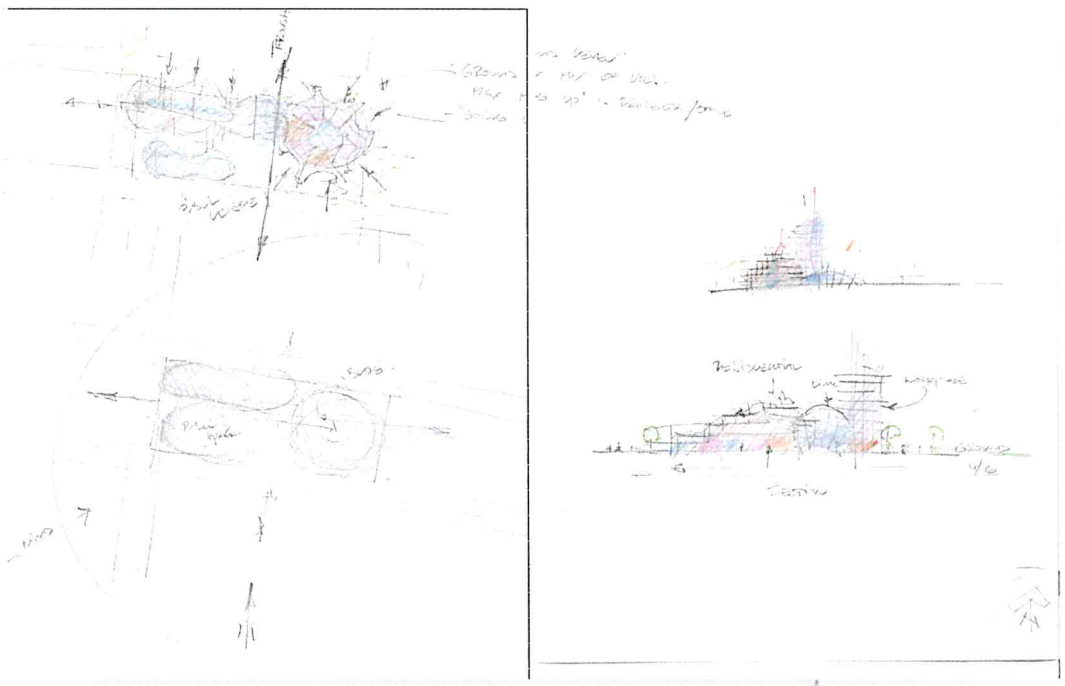
ARTIFICIAL COOLING - COOLING OF AIR EITHER DIRECTLY OR INDIRECTLY CONDENSING OR EVAPORATIVE SYSTEMS.

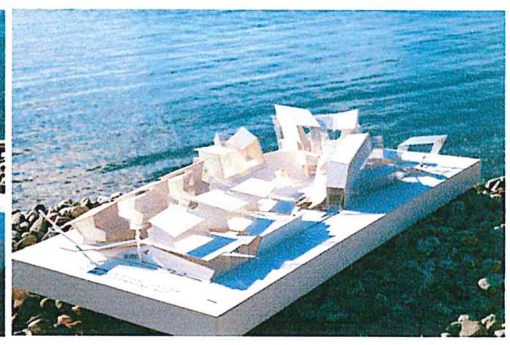
KEY: NO IMPORTANCE — VERY IMPORTANT



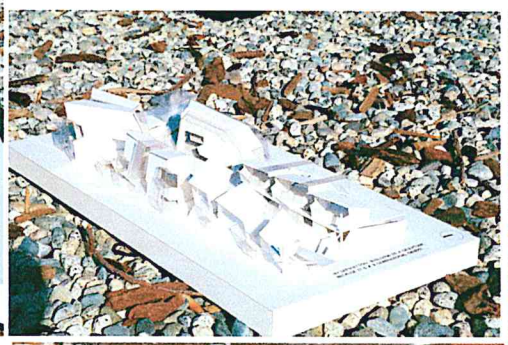


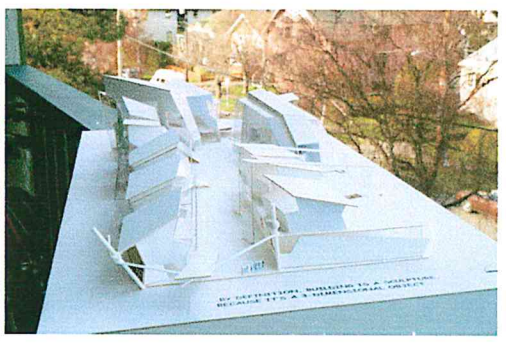


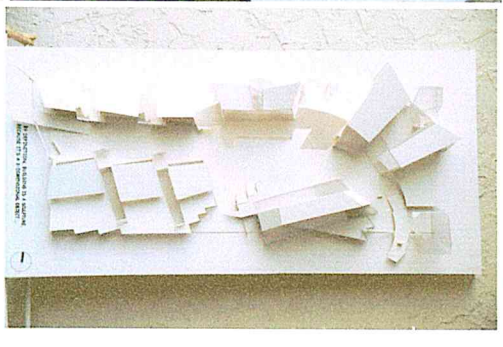





BY DEFINITION, BUILDING IS A SCULPTURE.
BECAUSE IT'S A 3 DIMENSIONAL OBJECT.



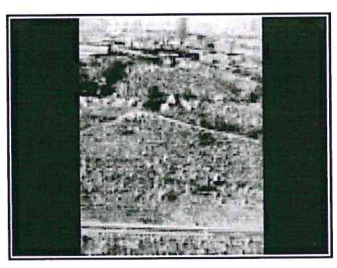


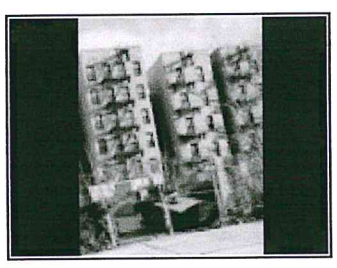


FOLLOWING IS A SUMMARY OF MY 2nd. PRESENTATION.
IT IS A POETIC STUDY OF A NEW NEIGHBOURHOOD,
JUXTAPOSED WITH REALITY.
THE PRESENTATION IS IN A DIGITAL FORMAT AND INCLUDES:
SLIDE SHOW & ANIMATION WITH A BACKGROUND AUDIO.


:12 1


:05 2


:05 3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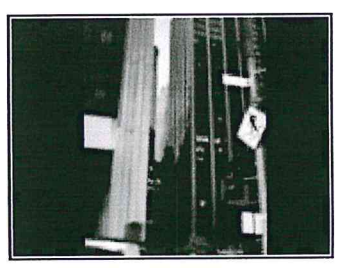
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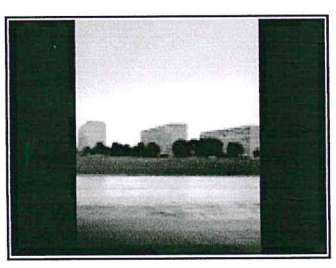
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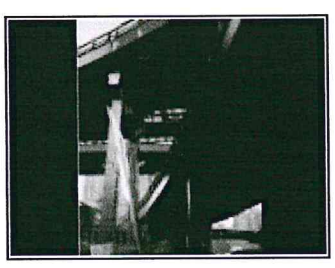
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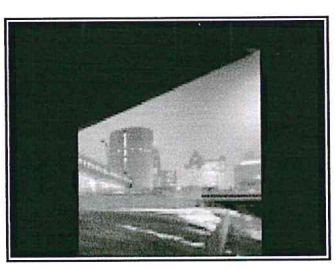
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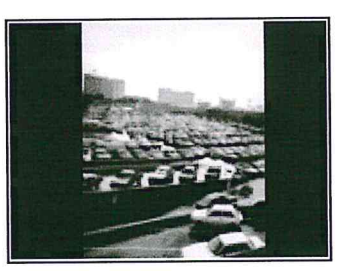
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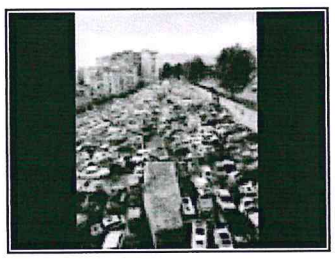
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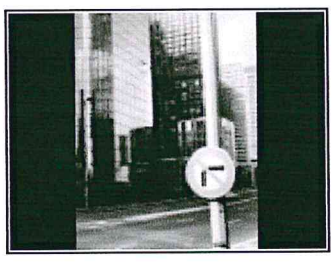
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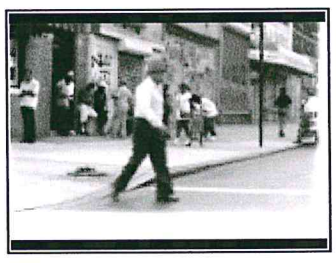
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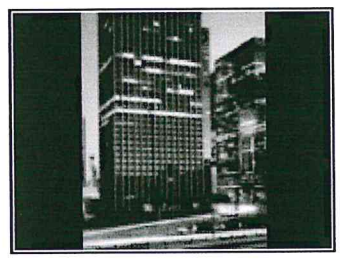
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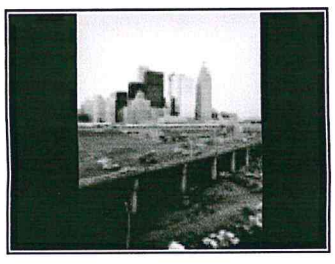
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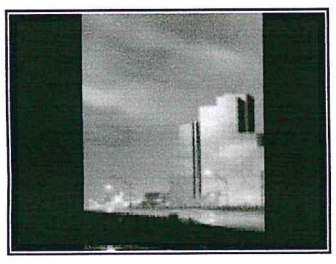
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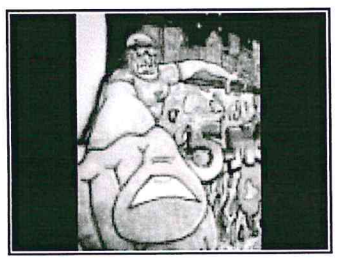
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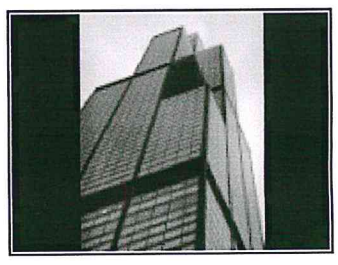
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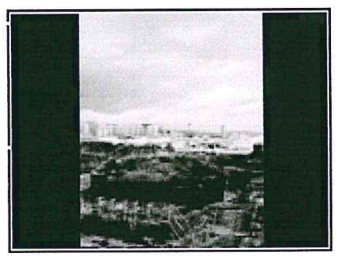
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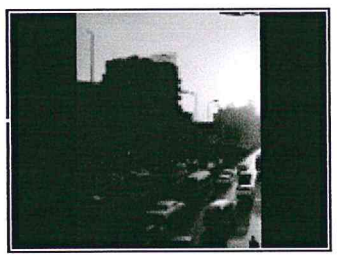
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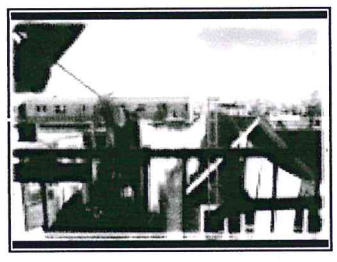
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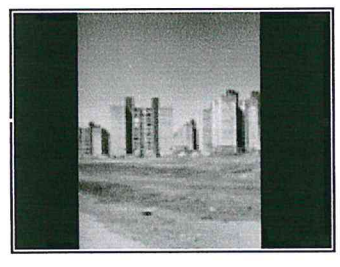
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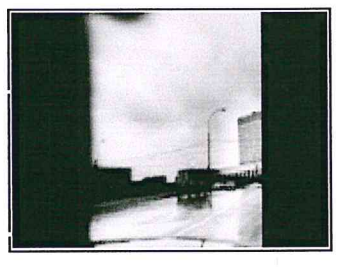
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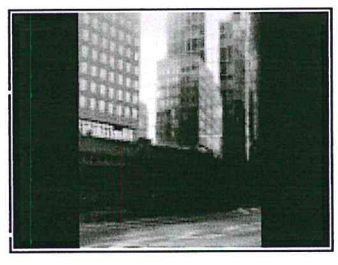
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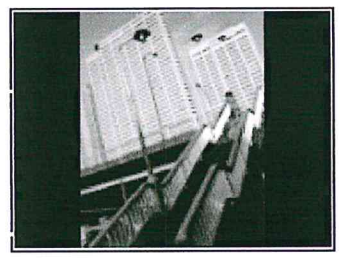
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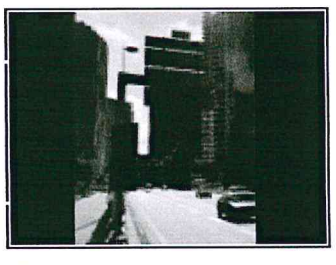
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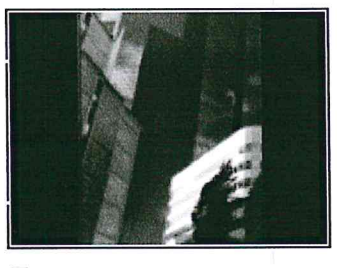
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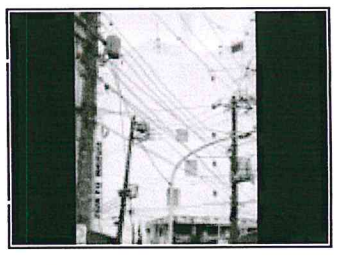
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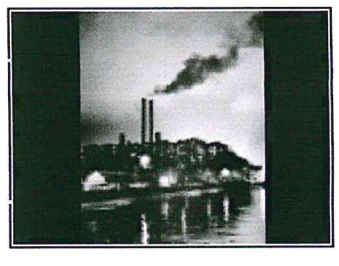
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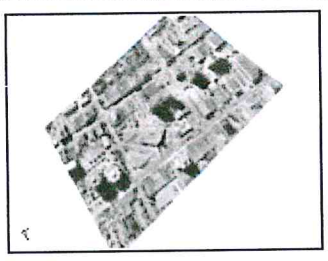

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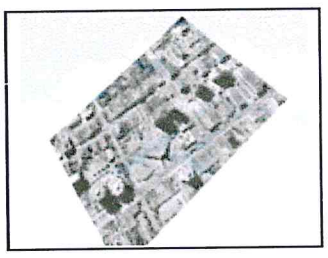

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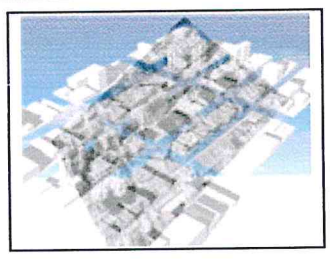

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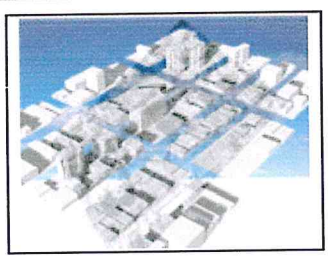

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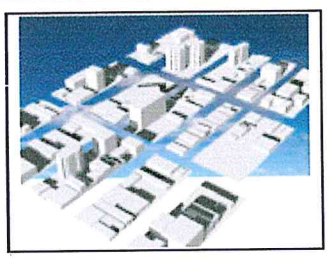

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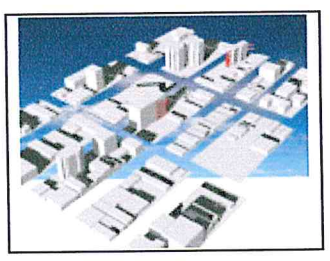

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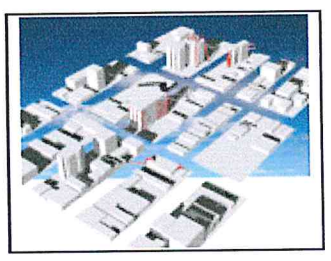

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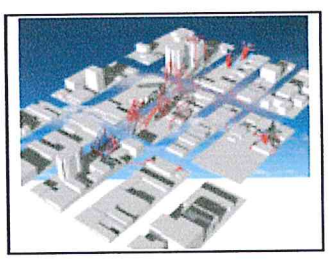

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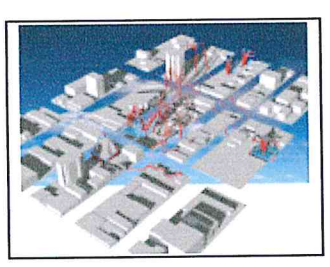

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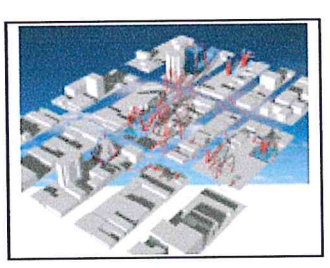

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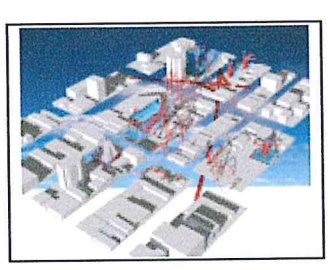

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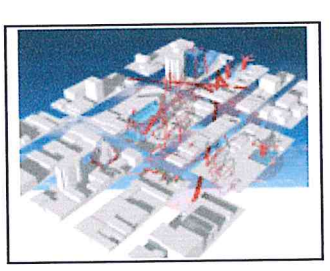

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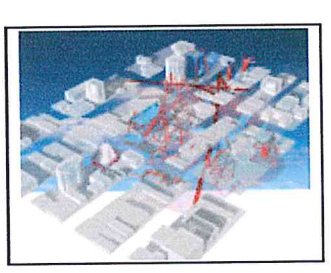

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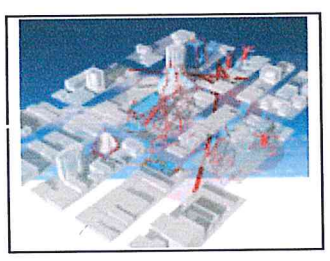

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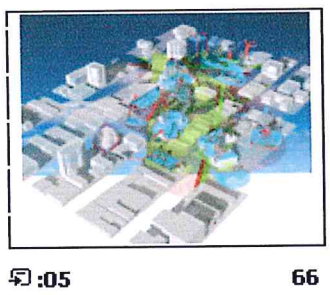

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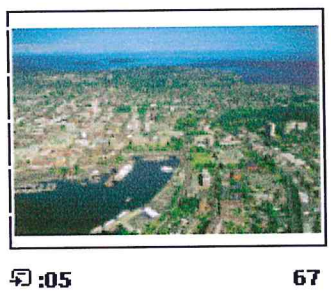

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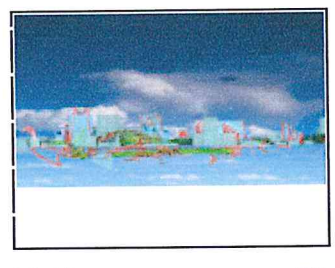

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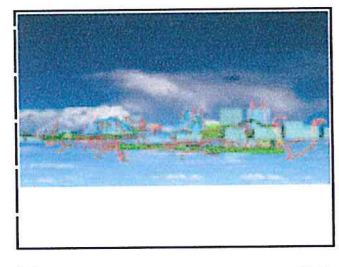

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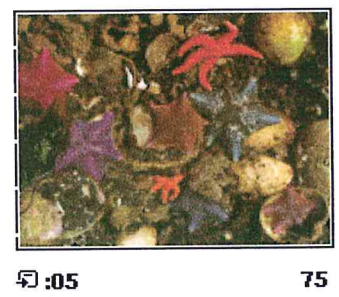

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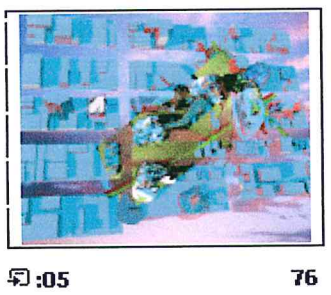

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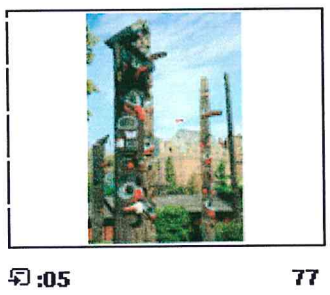

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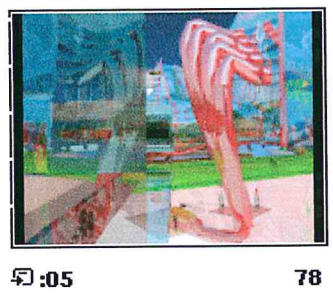

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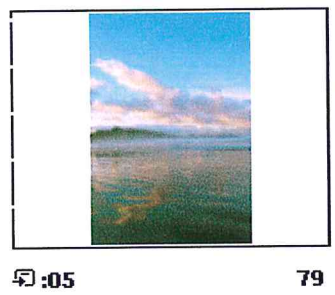

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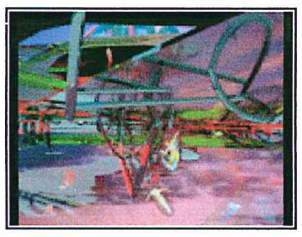
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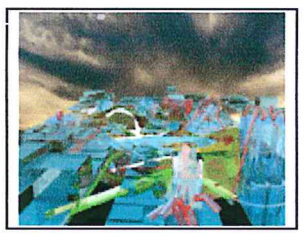
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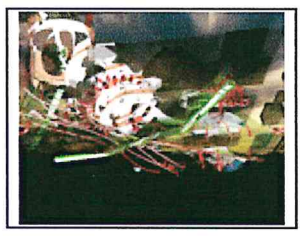
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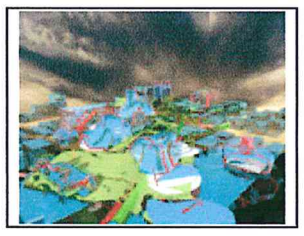
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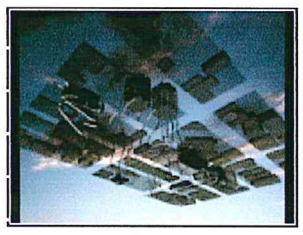
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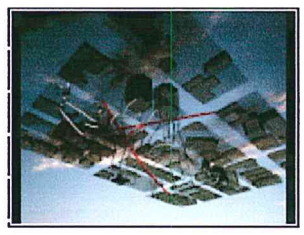
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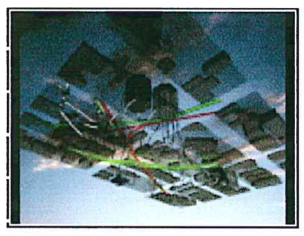
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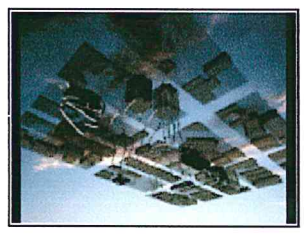
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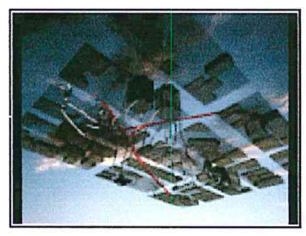
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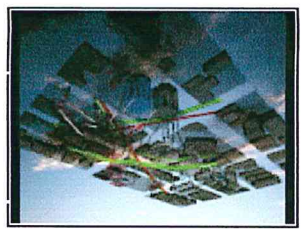
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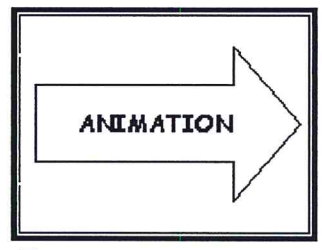

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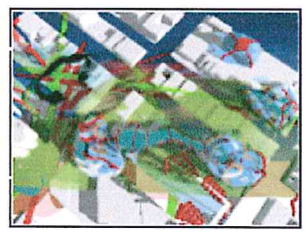
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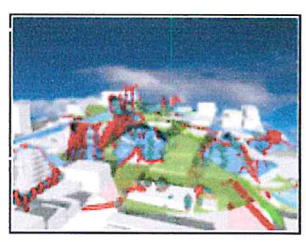
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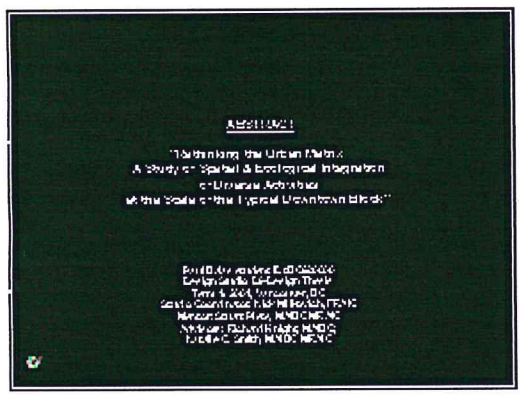
FOLLOWING IS A SUMMARY OF THE 3rd. PRESENTATION.
IT IS A STUDY OF A SELECTED PART OF THE WHOLE NEIGHBOURHOOD
PRESENTED IN THE 2nd. PRESENTATION.
ALL MATERIAL IS IN A DIGITAL FORMAT AND INCLUDES:
SLIDE SHOW WITH A BACKGROUND AUDIO.



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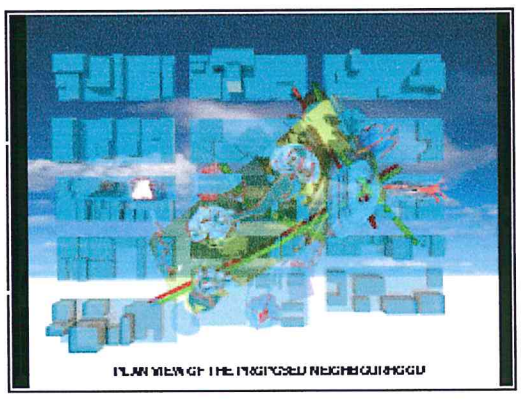

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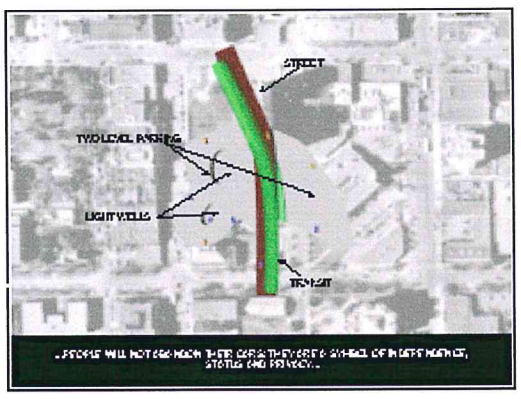

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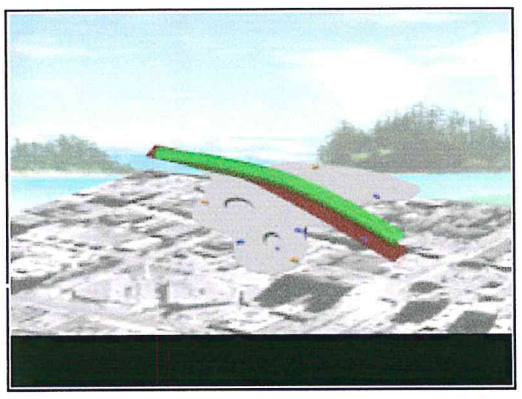

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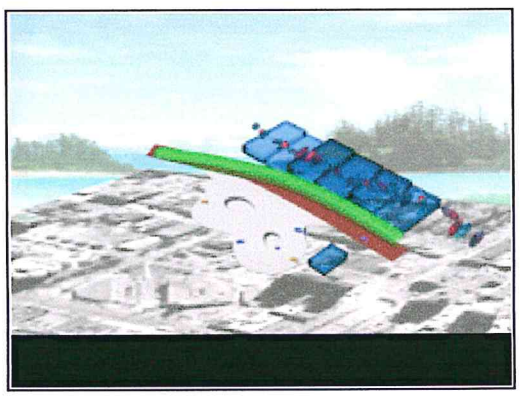

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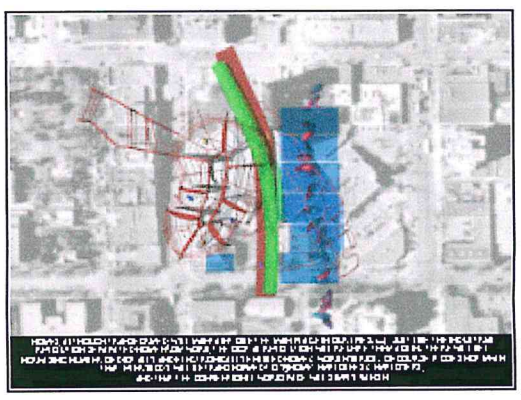

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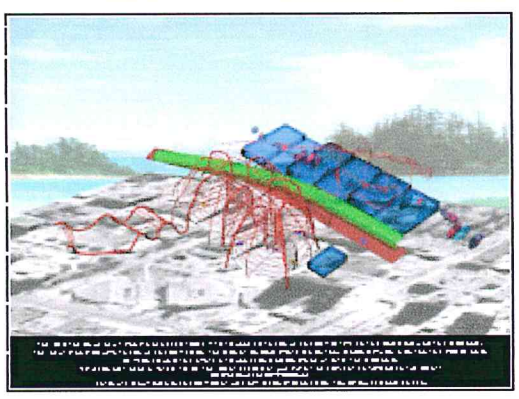

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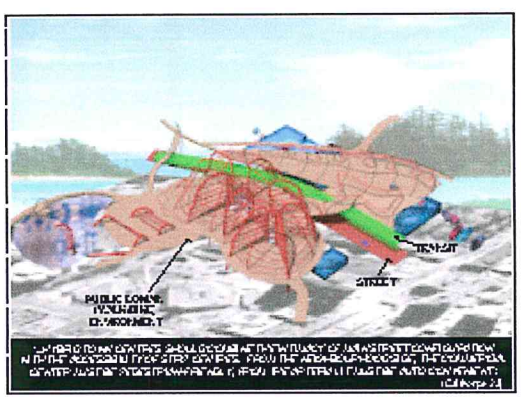

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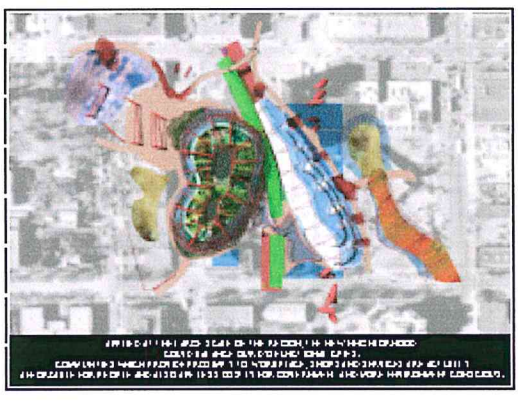

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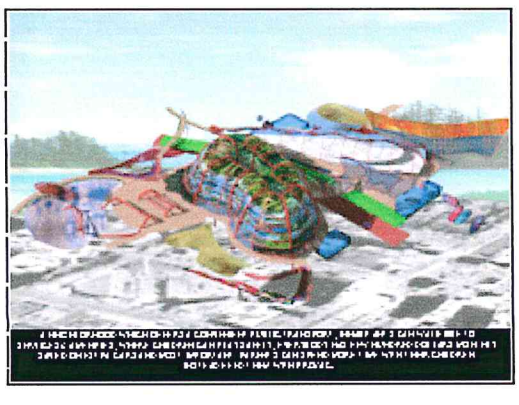

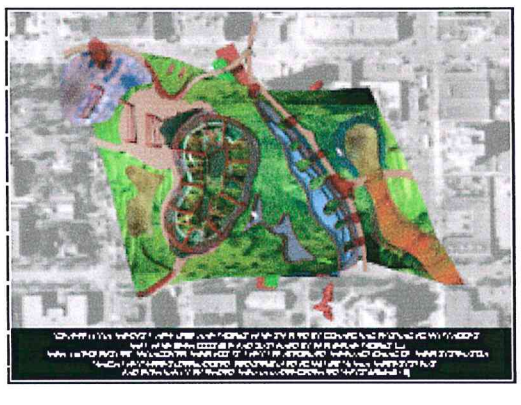

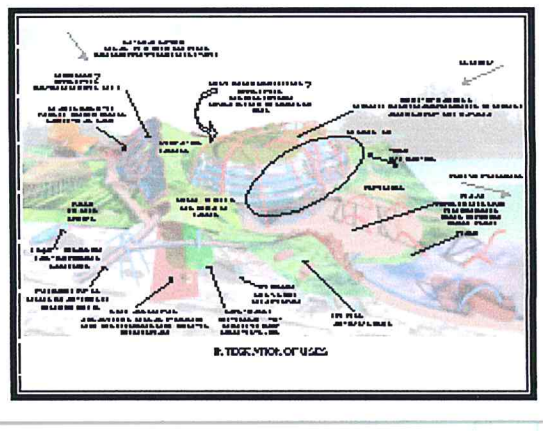

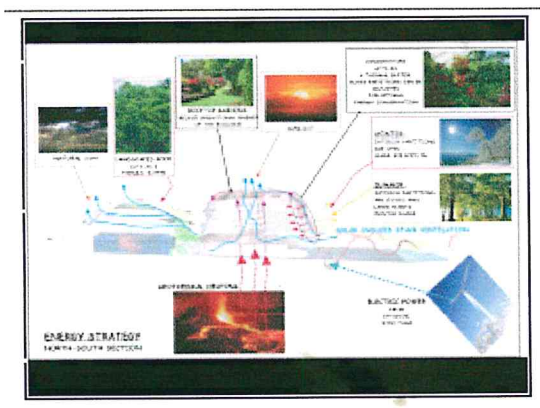

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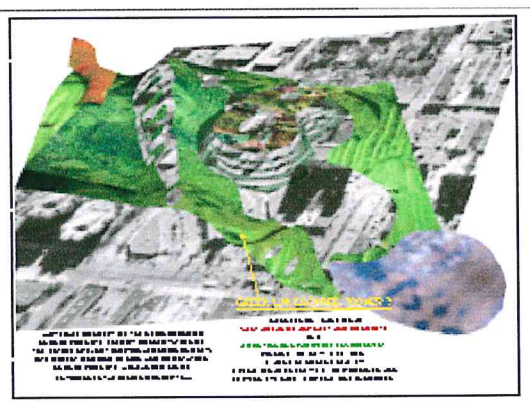

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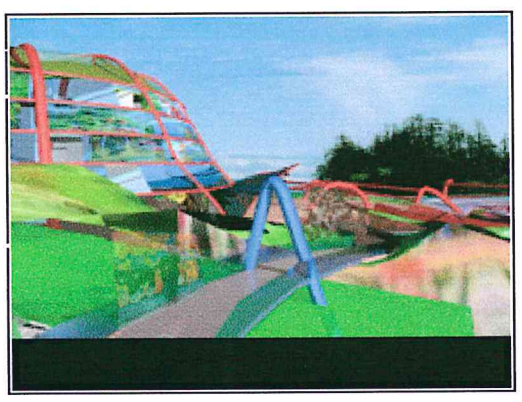

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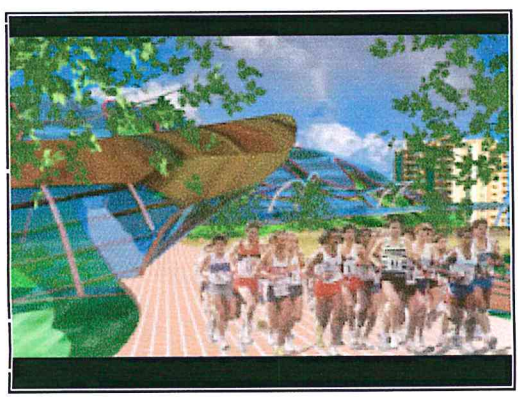

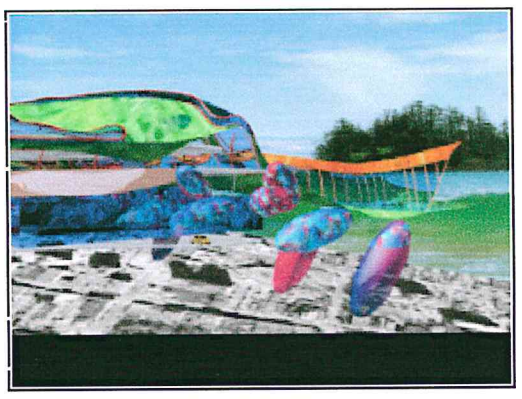

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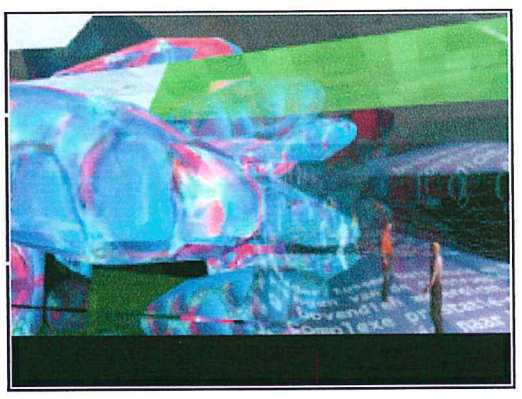

29