UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

chapter one

greater proximities

The exploration on proximities drives the project investigation from a greater background study to a specific site and program. Decision are made from an applied research methodology and critical analysis. The architectural project and its context was localised within the city of Pretoria, South Africa. Drawing closer the proximity of global issues to local issues, the field for design and development was found within the site of the Old Pretoria West Power Station. Simultaneously, the same research methodology led to the development of the program of urban agriculture, and specifically vertical agriculture.

21st century
urgent urban challenges

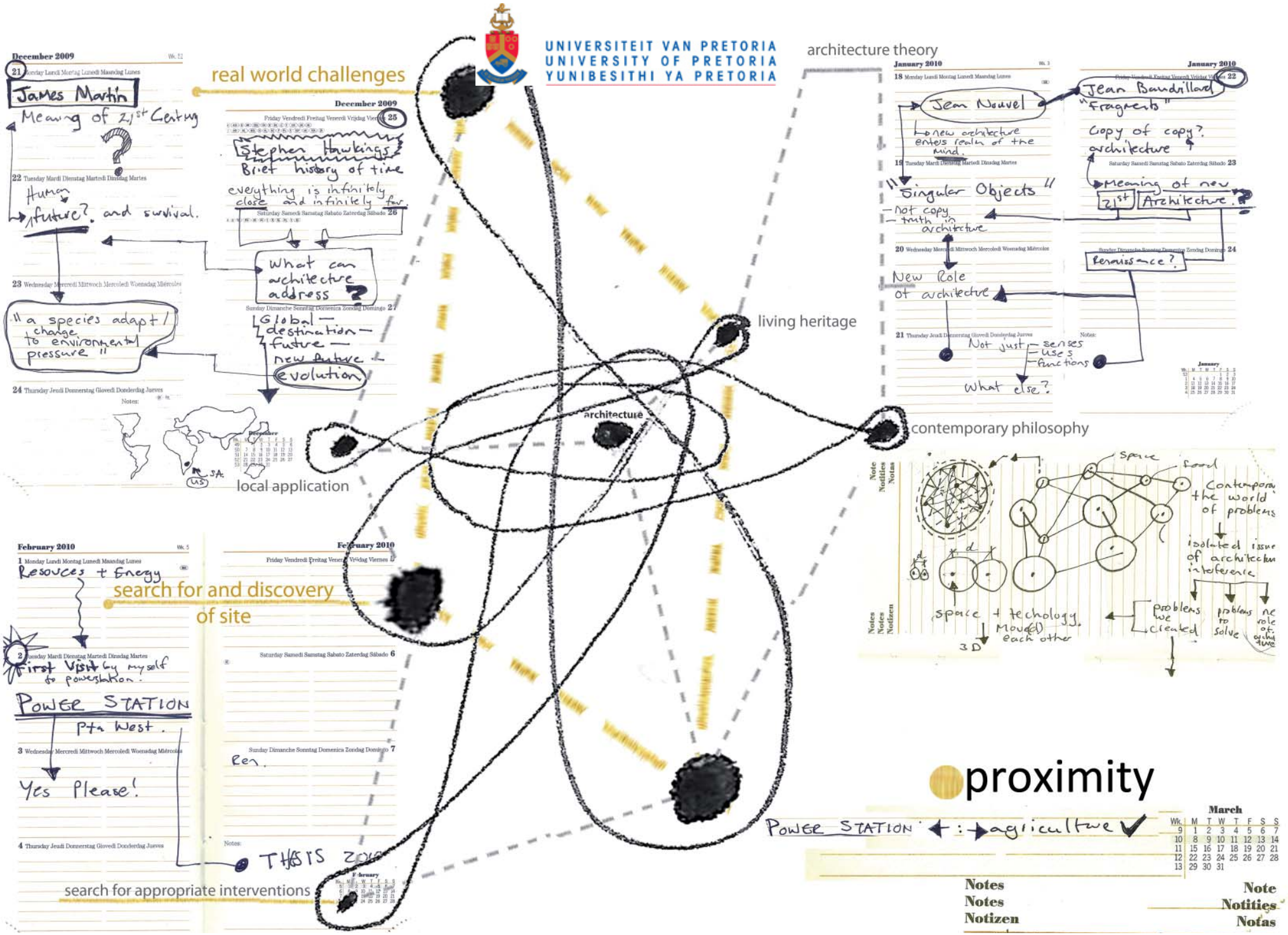
The research questions rose firstly from a background study on the current zeitgeist of the 21st century and its projections for the next century and beyond. From this background study, the initial direction of the project was driven by three topics: the Megacity phenomenon; increasing scarcity of resources (especially land and water) and the true power of humanity's control over its own future.

By closing in from these greater proximities to local proximities, new roles for architecture can be found. The field created between them is further investigated for a conclusion on site choice and program choice.

"...the 21st century is an extraordinary time - a century of extremes. We can create much grander civilizations or we could trigger a new Dark Age. There are numerous ways we can steer future events so as to avoid the catastrophes that lurk in our path and to create opportunities for a better worlds. A revolutionary transition is ahead of us.... this could be humanity's last century, or it could be the century in which civilization sets sail towards a far more spectacular future."

James Martin
The Meaning of the 21st Century, 2006

Figure 2: Investigation material that guides the development of the project [author, 2010].


UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
real world challenges
architecture theory
living heritage
contemporary philosophy
local application
search for and discovery of site
search for appropriate interventions
architecture
proximity
James Martin
Meaning of 21st Century
Stephen Hawkings
Brief history of time
everything is infinitely close and infinitely far.
What can architecture address?
Global — destination — future — new future
evolution
"a species adapt / change to environmental pressure"
Jean Nouvel
"Singular Objects"
- not copy
- truth in architecture
New Role of architecture
Jean Baudrillard
"Fragments"
Copy of copy?
architecture
Meaning of new 21st Architecture.
Renaissance?
Not just — senses — uses — functions
what else?
Resources + Energy
first visit by myself to powerstation.
POWER STATION
Pta West.
Yes Please!
THESIS 2010
POWER STATION : agriculture
Space
food
Contemporary the world of problems
isolated issue of architectural interference
space + technology. Moved each other
problems we created
problems to solve
3D
Notes
Notes
Notizen
Note
Notities
Notas

proximities our current world

In his book, “The Meaning of the 21st Century”, James Martin illustrates the importance of the 21st century. In the past, world history took its course and was marked by scholars decades, sometimes centuries later. Event and direction happened almost per chance and evolution was slow. Now, in the 21st century, we are for the first time dually active participant and historical witness of our own time [Martin, 2006:226]. Long-term future scenarios are moving ever closer to our present short-term decisions as global issues are affected by the direction of individuals and individual societies. The 21st century is the emergence of literal global consciousness: we are intertwined in each other and with the earth, for better or for worse, as we are closing in on not only physical human proximities (visible energies and resources) but also on metaphysical or virtual proximities (invisible, digital or microscopic energies and resources). We are comprehending and directing our own evolution via the emergence of digital culture and the origin of truly abstract and “invisible” landscapes (virtual media) and “invisible” technologies (nano- and biotechnologies) [Martin,189-274].

Martin further stresses the fact that at the end of the 21st century, we are either going forward as a civilization or stepping into a prolonged new Dark Age [Martin, 2006:xiii]. For progression, Martin relates the importance of the sustainment of localities within a global network. Furthermore, Martin illustrates a very unnerving fact - humanity’s fate is not blindly fatalistic anymore, but rather humans have the ability to direct their own goal-orientated development and advancement into the future [Martin, 189-232].

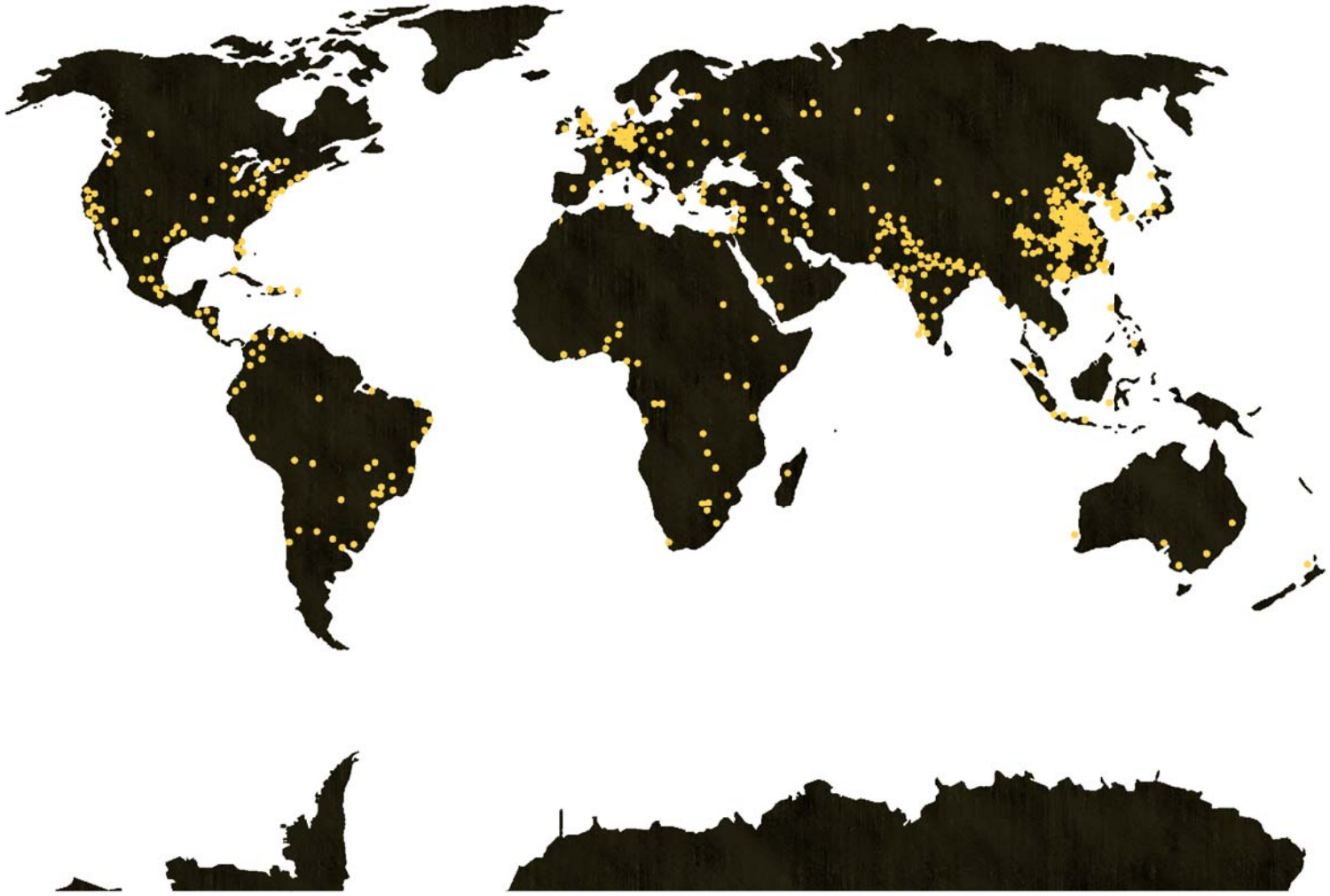


Figure 3: Cities with populations over 1 million, 2006 [author, 2010].
adapted from wikimedia commons

james martin

The Meaning of the 21st Century, 2006

Martin is futurologist and researcher at Oxford. He won the Pulitzer Prize for his insightful book, ‘The Wired Society.” He is founder of the James Martin 21st Century School, Oxford (founded 2005) and also the World Education Corps (2002).

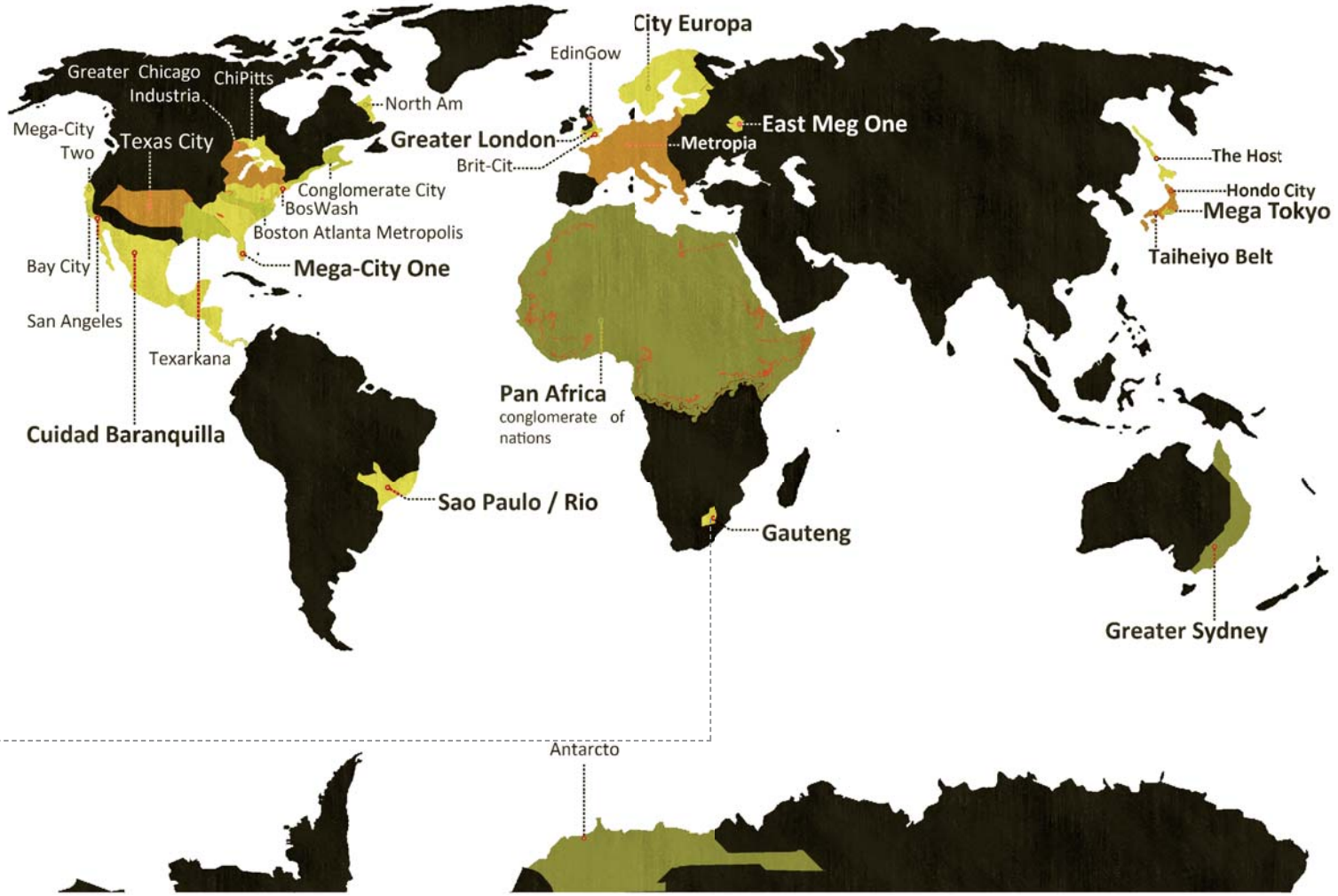
global 20th century

distance is gone, locality is everywhere

near future megacity phenomenon

Cities are developing into inevitable megacity scenarios, and the future of architecture is certainly urbanistic [Nouvel, 1997:95]. Proximities increase as we crowd closer, but we traverse further for our limited resources - land, water and food. Furthermore, cities are expanding onto traditionally "no-go" industrial peripheries and we are now faced with exploring new typologies of industrialised urban cells - places where production and living collide. The human habitat is slowly trying to evolve into habitats that are self-sustaining local entities. This is evident through new legislations suchs as *Green Star* or *Leed* rating systems as well as in local policy making [SANS 204-1:2008], and most importantly on socio-economic level through the Green Economy revolution [South African Cities Network, 2009:37]. We are, and must continue to, evolve into cultures that use intelligent technologies to be a productive and sophisticated civilization. This generation of professionals have exciting and daunting new roles to play in this Transition Century [Martin, 2006].

South Africa is already moving towards its own powerful megacity as the Federal and Commercial capitols collide



Figures 4: Predicted megacities of the future [author, 2010] *adapted from http://io9.com*

r i c h a r d r o g e r s

World Sustainable Building Conference, Tokyo, 2005

"...the urgent task is to forge an environmentally responsible modern architecture, to use technology to **achieve beneficial ends** - the ultimate aim being to achieve carbon dioxide neutral environments...."

"...**by fusing** social concerns, technological and structural innovation and environmentally responsible design, I'm convinced that a truly modern architecture for the 21st century can be created...."

global 21st century megacity phenomenon

nd study, the most pressing issues are listed [Martin,281-293] in order to understand where architecture can play its new role in the development of the 21st century. By identifying which global issues are directly related to architecture and the built environment, it became clear that architecture and the built environment can answer to many of the most pressing global challenges that we are faced with today when taking on the role of a producer of energy and resources.

The earth [1] and ecology is the most important informant on program and site choice as the project aims to draw closer on the proximity of the built environment of the 20th century to a ecological environment of the 21st century. This indicates that the project should minimise its impact on the earth by decreasing its carbon footprint as much as possible. The building must therefore develop on or re-use existing built fabric, incorporate renewable and sustainable materials and structure choices and be as self-sufficient in its energy consumption and supply as possible.

The next issue addressed is that the project must be economically profitable, economically sustainable, create work and aid in alleviating local poverty [2]. The project must provide work for a workforce of a majority of simply educated persons (or even non-educated persons) and unskilled labour. The program and building must be instructional and exemplary in order to empower individuals or groups to learn and apply knowledge from the project elsewhere.

The project aims to encourage lifestyle changes [3] by advocating localised, resource-efficient, sustainable, urban living as a norm - creating a sustainable productive culture. This means that project must also be public in nature and participate with urban activities in an active (formal) as well as a passive (informal) manner.

This project addresses these issues and strives to provide a solution to global challenges in a local environment in the pursuit of localised, resource-efficient, sustainable urban cells. By identifying these global issues locally in the city of Pretoria, the project intensifies the proximity of global issues to local problems and opens up a field for development for architecture and the built environment to take progressive steps forward. The project aims to be a pilot project for South Africa. The lessons learned here must be improved and developed on further to aid in the development of not only South African cities, but also in the advancement of civilization as a whole [15].

Cities need to respond and start to cultivated resource-efficient, local, productive societies. The conclusion is drawn that the issue of production and industry is an incredibly important factor in the direction that urban development takes. By drawing closer on the above mentioned issues, it became clear that the program and site must address issues of industry and production processes in an urban environment

The role of architecture and the issue of production and industry and the urban environment is investigated further.

challenges connecting proximities

the new role of architecture as producer can answer to the most crucial of these challenges directly

1 the earth 2 poverty 3 population 4 change

of lifestyles 5 war 6 globalism 7 the biosphere

8 terrorism 9 undiscovered areas of creativity

10 disease 11 new human potential

12 the singularity 13 existential risk

14 transhumanism 15 advanced civilization

progressive role of architecture

An interesting dichotomy formed as humanity starts to focus on true sustainability. The world's view of itself has changed from isolated fortress cities into a hybrid, global system of networks in urbanity – where the connection of localities is the most important aspect. We stress narrowly on locality but connect endlessly worldwide. In this way, as individuals or as societies, we are daily narrowing our proximities with increasingly different cultures and sub-cultures, and also with new professions, new materials and virtual media. These proximities crash with each other sometimes intentionally but mostly spontaneously and spur on exciting developments. Surely, architecture should be informed by its own time and project innovation towards the future similarly? Should we not adopt additional or new roles in architecture before we call a "new building" 21st century "architecture"?

After considering this background study on the 21st century, it became clear that the field of architecture must develop many more attributes. In addition to sensory or sensational design, ergonomics or tectonics of object or space, architecture now has an additional characteristic: that of a local provider and supplier. The architect Jean Nouvel has a similar viewpoint and he believes that as a profession, architecture has the tendency to become too isolated [Nouvel, 1997]. Architects can too easily interpret the real issues of our time superficially and represent these solutions as visual misnomers, without really addressing them and their implications in their totality [Nouvel, 1997]. The contemporary philosopher Jean Baudrillard, who conversed closely with Nouvel on this topic, agrees and comments that the 21st century asks of architecture to be more than a reaction of physical dimensions only, but also reaction on a greater scale of metaphysical dimensions of virtuality and seemingly invisible systems and landscapes [Baudrillard & Nouvel, 2002:18].

To meet the challenges of the 21st century; to aid in the reintegration of production and industry into urban society; and to fulfil the need to generate sustainable urban cells and networks, the project aims to develop a the new role for architecture in a 21st century productive culture. From stagnant, passive and consuming buildings towards progressive, active and productive buildings, the new role of architecture is future-driven and goal-orientated and the new building aims to be a productive, active participant and catalyst for sustainable urban living.

The new role of architecture therefore implies that the building must be actively producing energy or resources within an urban environment and stimulate sustainable urban living. The new role of architecture is an architecture of production.

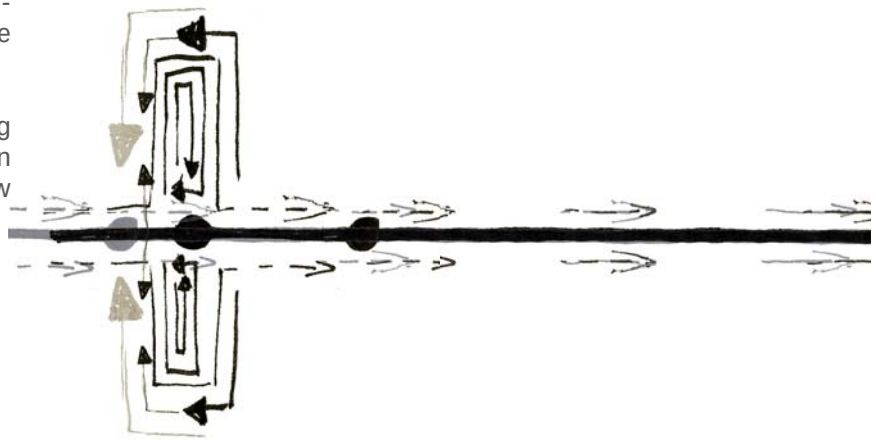


Figure 5: Architectural progression is informed by the discovery of new future-orientated roles [author, 2010]

passivearchitecture

challenging a stagnant, passive architecture of consumption by investigate new roles for architecture

"When a philosopher says that philosophy proceeds by concept, science by prospect, and art by precept and effect, he is drawing our attention to the prospect, to that which science can contribute. Heidegger's provocative statement comes to mind: "Science doesn't think". That's not what it's there for."

jean nouvel
selections from *Lectures at the Centre Pompidou,* 1997

"I want to ask the contemporary architectural world how **architecture for the coming era** should be manifested. Regarding the expression of the ideas that will be proposed, an abstract methodology is fine....practical proposals for compositions of systems are also welcome. The issue is not to discover new values in architectural elements, but to construct **new relationships between architecture and nature...."**

tadao ando
at the *World Sustainable Building Conference, Tokyo,* 2005

t

productive architecture

creating new roles for architecture by investigating future-orientated, roles architecture can have as an active, productive supplier of energy and resources

integration industry and production

From the transition of the 20th century into the 21st century, the Megacity phenomenon changed the urban condition in its relationship with production and industry. The pre-modern industry and production components [1] were mostly smaller, localised and internal scenarios within the walls of the city. They had a close proximity with urban program and processes. With the progression of the Industrial Age and the 20th Century, proximities shifted between industry and urban conditions. The intensification of the industry and production components became increasingly necessary yet increasingly alienating human environments. This cause them to be pushed out from the city to become unfavourable edge conditions [2].

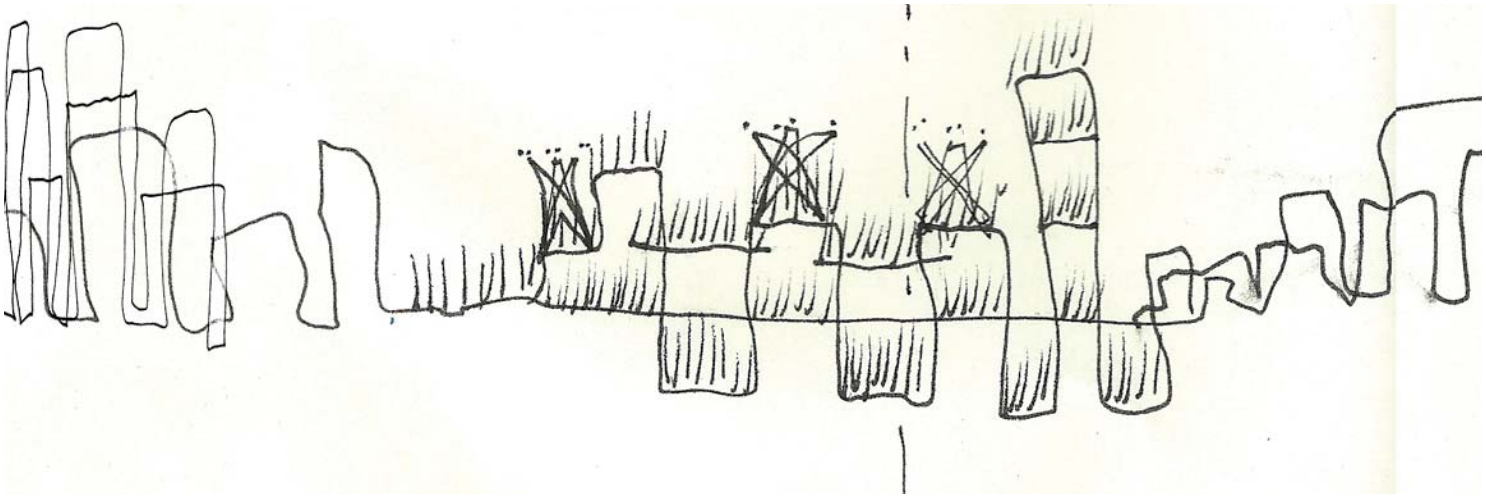
In the 21st century, however, the Megacity phenomenon drives cities into conditions of edgelessness as extreme populations and urban sprawl overtakes the traditional edge conditions of cities [3]. The proximities between urban conditions and industrial processes close in and they start to envelop each other. Also, the old technology of the 20th century - especially technologies involved in energy production and the energy industry - cannot cope with the demands of the 21st century and the environments that housed them are abandoned. Lastly, the need for cities to become resource-efficient and sustainable, requires new urban form and reform - networks of urban cells configure to form of smaller, localised, productive urban societies.

The closing proximities of production and the urban environment open a field for creative and progressive development for not only urban form, but also architecture and its role in productive urban environments. The site and program addresses the issue of 21st century urban conditions by developing on an industrial 20th century edge condition of the city of Pretoria.

A suitable form of production or industry to illustrated the integration of production and urban environment, as well as the new role of architecture as producer, is investigated further.

Figure 6: Transitions of industrial conditions within an urban setting from Pre-Modern to the 21st century. This global phenomenon and transition of industrial urban landscapes is also found in Pretoria, South Africa, [author, 2010].

[3] 2000-2100 shifting proximity of industry and production within the urban environment



industry transition

world-wide urban phenomenon

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

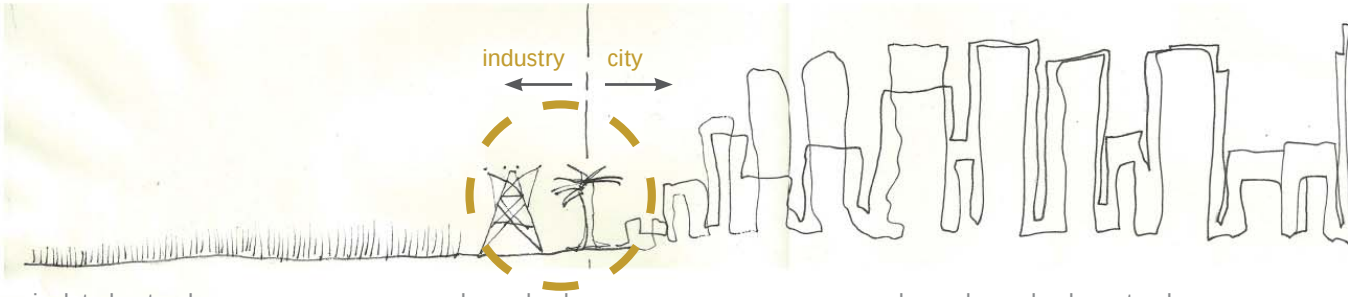
[1] 1850 pre-modern city - edgeless production

natural environment

clear edge by natural or man-made element (wall, river, hill)

clear urban edge by natural or man made-element
edgeless production

[2] 1900-2000 modern city - edge industry

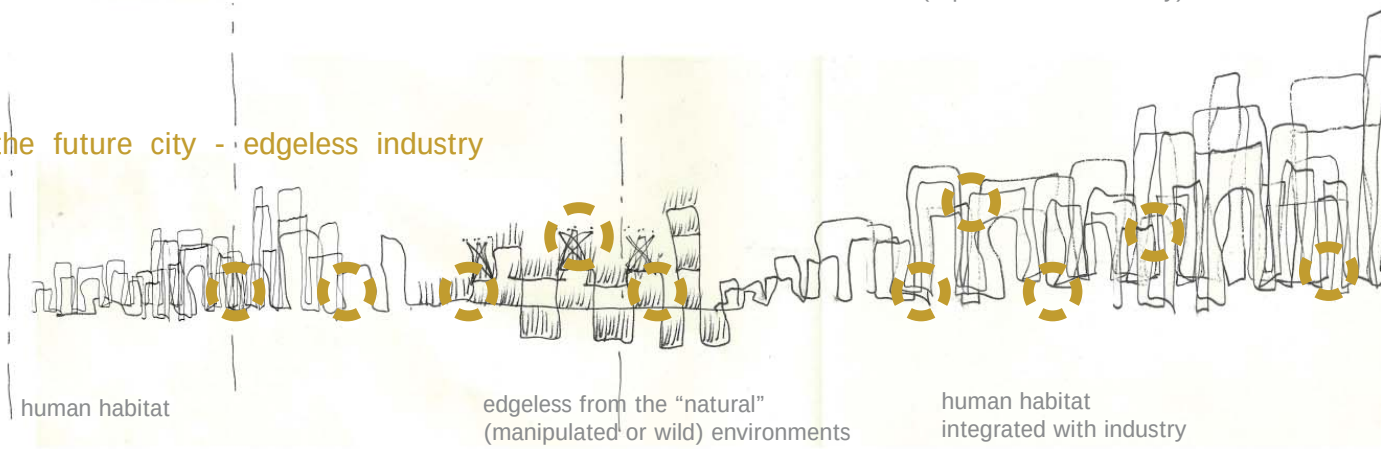


manipulated natural environment

clear edge by program
edge industry

clear urban edge by natural or man made-element
(seperated from industry)

[3] 2000-2100 the contemporary and the future city - edgeless industry



human habitat

edgeless from the “natural” (manipulated or wild) environments
edgeless industry

human habitat
integrated with industry

21st century
urgent human challenges

The conclusions drawn from the 21st century urban conditions and the new role of architecture as producer indicate that the topic of production in urban environments is the most pressing issue. Furthermore, within the past decade, food production and food supply has become an increasing concern and valuable commodity. Prices have in some instances surged by 50% to 200% [Eickhout et al, 2009].

The socio-economic problems that follow are enormous, yet the main issues are the speculation in food stocks (especially in low cereal stocks); unpredictable and extreme weather events; the rising industry of the production of bio-fuels competing with cropland for food production and finally, the very high oil and transport costs consumed by the food production in the traditional agriculture industry. The result is that either the food prices increase drastically, or cropland expansion occurs at the loss of valuable land and biodiversity [Despommier, 2008]. The global issue of food production for urban populations has local parallels in South Africa [Combrink, 2010]. The proximity between the issue of food production an urban density creates new field for architecture and urban design.

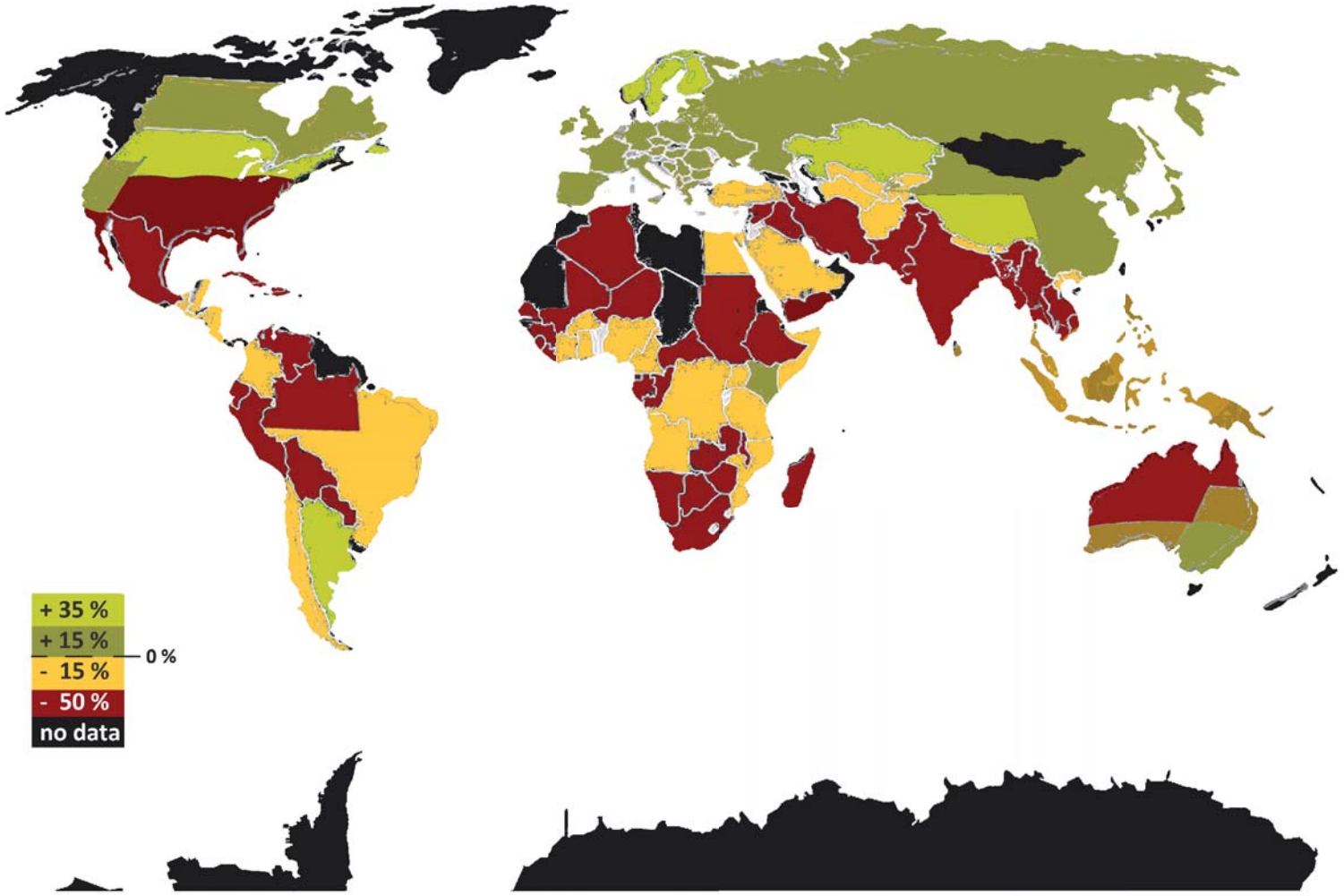
"...one solution involves the construction of urban food production centres - vertical farms – in which our food would be continuously grown inside of tall buildings within the built environment...All of this may sound too good to be true, but careful analysis will show that these are all realistic and achievable goals ..."

dickson despommier
The Vertical Farm, 2008

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

food shortage food crisis 2080

According to Dickson Despommier, with the world population increasing (estimated almost 8.6 billion people within the next 50 years) it is simply impossible to cultivate enough arable land, outside cities, to meet food production criteria [Despommier, 2008]. However, the technologies for food production increase annually [Despommier, 2008] and urban agriculture is practiced successfully in countries like Cuba and Japan. By producing food at the same place of its consumption, the system of urban agriculture reinforces a healthy, sustainable and resource-efficient balance of production and consumption. According to architect and author Andre Viljoen, urban agriculture is effective, practical, time efficient and not only aids in reducing high embodied energy use caused by contemporary western food production systems, but also provides new opportunities for employment, security, and urban rejuvenation across many scales [Bohn, Howe, Viljoen 2005:12]. Urban agriculture advocates that the global and national food supply systems of countries are by definition local industries The advantages of commercial urban agriculture outweigh the disadvantages considerably. It is far easier and more profitable to pursue urban agriculture as a form of livelihood than ever before. The techniques are wide-spread - from low tech, low education systems like small plot intensive farming *(SPIN Farming)* to hydroponic and aquaponic agriculture. Vertical and urban farming is taking a turn for the best in local and commercial application worldwide through companies like *Brightfarm Systems* and projects such as *Gotham Green* (New York), or *Pasona* (Japan). The farming industry is closing proximity inwards towards the urban environment.



: Projected losses in food production due to climate change by 2080.
adapted from Eickhout et al, 2009:46, author 2010

dickson despommier

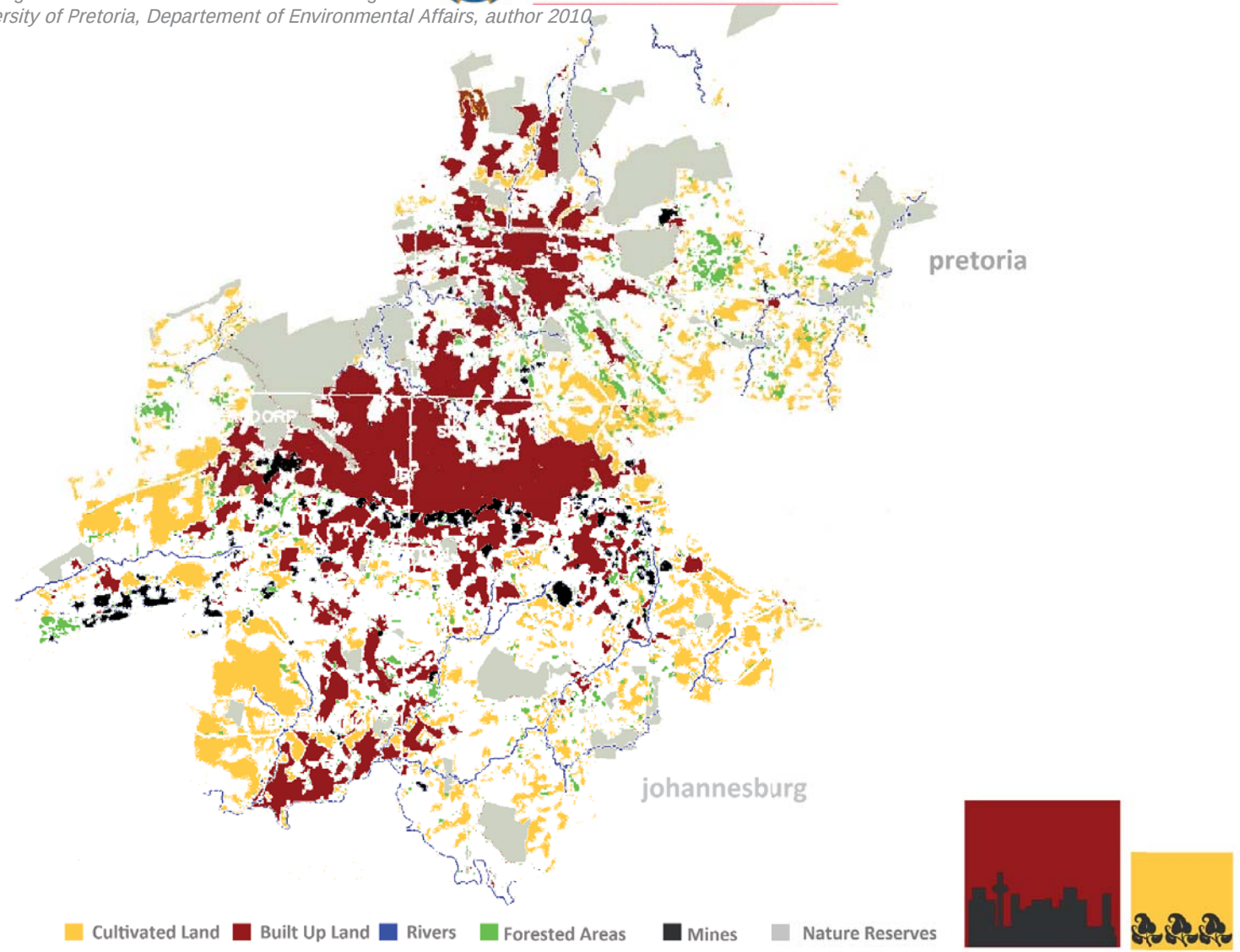
The Vertical Farm Project, NYC

Dickson Despommier is a professor environmental health sciences at University of Columbia, New York and director of *The Vertical Farm Project.*

world agriculture projection

projection changes in global agricultural productivity 2080

Figure 8: Similarities of global conditions to conditions in Gauteng
adapted from the University of Pretoria, Departement of Environmental Affairs, author 2010



gauteng local symptoms

challenge the integration of urban agriculture in the built environment

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

land shortage vertical agriculture advantages

Despommier further indicates that 38% of the landmass of the earth is currently used for food production [Despommier, 2008]. Besides the massive consumption of land, there are many draw-backs on land-based commercial agriculture - *urban* land-based agriculture also. Most importantly, it was proven with an experiment conducted by Dickson Despommier and his students in 1999. The experiment calculated how much food can be produced to supply for 50,000 people a daily calory intake of 2,200 calories in the city of New York using land- or soil-based urban agriculture. Using rooftops, parks and vacant land, it was not possible to provide food for even 2% of those 50,000 inhabitants [Cooper, 2009]. There is simply not enough horizontal space for efficient crop production to feed the populations of all our cities. There are many other problems with conventional, land-based agriculture besides requiring space. Crops are completely vulnerable to the elements and conditions of weather and seasons. In countries with droughts, famine or food shortages, these are great tragedies and can set agricultural production back many years. There is considerable uneconomic use of resources in land-based agriculture, including wastage in agriculture run-off, loss of energy resources in the loss of organic wastes of non-edible biomass production, general water mismanagement and losses, and infections of crops with foreign contaminants from adjacent sites and neighbouring crops, or issues of pest and vermin control. Also, the transport, packaging and refrigeration components and the effort to deliver produce to cities nationally or internationally contribute to great consumptions of fossil fuels. Lastly, most cultivated lands, commercially or privately owned, have long-term destructive implications and damage on natural ecosystems that takes years to repair [Despommier, 2008]. These are just a few problems, the list goes on considerably.

It is therefore essential to optimise land for crop production. Especially in urban areas, arable land within in cities that can produce enough commercial crops for the consumption of the inhabitants is extremely limited and will never reach food requirement targets [Despommier, 2008]. Vertical agriculture is a solution to the pressing problem of commercial food production for and within cities. Half a hectare of vertical farming can be an equivalent of traditional soil-based hectares by factors ranging from to 4 or 20, depending on crop types [Despommier, 2008]. In addition, vertical agriculture is an ideal program for the re-use of existing structures or buildings, and can give a new dimension to dilapidated spaces and environments within cities [Buck et al, 2004:5].

It was decided that vertical agriculture is the most suitable program for the thesis as it draws closer the proximities of industry, agriculture and the urban environment in a new field for architecture. It is now possible to explore the new productive role for architecture as it collaborates with agriculture and industry in a local urban environment.

south africa

"South Africa is a nett **importer** of food. even with our rich land and resources, we have a dire food security problem. This problem is real and current. In parallel, alternative methods and new farming technologies are **also real and current.** These systems are viable, productive, sustainable and profitable.

South Africa should lead this productive process and not merely **aid** in food security, but take courageous steps to **solve** food security problems. This pressing problem has a simple solution: intensive urban agriculture."

Morkel Combrink [combrink, 2010].

Continuous, annual crop production - no crop failures due to variations in weather conditions.

Agricultural run-off is minimised and water resources management is maximised.

Massive reduction in the use of fossil fuels (farm machines, transport of crops, long-term refrigeration and packaging et cetera).

Can be developed on abandoned or unused properties.

Provides for local sustainability for urban centres.

Can convert black and/or grey water into potable drinking water.

Contributes energy back to the grid (methane or bio-gas generation).

Provides new urban employment and urban rejuvenation possibilities.

Reduces the infection risks to crops (as found on the traditional agricultural interface).

Returns farmland to a much more natural environment, helping to restore damaged ecosystem operations.

Vermin and pests are eliminated and very easy to control.

Can consume off-site wastes example collecting and using restaurant bio-wastes for methane generation.

the vertical farm project, university of columbia

The Vertical Farm Project was started in 2001 by Dickson Despommier, a professor of environmental health sciences and microbiology at Columbia University, New York. This project has done substantial research on vertical agriculture, focussing its research on the production of food for 50, 000 people by a single building. The research ranges from topics on crop production, energy needs and consumption and possible materials. This project research was applied critically and adapted where needed in order to produce a model and solution for Pretoria and South Africa.

Applying the knowledge gained from the *Vertical Farm Project* and other independent research, the new hydroponic factory aims to be a pilot program for vertical agriculture for South Africa.

However, the urban conditions of Pretoria cannot match the urban conditions of New York City and so do not allow for the scale of the vertical agriculture project in Pretoria to reach the magnitudes of heights or footprints proposed by *The Vertical Farm Project.* Although crop types are similar, the new hydroponic factory in Pretoria will not cater for animal husbandry and this was factored out of *he Vertical Farm Project* model. Also, the vertical agriculture buildings proposed by the *Vertical Farm Project* are almost 30 storeys high and become extremely expensive and unfeasible in local application, and the strategy was changed. Instead of aiming to feed 50,000 people by a single building, it was decided that more buildings of a lower scale should rather be distributed around the city to produced crops commercially.

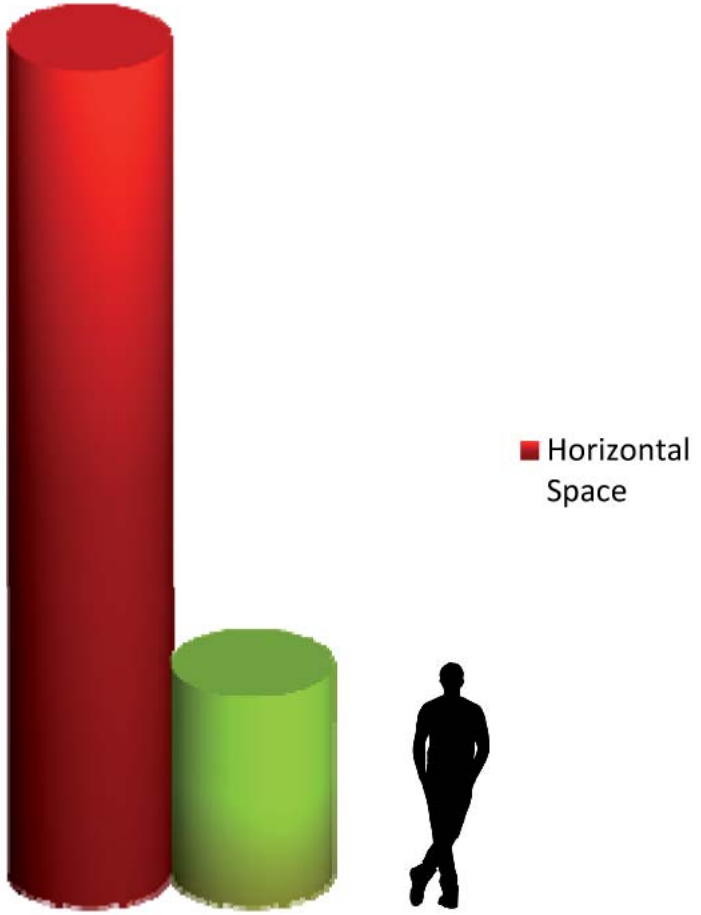


Figure 9: Graphic indicates the land use per capita for crop and food production. It does not even take into account values required for grazing for animal husbandry or fossil fuel consumption. This illustrates the advantages of vertical agriculture as a solution to the optimization of valuable land [author, 2010]

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

research strategy

problem statement

From the background study and theory, a research strategy is formulated on critical analysis and applied research strategies.

The issues raised from the background studies formulate three problem statements. Firstly, how can architecture aid in the reintroduction of productive processes or industries into an existing urban environment? Secondly, how can architecture aid in the creation of local, resource-efficient, sustainable urban support cells, and lastly how can a building be developed in an idiom of the new role of architecture as a producer of energy and resources?

hypothesis

Architecture can generate a sustainable, resource-efficient, productive society by changing the current culture and perception of urban production.

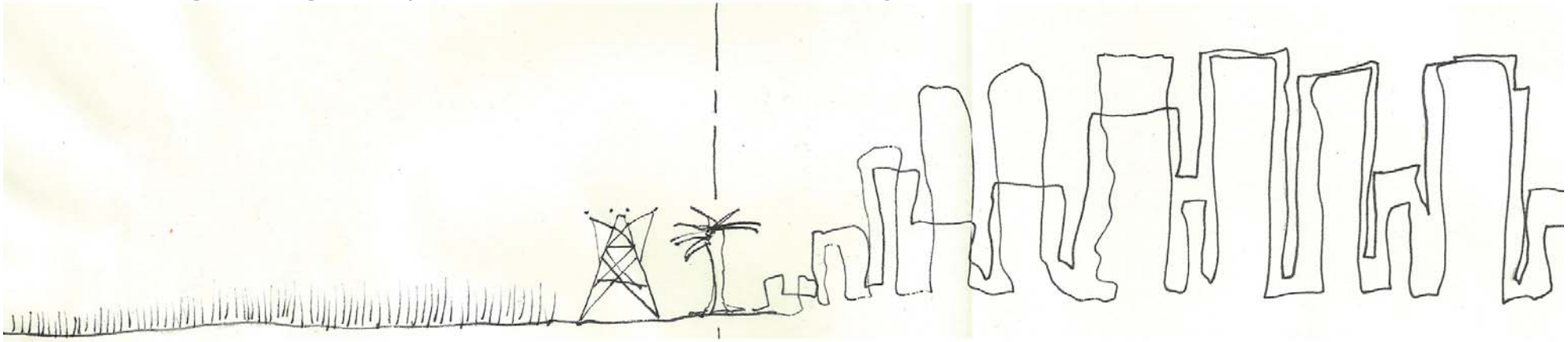
sub-questions

- What is a greater sustainable, continuous productive urban society and how can architecture encourage this within the city of Pretoria, South Africa?
- What type of architecture can be developed for vertical agriculture in South Africa?
- How can industrial heritage be configured to generate a sustainable, resource-efficient, productive culture?

1 the reintroduction of productive processes into the urban environment

2 the role of architecture as local support cell within the urban environment

3 the evolutionary role of architecture as a supplier of energy or producer of essential produce to meet contemporary and future challenges of a greater productive, resource-efficient society



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

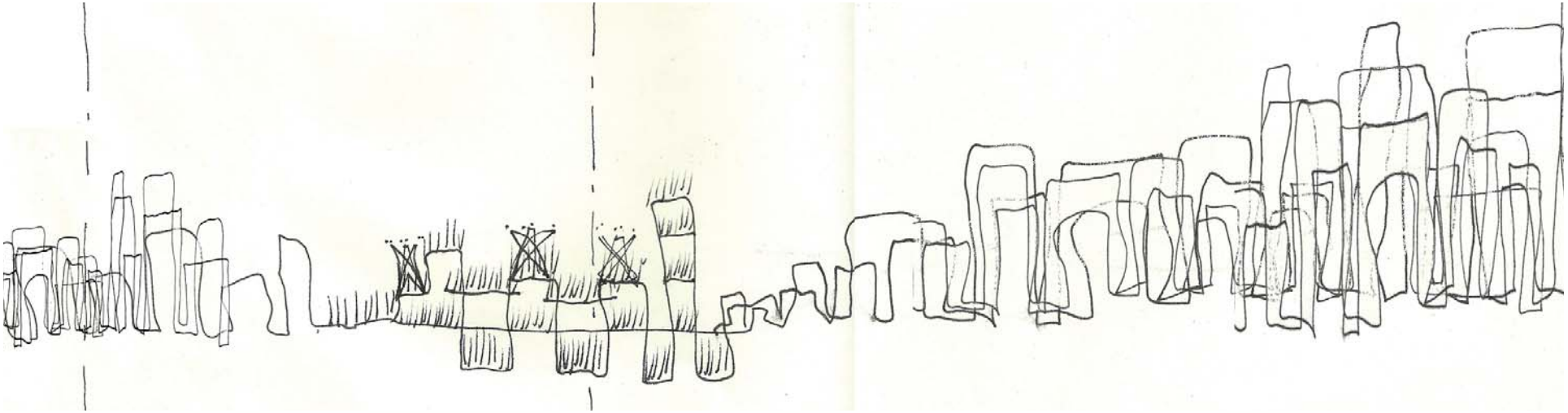
aims of study

The aim of the project is to illustrate that by drawing closer the proximities of food production and the urban environment; by developing the new role of architecture as producer; and by the re-use of industrial heritage, the architecture can generate a sustainable, resource-efficient, productive society by changing the current culture and perception of urban production.

Architecture can do this by bringing closer a tradition of distant commercial agricultural practice into the urban environment to integrate with more intimate social, activities of the city. This is done through vertical agriculture.

The design also aims to generate a new perception and understanding of the value of industry within cities and the potential of industrial heritage to reform dilapidated urban conditions. This will be illustrated by developing on a historic, industrial edge condition within the city of Pretoria.

to generate an architectural model for vertical agriculture for the city of Pretoria, on an existing industrial heritage site



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

methodology

Research for the project was done through descriptive and applied research methodologies. The following research techniques were applied:

observation

Research through observation was conducted by documenting and forming a greater framework vision for the site through the Pretoria West Framework Group, 2010. The specific site (the Old Pretoria West Power Station) was observed and documented through numerous site visits and on-site interviews. A guided tour of the site was also crucial in understanding its history , processes and development. Further observations were made by visiting local commercial farmers and food packing houses to understand the process involved in food production and transport. Visits to larger and smaller food markets across the city were conducted.

mapping

Observation and mapping within the framework work area and the site informed design decisions. This technique was used to map greater movement patterns around the site, pedestrian patterns across the site, greater and intimate site specific systems, heritage components, production processes, material and energy influx and distribution.

archive

Historic aerial photographs, maps and articles were studied to comprehend the development of the study area. Data from municipal records was also collected.

precedent and case study

The programmatic precedent of vertical agriculture was developed on the research model of *The Vertical Farm Project.* This was adapted and internalised for the new project in Pretoria. Precedent studies in regards to the adaptive re-use of industrial heritage buildings was also investigated.

correspondence

The program of vertical agriculture has limited to no professional correspondents in South Africa. International e-mail correspondence in regards to commercial, urban agriculture and small plot developments, commercial hydroponic culture, vertical agriculture, and other topics had to be conducted. The staff from *The Vertical Farm Project* provided valuable crop data that could be converted for local application.

descriptive interpretation

The data was collected through observations, archival and survey records, precedent, personal interviews and discussions, and finally email correspondence. The information is described and interpreted so that logical, realistic conclusions and models can be made for local application. The research is then further interpreted and configured to develop a solution for local conditions within Pretoria.

applied research

The descriptive research culminates in a site specific, conceptual model. This is developed into in an architectural built form and expression.

interviews discussions

Interviews and discussions were conducted with parties over the entire scope of the project. The most important interviews are mentioned here:

South Africa - The head engineer of the Old Pretoria West Power Station, Mr. Fio Masut, provided incredible amounts of valuable information and historic photographs that could not be sourced from anywhere else. This information was then shared with the University of Pretoria, South Africa, to be archived. He also related information on the current and futures status of the site and its relationship to the city of Pretoria, without which, the project would not be feasible.

South Africa - Mr. Morkel Combrink is an agricultural economist and provided information, guidance and most importantly, a critical professional opinion and motivation for the feasibility of the vertical agriculture for the specific site, for Pretoria and for the greater South Africa. He also guided decisions on crop choices and the project scope.

South Africa - Mr. Deon Brink is an chemical engineer currently completing his PhD in chemical engineering at the University of Pretoria, South Africa. He provided information on the energy production capabilities of the new design and the project as whole through its bio-gas and methane generation and energy potential.

India - Mr. M.C. Mahant is a specialist in bamboo construction technology. He provided guidance and information on the development of bamboo and bamboo technology as a possible structural system for the project.

Other interviews and discussions were informal in nature and were conducted on site or within the greater framework area.

It is clear from the interviews conducted that the project has enormous research potential for South Africa in many specialist fields, and the aim of the project is therefore to be a base for such research. It should be specifically noted that this document provides an *architectural* response and that the design solution aims to provide a platform for further development. The design solution is a *response* on these interviews - a reaction and interpretation on the provided information. Concepts are derived from the various informants to provide an architectural answer to a current and future project. The aim of the project is to determine what such a building would be like for South Africa, to develop a conceptual architectural model of how these systems could coexist, to explore alternative options and ultimately aid in the development of a new 21st century building and program.

Figure 10a (middle) and 10b (top right): Important interviews [author, 2010].