Northumbria University Architecture Portfolios

ORGANICITY
A PROTOTYPE FOR COMPACT URBAN LIVING

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Professor

(www.northumbriaarchitecture.com/research)

Northumbria University NEWCASTLE

Front cover

Illustration of concept

1.Project Details

Principal Researcher	**Paul Jones & Chris Brown**
Research Collaborator	**David Dobereiner, Michael Crilly**
Title	**OrganiCity/Matripolis**
Output type	**Design Competition**
Curator	**Paul Jones | David Dobereiner**
Function	**A Prototype for Urban Compact Living**
Location	**Global**
Client	**The Architecture Foundation, Welltech**
Competition Entry	**2014/5**
Support/acknowledgements	**The Architecture Foundation Welltech | Polytecnico di Milano**
URL	**www.northumbriaarchitecture.com/research**

1. Summary

The competition entry, Organicity, was developed in response to the competition brief written by the architecture foundation, Welltech in 2014. The brief called for smart and sustainable proposals for living within cities, that are integrated with the rest of the biosphere. The authors argue in this research that a sustainable urban future remains a futile, quixotic, aspiration unless mankind sees the problem in an integrated way.

By 2050 there will 8 billion people living in cities; two billion of which will live in slums, where they will be forced to scratch out an existence without access to the basic services necessary for life. Another three billion will live severely compromised lives within urban sprawl, left to fight for resources as city governments fail to cope with the rapid influx of people.

We present here an alternative urban future, where new densely populated sustainable urban communities manage and generate resources at a local level. Each block comprises residential, urban agriculture, retail, industry, commerce, education and health facilities, stacked above each other to maximise density and compaction. They accommodate approximately 5,000 -7000 people per unit, and each has a primary industry that trades with other neighbouring communities to generate income and resources.

* This initial research contained in the competition expanded resulted to include journal and conference presentations, exhibitions in prestigious venues, and invited keynotes and workshops around the world. This will be discussed in the impact and dissemination sections. □

2. Intoduction Brief & Sponsors

INSTITUTIONS

ARCHITECTURAL FIRMS

COMPANIES

The Architecture Foundation Welltech, in collaboration with the Polytecnico di Milano, run an annual international design competition to consider future urban living, employing the concepts of Smart and Sustainable Cities. The winning entries are presented with a WT Smart City award and their expenses are paid to attend the award ceremony in Milan. This award is highly regarded in Europe and the competition winners are exhibited annually at the Palazzo Isimbardi as part of *Milan Design Week*, as well as at other international venues. The winning schemes are viewed from visitors from all over the world. Each design team has the opportunity to present their entries at the Palazzo through a public lecture. The competition entrants were asked to propose developments that:

1. Celebrated the Urban Environment

Vibrant and successful neighbourhoods can be created by following good urban design principles, such as incorporating a rich mix of building uses, providing spaces to play and relax, and building at a sufficient level of density. What form and structure should the development take to improve well-being, prosperity, and to establish a place where people will want live?

2. Instigated an Energy Revolution

It is predicted that a 60% reduction in CO2 emissions is needed by 2050 if the world is to combat the harmful effects of global warming. How can we reduce the environmental impact of cities to ensure that the do not emit unnecessary CO2 and other pollutants into the environment, through improving energy efficiency and reducing it's reliance on fossil fuel?

3. Increased Sustainability within the Urban Realm

alongside their energy use, urban communities also generate pollution (particularly CO2 emissions) through transportation, food production / delivery and waste. How can the lifestyles of the residents of new communities be made more sustainable? Addressing the need to reduce car use, growing food locally, limiting the amount of waste produced etc are all part of the solution.

The research questions were developed in response to the competition brief.

The competition was predominantly ideas-related, but the organisers stated that visitors to the exhibition and partner organisations had, in the past, contacted the winning entries to offer commissions or collaborate on future projects. This proved to be the case, and will be discussed in the impact and dissemination section. ◘

3. Winning Entries & Judges Comments

Exhibition at Palazzo Isimbardi.
Entry by Jones (left foreground)

Judges

Professor Cesare Maria Casati: University of Rome La Sapienza in Valle Giulia, past Editor in Chief of the magazine " Domus",

Dalia Gallico: President of the design SIGNUM LAB

Ambrogio Rossari: President ADI Lombardia, and founder Rossari & Associates.

Professor Luigi Bandini Buti: Polytechnic of Milan, Architect and European Ergonomist.

Professor Fernando Gaja I Diaz. Polytechnic of Milan -Urbanist

First Prize: Alles Wird Gut Bio Campus

Second Prize: Amphibian Arc Zoomlian Tower

Third Prize: Dioinno and Buffalo University

There were six commendations

Including: Jones, Dobereiner and Brown who received an honorarium for travel to the event.

General Comments of the Judges

The jury were inspired by the vision and diversity of the competition entries; the commended schemes were chosen due to the clarity and singular conviction of their ideas and the ability to present a new future with sustainability as a fundamental principle. Credit was also given for originality and novelty.

*(approximate translation from Italian text)

4. Research Context

Fig. 01 _ example of contingent inhabitation in the over-crowded third world cities

Fig. 02 _ Nearly planned Chinese Super-City

Cities – we are repeatedly told – are the future. Indeed, the Chinese government recently unveiled plans to construct a city three times the size of New York, calling it a "strategy crucial for a millennium to come". Yet as it stands, visions of our urban future are bleak: by 2050, researchers predict that up to six billion inhabitants will live in urban areas – more than two thirds of the world's population. There could be as many as 30 cities with populations exceeding 10m, and massive urban areas will merge to form megacities, resulting in urban populations exceeding 50m. Such density, especially in developing cities in the Southern Hemisphere, will almost certainly result in urban living breaking down with human catastrophes, such as starvation and the spread of disease as a result of unsanitary conditions. The megacities of the future will have weak and unsustainable local economies, that will negatively affect citizens' lives in myriad ways. Pollution will rise exponentially, with toxic smog regularly enveloping entire cities. This will inevitably lead to a rise in respiratory disease, which is already emerging as one of the three major health risks to the modern population (World Health Organisation, 2015). Bad air quality will be made worse by the *urban heat island effect,* as parks and rural hinterlands are built over to house the influx of people. Nature will struggle to gain a foothold in the future city, with rural land predicted to shrink by 30% to accommodate urban expansion. The lack of countryside and green space will ultimately contribute to the sixth recorded mass extinction of animal and plant species.

5. Research Summary

Fig. 03 _ Initial concept sketch

The research team for the competition submission undertook a comprehensive literature review of relevant theories and concepts relating to sustainability and urbanism. In particular, the authors established a theoretical position for this competition by considering political, economic and social philosophies that challenge existing neo-Liberal and capitalist ideologies that we argue have caused significant environmental and sustainable issues, particularly in cities. Key subjects of the theoretical review included neo-anarchy, ecological economics, and participatory economics (as advocated by Chomsky, Daly, and Albert, respectively). Each author independently argues that national power and wealth should be devolved to local levels, ceding more immediate and contextual control of key decisions affecting people's lives and the wider environment.

In terms of sustainability, policy-makers in the west have principally focused on renewable energy generation and conservation protocols within the domestic sector, whilst allowing commercial and industrial sectors to remain profligate, polluting and unsustainable (Larsen,2010). The design team for this project have developed original proposals for living 'off grid' by expanding upon limited conceptualisations of this term, relating to autonomous energy generation. Here we also include local governance, resource generation and waste management. The authors, have also investigated and applied recent urban design theories including, 'smart growth' and 'urban ecology' to this competition entry, arguing that an urban development should be both compact and bio-diverse. Residents of *Organicity* are encouraged to use walking as the principal mode of transport in order to build a stronger, healthier sense of community and place, embracing casual interaction between man and nature. The local terraced topography is utilised and shaped to surround the practical and symbolic commons plaza. Housing facades face towards each other to engender community, security and co-operation. Each of the terraces provides apportioned space for allotments and planting to act as natural corridors, which merge with wildlife zones between the urban communities. Appropriate technologies, both natural and manmade, have been sourced, researched and applied, creating a sustainable 'pollution free' proposal. ◘

matripole

an integrated self-sufficient habitat for rapid urbanization

sufficient wealth for all, efficiently maintained, allocated, and equitably distributed- not maximum production - should be the proper economic aim of society

herman daly (1977)

for cities to remain viable they would have to assume the role of supplier of resources as well as consumer.

jane jacobs (1970)

The Matripole is a prototypical live/ work infra-structure, developed to accommodate the rapid urbanisation that many cities around the world are currently undergoing. Some cities, especially in Asia and South America, are virtually doubling in size each year. By 2050 it is estimated that 8 billion people will live in cities. Cities are the big consumer of resources; they continue to leach from the surrounding landscape. Intensive agricultural methods used to resource urban centres are responsible for irreparable damage to the biosphere, as a result of run-off from fields into our watercourses. This has led to mass extinction of many species and a loss of biodiversity. Cities cannot cope with the influx of people at present, an additional two billion will need to be accommodated, fed and the their waste treated otherwise cities will become desperate places to live. The matripole is an infrastructure that is autonomous; it is built for extreme density of occupation; it is multi- programmable; it uses non- polluting intensive agriculture in industrial greenhouses to feed the community. Each matripole has the necessary expertise to operate: doctors, architects, dentists, solicitors, along with other workers, skilled and unskilled, will help the community flourish. Each Matripole, like the Medieval Guilds, has a principal industry that it exports to others. There is equity within the community and it is sized to ensure direct governance, with a population of no more than 4000. Each matripole has its own civic chamber where elected representatives govern through face to face assembly.

rapid growth of cities **1990-2025**

knowledge zone, under the residential zone, facing onto nature zone, schools, library, research, invention, workplace

greenhouse zone plants grown 24hrs per day

aquaponic zone growing fish (tilapia) for protein

allotments+ permaculture

community centre civic building

public plaza to encourage community interaction and placemaking surrounded by cafe, restaurants, shops etc.

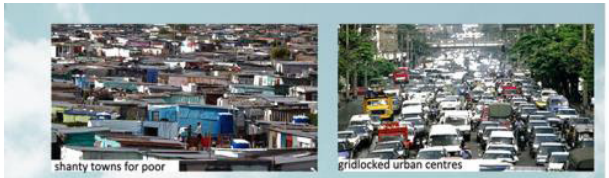
various residential accommodation facing onto allotments and plaza. flats duplex, town houses communes extended families

industrial zone in the area without natural light. Each matripole has an automated specialist trade for export to other matripoles

nature zone matripoles s untouched develop dive

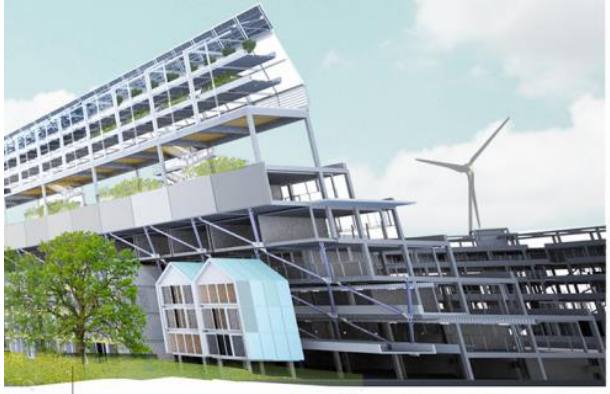
community of matripoles supporting an urban centre

view of living zone of the matripole across allotments to community plaza



principal themes covered by the competition entry

- densification of urban realm
- direct goverance within indivdual community
- a waste free environment
- restoration of biodiversity of the biosphere
- all resources derived from renewables
- community built on steady state principles
- no car zone, reliance on walking and cycling
- mechanical movement limited to institial zones between the matripoles
- creating lively, enriching public realm



is between
seeded this area is
humans allowed to
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section cut through the matripole

typical plan showing types of residences

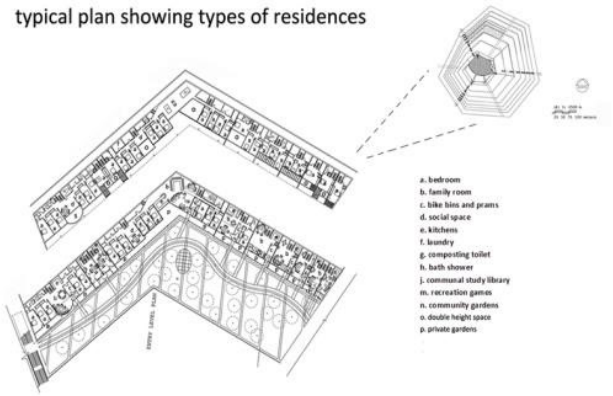
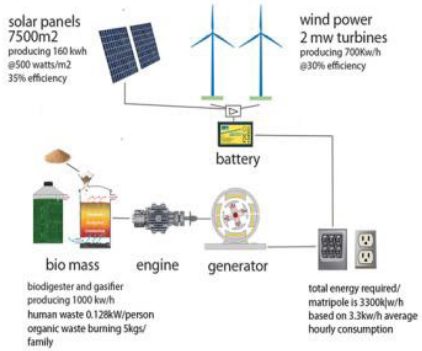
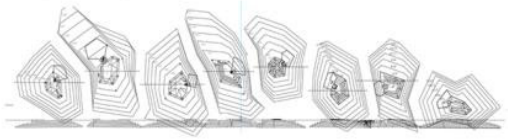


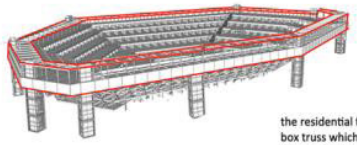
diagram showing energy generation



taxonomy of matripoles forms



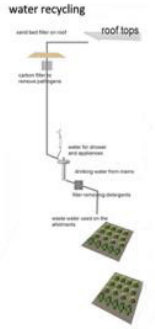
axonometric showing structure



the residential floors are hung from a continuous box truss which in turn is supported on the liftshafts towers. A triangulated lattice spreads the load equitably, see members in perspective below.

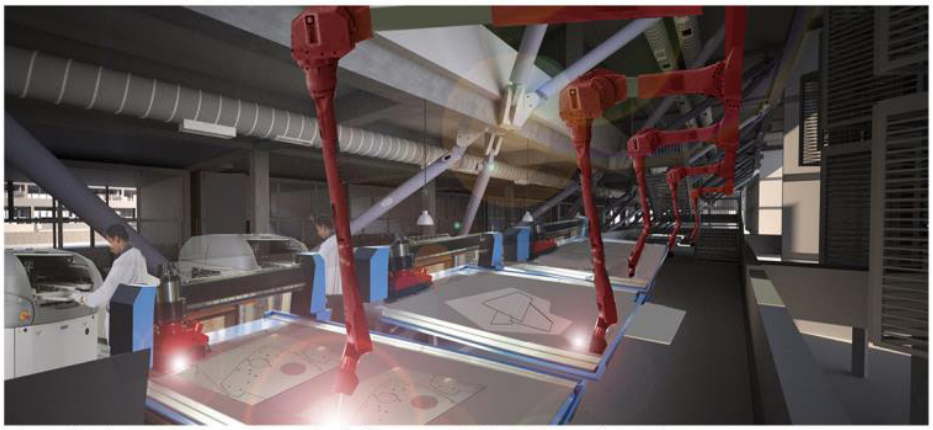
water recycling

domestic recycling interface



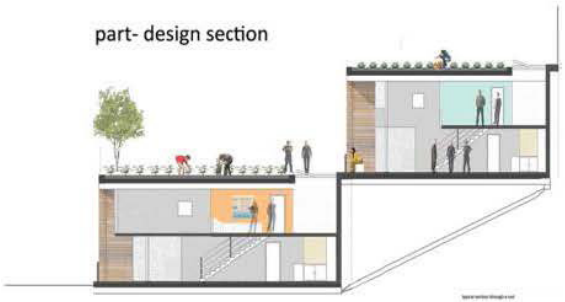
the interface recycles household waste for collection
food waste is collected and composted, the unit actively
recovers heat from the appiances

view showing apartments and permaculture in the foreground



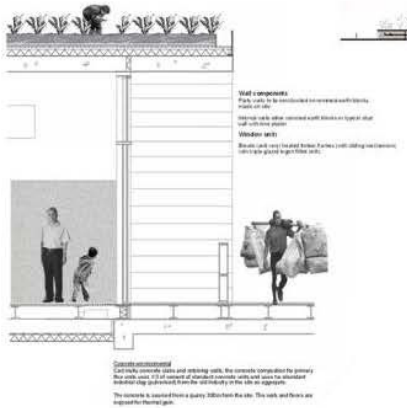
view of industry zone, each matripole has a specialist industry for trade

part- design section



technical section

technical specification



pv panels open for solar gain

pv panels closed at night to grow using uv

food production

placemaking

biodiversity

slice through the matripole showing the extent of the programme

view of nature zone, with schools, library, research labs overlooking

community working in the upper greenhouses

6. Statement of Significance

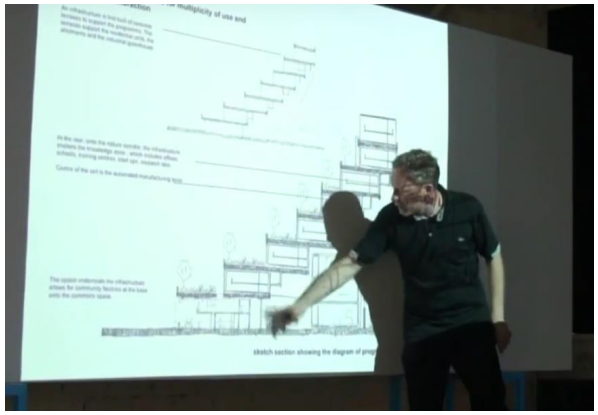


Fig. 03a _ Keynote presentation Ukraine Architecture June 2016

Fig. 03b _ Prof. Nick Dunn (collaborator on Exhibition) on Ukrainian Television

The extent of the dissemination of the project has meant that the PI (Jones) was invited to present the research to several developing countries who are struggling with rapid urbanization.

Keynote presentations

Delegation from Szenchuan, China

May 2015. This presentation was made to a delegation of civil servants, including the mayor and head of development control, as well as architects, planners and urban designers who are looking for new types of developments to deal with the exponential rise in population within the province. They were particularly interested in how to encourage mixed use developments as in recent years development has been zoned. This has been particularly problematic for residential communities that have become isolated.

Kiev, Ukraine

September 2016. This was a keynote presentation for *Ukraine Architecture* through invitation after exhibition in June 2016. The audience were designers, architects, urban designers, council and government officials from Kiev. The latter were interested in how to finance development through a *Community Interest Company* (CIC) and *Energy Service Company* (ESC) . These development strategies are not known in Ukraine, due to latent communist politics and economics and therefore viewed with interest in the new more liberal society.

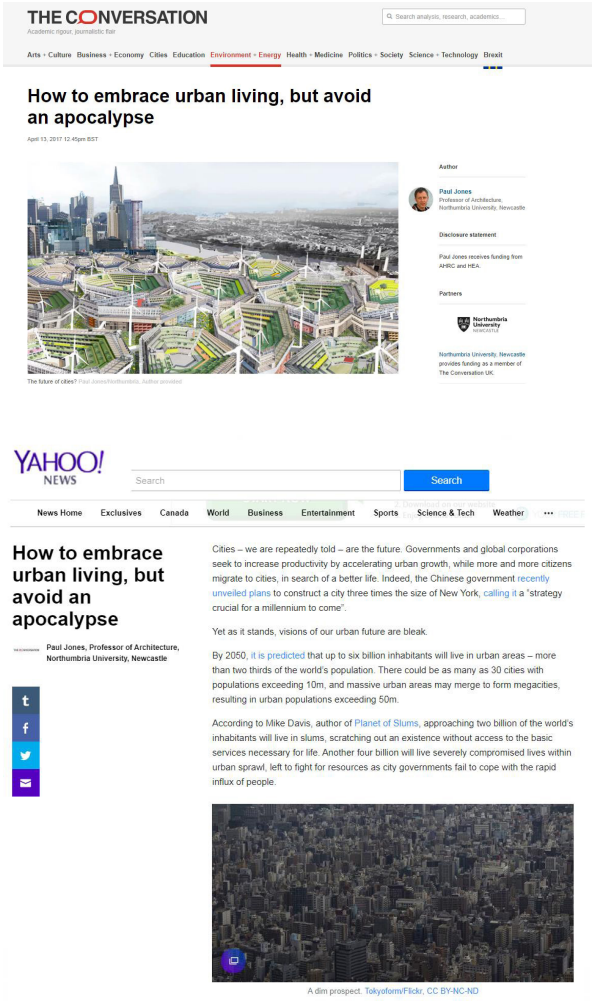
Bangalore, India

Jan 2015 This presentation was given at *Creativity for Urban Futures* symposium. The invitation was from Professor Amaresh Chakrabati (senior Professor and Chairman: Indian Institute of Science Bangalore. The presentation was to designers, architects and government officials. The audience was interested in how we handled multiple building functions within a community, particularly novel ways to mix residential and industry. This is commonplace in India, but recognised as being without rules, leading to a chaotic urban environment. In Bangalore, the city leaders have sacrificed greenspace for development; a once fertile city it now lacks biodiversity. The integration of greenspace within the development was also of interest.

Delegation from Lagos, Nigeria

June 2016 a presentation was made at Northumbria University to Okuyemi Ibiyemi- Head of Development- Lagos Municipality and a delegation of Nigerian planners and urban designers and other government officials, architects and urban designers. This presentation formed part of workshop to overcome the explosion of urban population in Lagos. This city is currently growing the faster than any other in Africa and one of the top ten in the world. There is little or no development plans to manage this growth; the delegation were interested in new approaches to dealing with density. They also expressed interest in *Energy Service Companies*.

7. Statement of Significance



The project has been extensively disseminated through several modes of communication.

Exhibitions

The competition entry was exhibited at three international venues: The Palazzo Isimbardi for *Milan Design Week* and at the Izone Gallery for *Architecture Ukraine* in Kiev, in Nov 2015 and June 2016 respectively (see fig 3c). This exhibition showcased projects submitted by influential international architects regarding the future form of cities. The estimates from the respective venues suggest that the project was seen by in excessive of 50000 people over the duration of the respective exhibitions.

Extensive Media Dissemination

The *Tomorrow Cities Today* exhibition formed part of an arts programme on one of Ukrainian television primary channels. Prof. Nick Dunn from Lancaster University, a co-collaborator for the exhibition, was interviewed on the programme; the viewing figures were in excess of 2million (see fig 3b). The design research formed the basis of an article written for the Conversation, entitled: *How to embrace urban living, but avoid an apocalypse*. This was read by in excess of 6000 people through this publisher. It was re-published by several other web-based platforms, including: Yahoo News; this news providers have in excess of 10 million daily readers worldwide. It was also covered by numerous other media websites including: *Citi IO- Cities Technology and People; Phys. org. Citymetric.com; neconnected.co.uk.*

The project was also published in the local papers the *Newcastle Journal* and *the Chronicle* that have a combined daily newspaper reads of 50K. The competition was showcased on several principal architectural websites, including: the competition website (Welltech), as well as Dezeen, Architizer, Pinterest, Bustler and Architecture room, all showcasing the winning entries. These websites ensure worldwide dissemination, with hundreds of thousands of views.

Journal and conference proceedings

The project also formed the basis of two journal articles; the first in the Journal of Construction Research and Innovation entitled: Organicity: Utopia- a new model for sustainable urban development, published by Taylor and Francis. It was also published in conference proceedings of the first European Urban Green Infrastructure Conference, Vienna 2015. My co-author David Dobereiner presented the project at the conference. ◘

ARCHITECTURE
UKRAINE

Fig. 03c _ Exhibition at Izone Gallery Kiev and Press Coverage

7. Statement of Rigour

This project has involved extensive practice and praxis-based design activities, as well as more traditional research methods to answer the four research questions to realise the competition submission and associated exhibitions and the accompanying journal paper.

1. The research team for the competition submission undertook a comprehensive literature review of relevant theories and concepts relating to sustainability and urbanism; these include political, economic and social philosophies that challenge existing neo-Liberal and capitalist ideologies. Key subjects of the theoretical review included neo-anarchy, ecological economics, and participatory economics (as advocated by Chomsky, Daly, and Albert, respectively). There was also extensive reading around financing models for the development.

2. To arrive at a high quality design that satisfies the brief, we engaged in a thorough two-month design process using drawings, making, painting, modelling, computer modelling. This work was assembled into display boards and a 20 page report. Additional output was prepared for the exhibitions in the Ukraine and Italy.

3.Writing and presenting 4 No, lectures on urban design and theories relating to sustainability and globalisation theory presented (discussed in the significance section).

4. Extensive computer modelling was used to provide the competition judges and visitors at the exhibition with high quality 3D VR and augmented reality for improved functionality and insight, produce high quality graphic material.

7. Statement of Originality

1. The design team for this project have developed original proposals for living 'off grid' by expanding upon limited conceptualisations of this term, relating to autonomous energy generation. Here we also include local governance, resource generation and waste management.

2. The competition is original in its conviction through the Matripole developments to provide a holistic existence for its communards, including work, live, leisure, society, community, education and health. The larger Matripoles will house hospital and civic centres, facilities to be shared across several matripoles

3. Originality is demonstrated through how the research team propose the project is to be funded. The development finance ontology is structured around the grant, loan, asset and product. Here we look to use mechanisms such as Local Asset Backed Vehicles (LABV) and Community Interest Companies CICs, and Energy Service Company (ESC) working in partnership with agencies such as Public Works Loan Board (PWLB). See Q4 for detail.

8. Research Questions

1.
What social, economic and physical structure should be adopted for an urban development, so as to strengthen community spirit, collective prosperity, qualities of place and wellbeing?

2.
How can we reduce the environmental issues associated with urban living through the form of urban developments and the use of appropriate technologies?

3.
How can we encourage, and better integrate nature and biodiversity, as well as promoting food production within urban developments?

4.
How can a urban sustainable developments be made commercially viable, both in terms its initial construction costs and its ongoing resourcing and maintenance?

Inner City zone of matripole developments

9. Research Methods

The research project is a case study that utilises mixed methods. Each method has been chosen to be able to address the questions derived from the competition brief. The methods are often used in combination. The way that the method is used is referred to within the commentary for each section.

- text based secondary data analysis of research.

- papers, reports and books including:

- urban, smart and place-theories

- alternative economic philosophies, including: neo-anarchy, participatory economics and ecological economic

- environmental and sustainable theories and technologies

- alternative community development and real estate ontologies and;

- building and urban design precedents

- praxis and practice-related activity applied to the research questions, using computer and physical modelling, as well as drawing, (in combination) to develop and test design solutions.

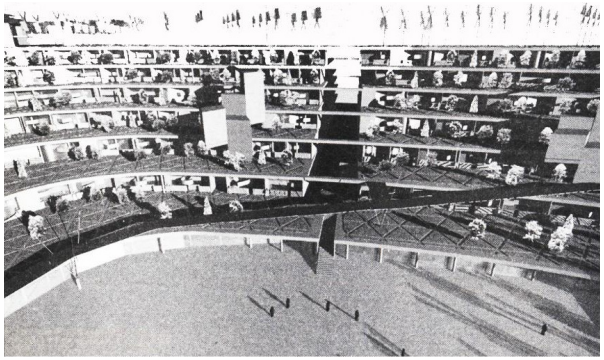


Fig. 04_ Physical model of Organicity Unit.

Taxonomy

Conceptual design iterations
Drawing
Model-making
Construction methods
Spatial analysis
Participatory activities
Text-based research
Phenomenology
Theoretical research
Fieldwork
Photography
Topographic survey
Design research
Trial and error experimental design processes
Design-led research
Historical research
Typology research
User experience
Diagramming
Interviews/user consultation
Scale modelling
Digital fabrication methods
Site analysis/study
Visiting similar building types

10. Question 1

What social, economic and physical structure should be adopted for an urban development, so as to strengthen community spirit, collective prosperity, qualities of place and wellbeing?

Method

Text based secondary data analysis of research (papers, report and books). including:

Specifically:
-urban, smart and place-theories
-alternative economic philosophies, (neo- anarchy, participatory economics and ecological economics).

Praxis and practice-related activity related to the research questions, using computer and physical modelling, and drawing, (in combination) to develop and test design solutions.

Context to research question - the extant urban condition

Urban habitation in the modern era has become dysfunctional, characterised by disintegration within the urban realm, Augé (2009). This phenomenon is a result of the mass migration of people from rural areas to cities (particularly over the last 50 years) and a global society where free market economics has been seen as more important than almost everything else, including the environment, Hinrichsen (2009). Under "laissez-faire", neo-Liberalist economics, (the prevailing global economic philosophy), urban life for many has become socially alienated, wasteful, and indirectly threatening to all life, Larson (2010). Cities, particularly in the southern hemisphere, have largely ceased to be good places to live, except for the very rich. They are often sprawling and chaotic, without development rules or basic services necessary for life, Trivedi et al (2008). The poor suffer most and are forced to occupy inappropriate contingent spaces or severely compromised areas at the city edges where urban cohesion breaks down, Kenworthy (2009).

While the rich flourish, more than a 1/5th of the world's population is starving and malnourished. The wealth created through this economic system is not trickling down from the rich, nearly as fast as poverty is welling up. Some governments across the world have put in place welfare provisions to support the poor, but state intervention- as advocated by supporters of Keynesian economics- is now under attack by the corporate elite. Chomsky (2009) argues that the situation is far worse than the market could create on it own, with the state manipulating the economy to favour big business, what Dewey (1938) referred to as 'Industrial and Financial Feudalism'.

The negative issues associated with urban living do not just affect the poor, the middle classes have also suffered through a progressive loss of community in urban centres. They have avoided some of the other more immediate issues associated with poverty, but this demographic has increasingly become isolated and experienced loneliness, Samuel (2008). Urban planning, or lack of it, has contributed to this isolation; many cities have become sprawling, designed round the car at the expense of public spaces where people would naturally congregate (discussed in question 2). The effects of urbanisation are especially problematic for vulnerable sectors of society. Older people, and those with disabilities, find living in urban environment challenging and yet their needs are rarely considered, often resulting in social isolation, Prince (2008). In urban areas, people are more likely to live alone and this is especially so for older people, Gusmano and Rodwin (2010). In terms of the urban built environment, as cities grow they become less coherent and the qualities of place disappear, especially where there is a lack planning policy or strategy, as seen in many of the cities in the developing world, Hinrichsen (2009) Fundamentally, the quality of life and wellbeing are a function of the quality of the urban realm, Duany (1996).

Fig. 05 _Urban Isolation and Loneliness

Fig. 06 _Community Participation and Collectivism

Organicity - an alternative Socio-Economic Structure

Our proposal presents an alternative urban vision to many of the issues set out above, by promoting density, collectivism, localism and sharing, as fundamental socio- economic principles. A successful society is one where the economy, as well as generating wealth for all, also delivers sustainable wellbeing for its citizens locally. Our proposal seeks to understand and positively influence wellbeing, with communities having the freedom to govern themselves. We anticipate that such decentralisation of power, ownership and control would crystallise the social structure of the communities into a new kind of inverted hierarchy. Albert (2003) argues that direct democracy at a local level, has a better chance of succeeding than through national rule.

We argue that these have the capacity to improve prosperity and wellbeing in urban areas, while also enhancing place-making. We assert that the physical form and morphology of the development is fundamental to developing these principles. This is discussed later in this section. We position Organicity outside of capitalism; instead of seeking profit, the community's principal goal is the sharing of resources equitably, so that everyone has a decent standard of living. This approach is borne out of the principles of *Ecological Economics*. Daly (1977), the founder of the movement, argues that,

'sufficient wealth, efficiently maintained, allocated, and equitably distributed – not maximum production – should be the proper economic aim of society.'

This theory also proposes that economies should be appropriately scaled and managed not to exceed their ecological limits, and that production should be a function of the environment. When considering the social and economic structure of the development we also borrowed from Michael Albert's (2003) theory of *Participatory Economics* (also known as Parecon). Albert advocates a localised economic system based on sharing, equity, solidarity and self-management for all, rather than the accumulation of wealth for the few. He also proposes the application of the principle of balanced workloads and collective responsibility for community assets- importantly, this includes care and support of its inhabitants. The sharing of assets and community responsibility is fundamental to both Daly's and Albert's position. It is proposed that members of the Organicity community would sign up to an equal share of community service, including the production of food. This important work would be distributed between all able- bodied people, (including children above a certain age), it would probably not amount to more than half a day per week. In Organicity we promote the sharing of resources particularly, cars, appliances, and tools, for instance, used according to an agreed upon a planned schedule. This equipment would be owned collectively to borrow when needed and would dramatically reduce the number of these articles produced, sold and individually owned. Switching from total private ownership to partial collectivisation at the community level, would reduce the cost of living for member households. An advantage of this type of collectivism and sharing would be that city dwellers are brought back into a natural condition of *association* with other fellow beings, reducing loneliness and isolation. People would contribute to the community, spurred on by others doing the same; in this way they will inevitably become active citizens. This return to a more natural social condition, also includes association with other species. This community model is very much inspired by the Medieval Guild structure which worked at a localised

Fig. 07 _Community Participation and Collectivism- gardens

Fig. 08 _Noerdlingen in Bavaria- a classic Guild plan designed around public space

level with each member pledging support to other members and taking responsibility for the upkeep of the community. In this model, capitalism gives way to direct democracy.

To facilitate a culture of sharing and collectivism, the political and governance structure is also important, as is the size of the community. If populations grow larger than several thousand people then they become unwieldy and direct democracy breaks down, corruption is also likely, Clark and Foweraker, (2001). Face-to-face assembly and decision-making becomes impossible, or at least less democratic as the community becomes too big. On the other hand, groups that are too small will not be able to sustain enough energy to monitor the construction and maintenance of their physical and social infrastructure. Each Organicity community will have an administrative building where governance takes place (see competition boards). An elected council of residents will oversee the running of the community and ensure a fair distribution of the community assets.

The physical structure

The physical structure of the community is in some ways less important than the ideas that underpin it. We considered what a settlement would look like if there was a society of relatively free- equally endowed- individuals, living within a value system that prioritises cooperation over competition. We recognise that such an infra- structure could take multiple forms, although we argue that its physical form and layout is key to its success. A typical Organicity unit would accommodate living, working, education, plants and animals. Not only would the environment and biodiversity be maintained, but cohesion would also increase and those who feel isolated would be brought into the community. Those who are not able to contribute in this way, due to age or disability, will be supported in other ways (discussed later). Like the Guilds, we propose the development should be 'place-based', where the socio-economic and political structure of the community is seen in the morphology and design of the built and natural environment. It is worth noting that the medieval citizenry displayed a clear preference for streets and paths emanating from a commons space or square; an arrangement that results in neighbourhood identity at a human scale. This is illustrated in the plan of Noerdlingen, a Guild town in Bavaria (see fig 8). The structure and morphology here contrasts sharply with the typical auto-city with its endless proliferation of outwards orientated blocks that float in a sea of traffic.

Fig. 09 _Typical Organicity Unit

Fig. 10 _Community commons space

Fig 9 shows a typical Organicity block; solidarity and community can emerge by increasing opportunities for people of all ages, and stations in life, to encounter each other and interact at a human scale and pace. The public spaces 'invite' all the residents to participate in the communal activities, where they may see their friends and family. People living in the community will enjoy easy access to the commons; it is a community space, but also a public space- equally friendly to visitors from neighbouring communities. We have re-invented the concept of 'terraced housing', where dwellings are stepped back up a slope forming true terraces. Access to all of them is provided by a gentle pedestrian ramp connecting the residents to their common spaces and services at grade level, terminating at the roof and community greenhouses, where the community would come together to grow foodstuffs for the development (see fig **11**). Because the terraces curve around to embrace the commons plaza, all the house façades inflect towards each other so that neighbours are more likely to get to know each other. Older people, and those with disabilities, would have more immediate access to the public realm and feel more connected. Natural surveillance would be a consequence of this arrangement, so that issues of isolation would be less likely, as people become more neighbourly and naturally look-out for those in distress or trouble, as used to happen in the back to back pre-war housing communities. Again, we anticipate an improved sense of community spirit, as a result of this activity. The commons space (see fig 10) is essential in developing place-making characteristics within the development. Shops, cafes and restaurants engage directly with the public realm, further encouraging an active and vibrant urban community and providing opportunities for employment.

Organicity: A Physical Structure underpinned by Smart Growth, Wealth Generation and Collective Prosperity

The physical structure of Organicity is underpinned by the principles of Smart Growth, as developed by Kelbaugh and Duany. Both are architects and planning theorists who propose a new urban model that is more diverse, compact, sustainable, as well as legible, and importantly actively integrates living and working. As density increases interesting cross and multiple-programming of buildings- where numerous activities exist within one block- bring complexity, intrigue and excitement, and further opportunities for association and interaction. More collective energy would remain within the community throughout the whole day, instead of urban communities being emptied in the evening. To the rear of the development there is a *Knowledge Zone*, which benefits from views of the nature corridors between the individual Organicity units (see fig 12). This zone includes commercial premises, such as offices, start-up businesses, research units and studios etc. There are also community resources, such as schools and clinics. The commercial units are rented to the community as an income generator, and this money is reinvested into maintenance and a capital project fund to be allocated by the elected council.

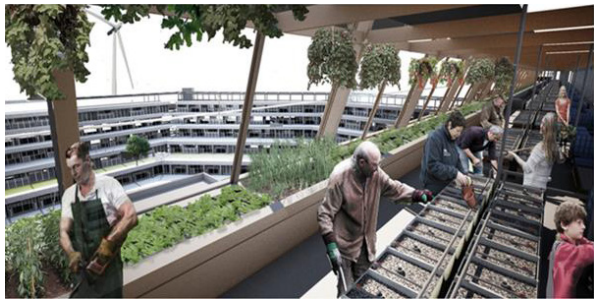


Fig. 11 _Community Participation and Collectivism- gardens

Fig. 12 _Knowledge zone and nature corridor

Fig. 13 _Automated zone

Each Organicity community has a principal automated industry (following the Guild model of a primary trade) and the goods and services generated can be traded with its neighbouring communities. The Industrial Zone is be located within the part of the infrastructure that does not benefit from natural light (see fig 13). The proposed industries would utilise efficient, cutting edge, technologies in an automated production line. Fig 13 shows laser cutting and fabrication as a possible technology. It is envisaged that only a few workers would be required to oversee the process due to the utilisation of modern technology. This would be the principal generator of wealth for the community.

It may be protested that this type of local devolution would take resources away from the State, which over time could have a negative impact on the national economy. It is envisaged that each Organicity community would still pay taxes. Any profits generated, however, would be reinvested in the community, in the same way as the Guilds did several hundred years ago. The point here is that the money in Organicity would remain local, benefitting local people for the common good.

Building to enhance community spirit and place-making

The concrete infrastructure that supports the array of functions and programmes would be funded through commercial and public sources (discussed in Q4). This would be built independently. The diversity within the residential community would come through programme of self-build, self-funded, residential projects. Or for the not so adventurous, or those who have access issues, a range of customisable housing solutions would be offered. The construction of the houses, especially for the self-builders would inevitably build community spirit, as has been seen in numerous other developments spoken about at length by advocates such as Walter Segal. The customisable options would be built by the *Organicity Building Company,* whose work would also include the general maintenance of the community. Operatives would be paid a wage, and any profits would be paid back to the community. Within the design of the houses we encourage loose fit planning, where residents can decide how the space is carved up. There are no rules as to whether they should be open plan or cellular, or how the units are programmed. Each family will, however, be allocated space, based on their needs. There will be rules relating to proportion and quality, so that there is some discipline to the architectural works (see fig 15). We argue that giving the community options as to how they arrange and conceive their domestic space is a common-sense alternative to the prescriptive, one-size-fits-all, model that the major house builders offer. Allowing people to live in bigger extended family units will mean that older people are less likely to become isolated. We encourage the provision of a full range of unit sizes to cover all demographics from 1 bed-flats flats to connected multiple units for extended families with up to 9 bedrooms (see fig 14).

Opportunities are provided to allocate more space for entertaining, or for a home office/studio. Over time people could naturally down or upsize depending on their domestic situation selling the space onto others in the community of people are others that have applied to the community for residency.

above

Fig. 14 _Modern Methods of Construction- differing unit sizes

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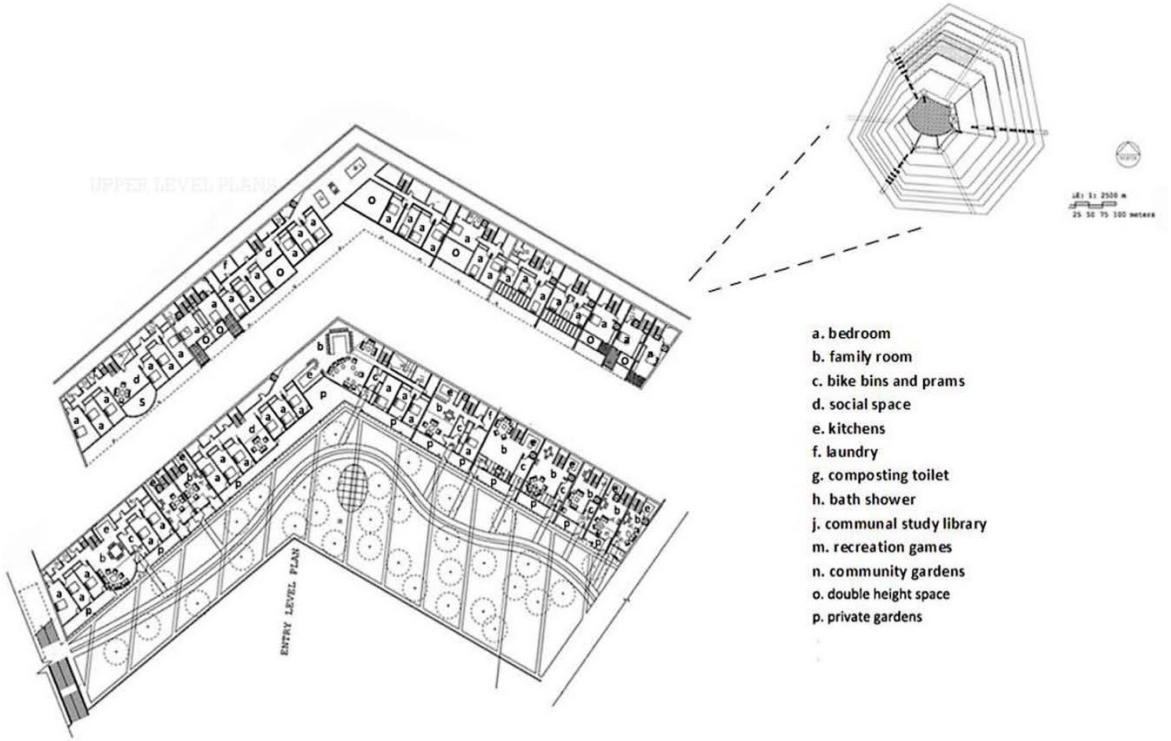
Fig. 15 _Typical parade of houses showing four different occupant types, (1,2,3 and 6 bed). Diversity of facades is encouraged.



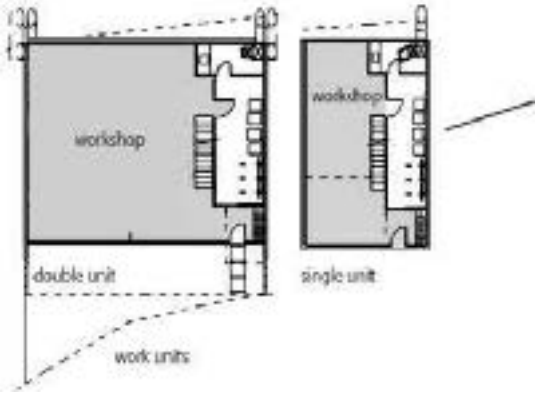


Fig. 16 _Plan of block showing full variety of house types for 1 bed to multiple family units

Fig. 17_Slice through typical Organicity block showing multiple programmes and building functions

A diverse employment community

It is envisaged that Organicity will include people with all the necessary skills and expertise to support the community and create not class ghettos (as the case in most city developments) of middle class professional, white collared or blue collared, tradesmen, operatives, unemployed etc. Doctors, architects, engineers, teachers, office workers, gardeners, dog walkers etc. will all contribute in their own important way. Each Organicity unit will be differently scaled to provide wider community facilities shared between units. Bigger units' ones could house local hospitals, or universities, colleges and schools, or administrative buildings etc. However, each unit would have smaller scale facilities to deal with the majority of daily needs. This follows the Cuban models of local satellite facilities, and national centre of excellence. A percentage of the money generated by individual units would go to *shared* healthcare and education resources. ◘

11. Question 2

How can we reduce the environmental issues associated with urban living through the form of city developments and the use of appropriate technology?

Fig. 18_ Banal placeless modern housing in the UK

Research context to question

Cities are the big consumers of resources; 60% of the earth's population currently live in cities, increasing to 80% by 2050, Population Reference Bureau (2007). There are many seemingly intractable environmental issues associated with cities: they are a key polluter of the biosphere, and an enormous drain on global resources to service, maintain, and facilitate their rapacious growth. The issue with waste generation is also significant with an estimated 1.3 billion of tonnes of city waste dumped in landfill every year.

Vehicular traffic constitutes perhaps the main environment issue that cities must grapple with. Therefore, the form and structure of the city is where we need to direct our efforts, if meaningful improvements are to be made in terms pollution generated by cars. The 20th century saw the developed (and more recently the developing worlds) deluged with cars. To facilitate commercial efficiency, cities continue to be chopped up into specialised zones meaning that people and goods must travel by vehicle. The fragmentation of urban areas by function- a model predicated upon and enabled by the car- has turned cities that are practically unfit for humans in the sense that many urban residents could not work, feed themselves, or socialise without a car. The reliance on the car for trips that should be undertaken on foot or bike, is one of our indulgences that is killing us through the pollution it generates.

Modern transportation has reduced the need to be in proximity to the workplace, consequently some people now choose to work in different cities to where they live, some even in different countries. Numerous housing estates across the world are being built without any infrastructure, such as shops, schools and community facilities, meaning that unnecessary car journeys have to be made to get even basic provisions. The major house builders have lobbied government to weaken planning regulations, so as to be allowed them to build poor quality modern housing schemes.

'Most of these newly adopted patterns [housing estates], particularly in suburban, urban fringe, are largely antithetical to concepts as self- sufficiency and containment, energy efficiency due to the reliance on car (Hillman 1996 p36).

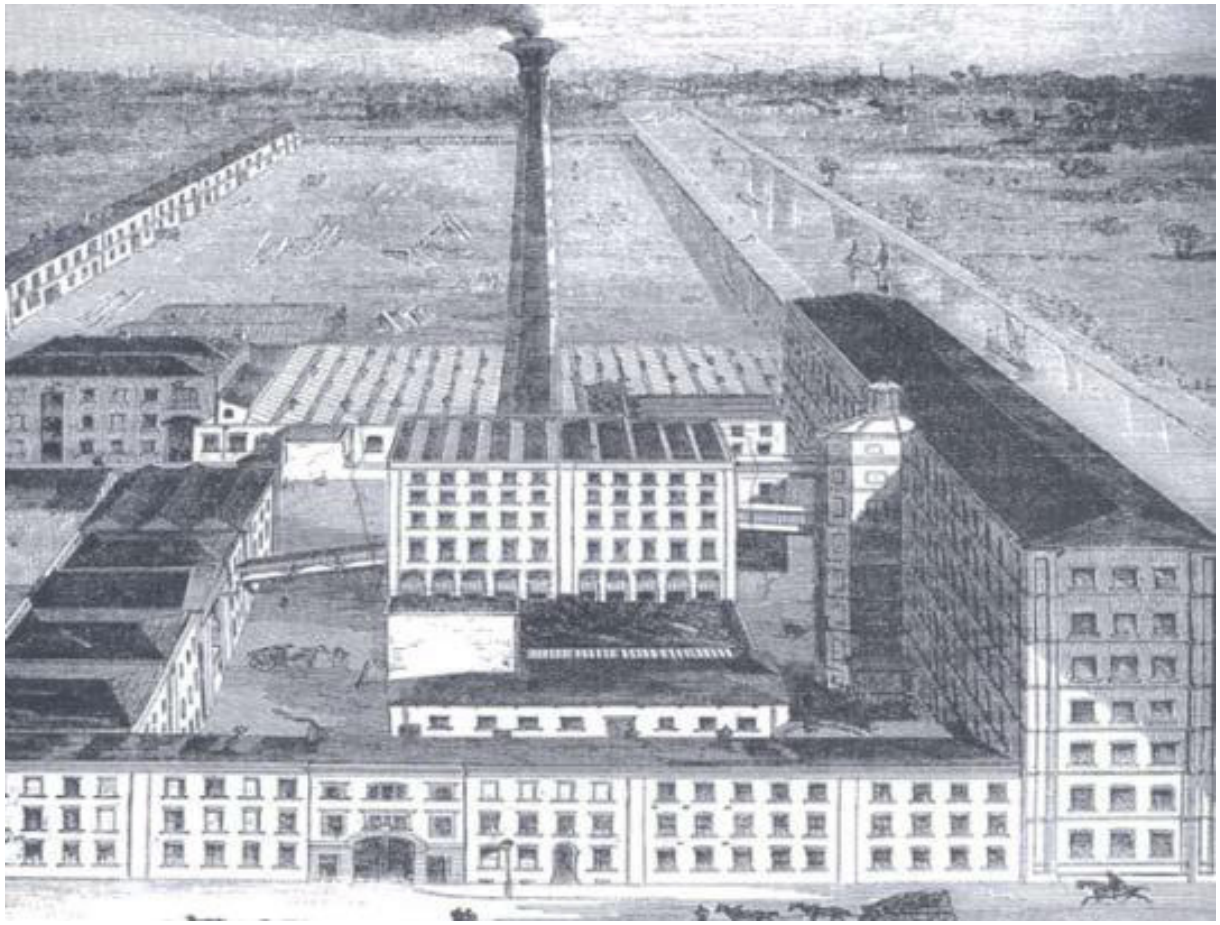


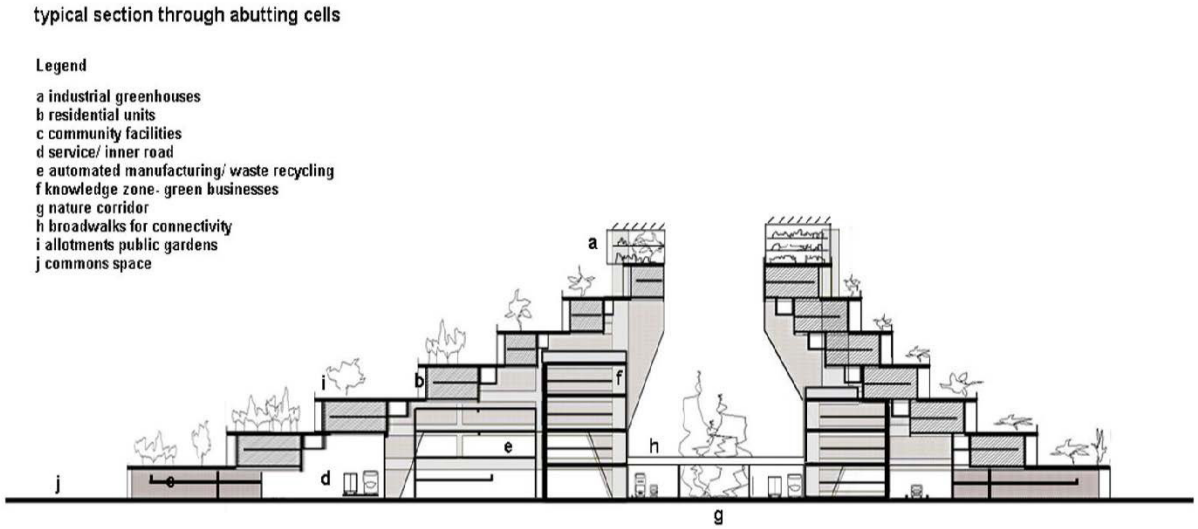
Fig. 19_ The Victorian Live/Work Philanthropic Model

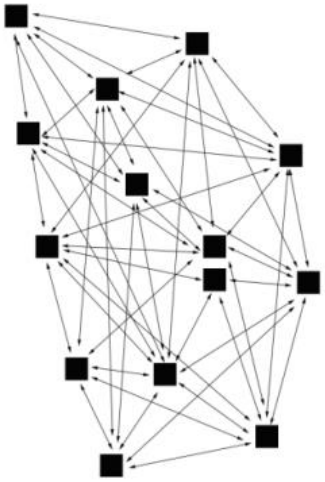
Organicity- a compact, non-car development.

Many environmentalists are advocating compacting our cities, increasing the density of developments as a way of reducing our energy consumption. Elkin et al (1991 p12) goes as far as to say that;

'a sustainable city must be of a form and scale appropriate to walking, cycling and efficient public transport and with a compactness that encourages social interaction.'

We are interested in the Victorian philanthropic housing where residential communities were in proximity to their place of work (see fig 19). This association between work and living provided us with a blueprint for the development. It has often been said that the most energy efficient journey is the one you don't have to make, or that you made through your own physical endeavour by either walking or cycling. There are no excessive travel distances to and from work in Organicity.





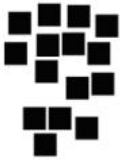


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Fig. 20_ Section through an Organicity unit

right

Fig. 21_ Compact urban living

We conceive Organicity as a pedestrian enclave. Vehicular access is provided, but cars, and their necessity, have been generally designed out of the community. Vehicles would be restricted to boundary conditions and to service areas, with a small number of adjacent parking spaces. It is envisaged that many people would find work within the community and others could work from home with advances in technology, particularly the internet. Others may bike to work in other blocks, or within the local neighbourhood. Only very few would need to own a car for a daily commute and these could be parked alongside the communally-owned cars that are available for use on special occasions. For 500 households, then, perhaps 25 parking spaces would suffice. The same households in conventional suburbia would probably require 10 times that number. This significant reduction in cars would in turn reduce pollution and the heat island effect. To be discussed later in this section.

Fig. 22_ Section through an Organicity unit

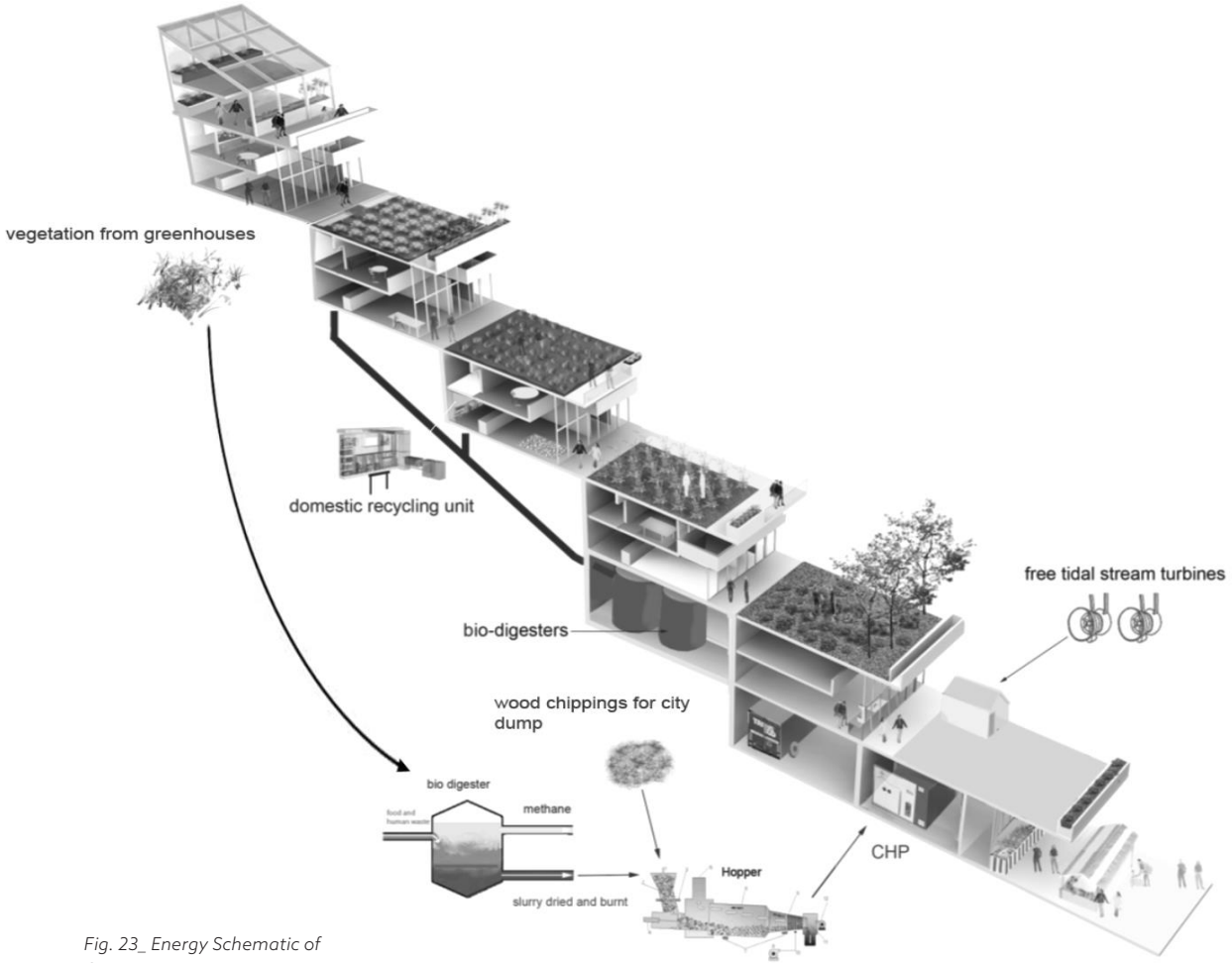


Fig. 23_ Energy Schematic of Organicity

Organicity: An Energy Island

Primary Energy Generation

Fundamental to a sustainable global future, a reduction on the reliance of fossil fuels is urgently required. Each Organicity unit is considered an energy district and derives its heat and power from renewable sources, mainly derived by the CHP system, burning waste rubbish from the community (that would usually end up in landfill) and bio-digesting human and food waste. We would also look to utilise context-specific renewables i.e. solar in hot climates or wind if the topography is conducive, (see primary strategy diagram). The three-phase supply for the workshops and the recycling units is generated from the CHP. Any surplus energy will be sold back to the grid. A small amount of energy is generated by PV cells for the electrically-charged vehicles and to power the water pumps and sprinklers for the allotment and greenhouses. This makes sense as the pv cells are in phase with the summer months where there is a demand for this equipment. The CHP heats and cools air displacement through a plenum in each development. (see fig 23)

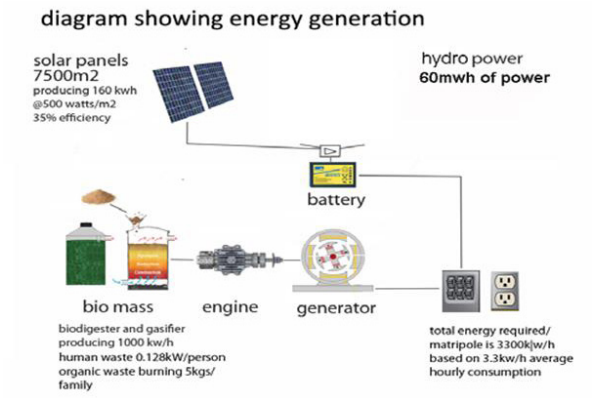


Fig. 24_ Energy Schematic of Organicity

Rationale for renewable energy: Organicity

We propose that the development be taken off the grid, and that the energy be derived from the available recourses in the vicinity of the site. We have calculated for 2500 homes, 50 community units, and 30 industrial units (including the primary industry). We intend to use human and food waste, producing methane through bio- digestions. Clippings from the woodland and allotments can be gasified to run a CHP. Methane, produced through bio-digestion can be mixed with the producer gas to also help fuel the CHP. We can also use wind power capturing 30% of its potential. According to Ofgen the current electricity consumption of a typical UK household is 3.3kWh. We recognise that this is an average and that the peak is far higher at approx 6.0kW. It is generally frowned upon by environmental engineers to mix renewables, sometimes referred to as *eco-bling*. However, in this instance, the technologies operate together and in parallel. The installation was designed in consultation with Chris Underwood (Prof of Renewable Technologies).

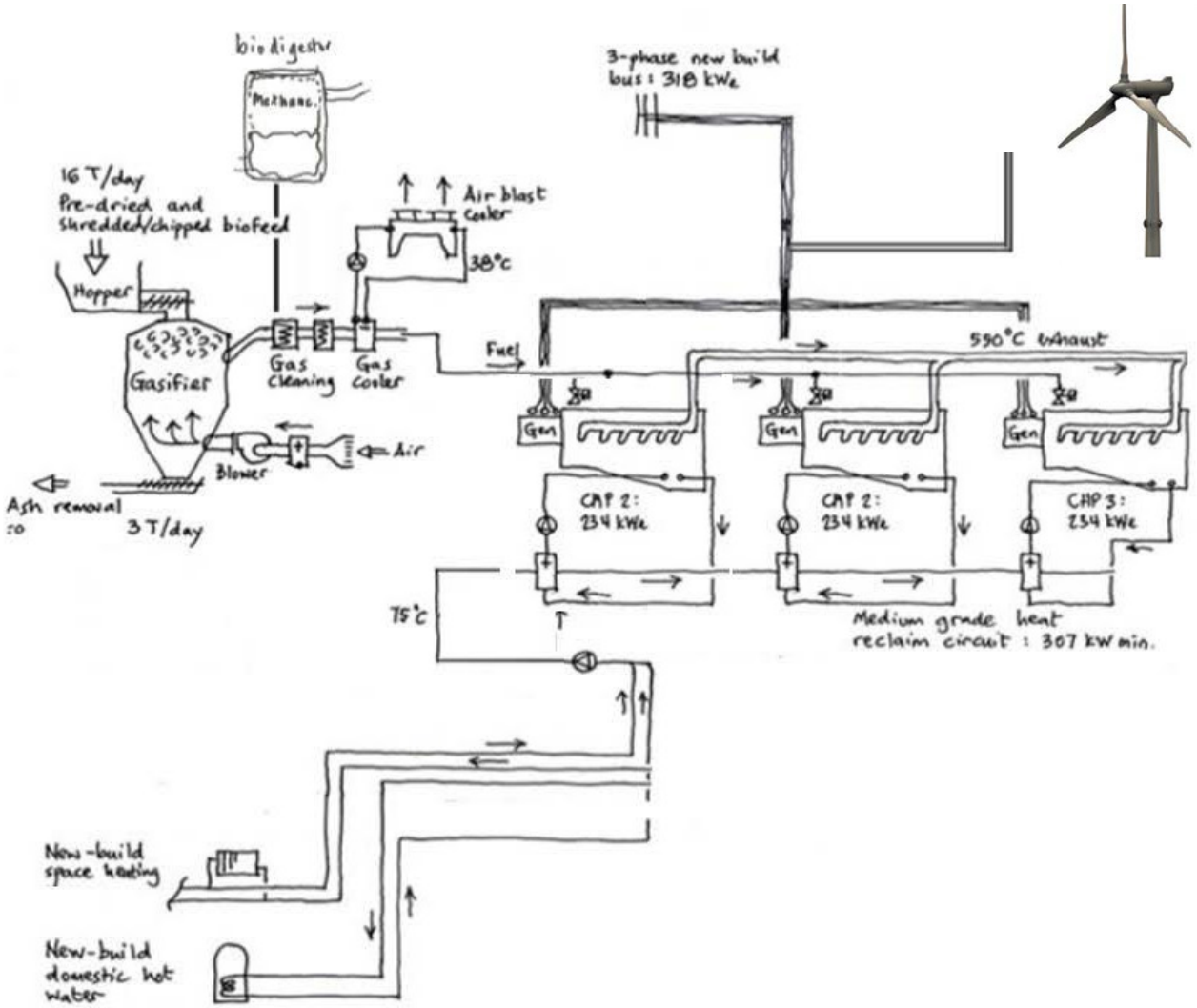
The three principal sources of renewable energy operate as follows:

1. Biomass and Gasifier- we propose 8No. (1000kWh units) running off human waste @0.128 KW/person, family organic waste 5Kg/Family @ 2.13 KW/family. The remainder (4500KWh) would be made up of wood and compressed refuse pellets from city refuse points and the Organicity waste centre- approx (16 tonnes) per week.

2. Wind turbines- Each 2MW turbine operating at 30% efficiency (Ofgen estimate), generates 600KWh- we propose 4No. = 2400KWh

3. Solar -7500m2 operating at 35% efficiency, generates 160KWh @ 500watts/m2

Based on the figures above approx. 2500 homes could be powered, (on average demand). With the remainder used for the commercial and industrial units (3000KWh). These will run between 9:00am and 6:00pm and the residential between 7:00am- 9:00am and 6:00pm and 12:00pm generally. This means that they don't tend to draw on the system at the same time. The drop in usage at night (due to people being in bed) will be off-set due to there being no solar. We intend to store the electricity in batteries, as there will still be a night-time load due to standby equipment and fridges, etc. There are 8No. CHPs each being 1000kwh in size that will be drawn on depending upon demand. All fuel consumed by the CHP plant is derived from refuse (that refuse that is not recycled) and imported wood chips from tree waste, as well as dried human and food waste composted from the development. (estimated at 37500 tonnes/ week, 5Kg per household per day as well as from the workshops and shops).



PRIMARY ENERGY STRATEGY

4 No. 2MW wind turbines

2 No. additional 234 CHP 1000KW 40 in total to make 8KW

Fig. 25_ Schematic drawn by Chris Underwood (Professor of Renewable Energy Systems) of the primary energy systems working together (biomass running the CHPs for Organicity)

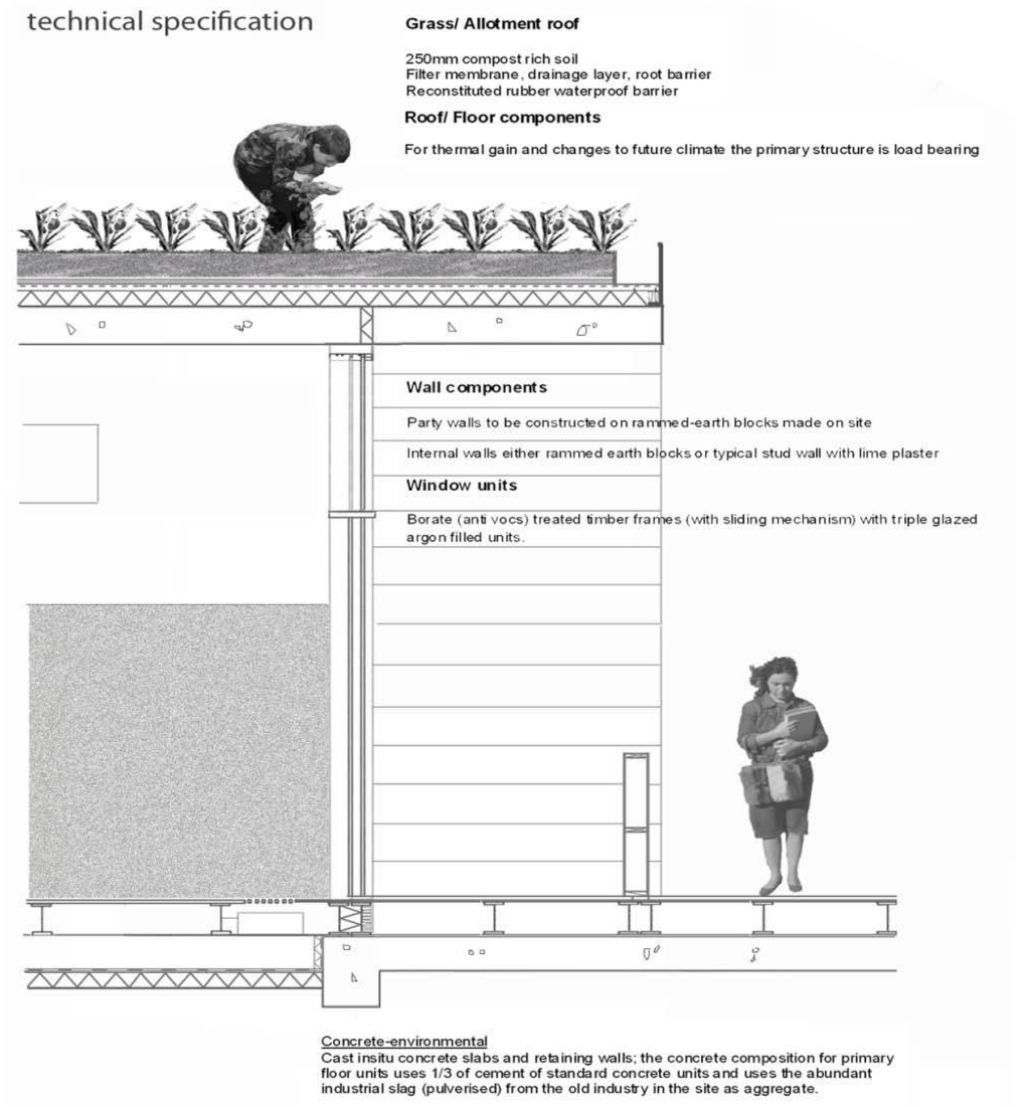


Fig. 26_ Typical construction of primary structure and inserted domestic units

Organicity: Environmentally efficient construction- building skin and fabric

The development can reduce its energy use by as much as 50% through efficient building physics (based on standard UK average usage- source Ofgem), in terms of efficient skin, solar gain. The construction detail is taken through a residential floor. The philosophy of the construction is to expose the high thermal mass of the infrastructure, using the structural components as heat stores. The concrete slab is exposed for a more thermally consistent internal environment. We have highly insulated the building skin to retain heat. The insulation is cellulose, from recycled newspaper. We have looked to use non-toxic recycled materials where possible. The concrete for the development uses iron slag as aggregate. Slag improves its structural capacity and importantly takes a polluting product out of the environment and traps it within the concrete.

The insitu concrete slab spans typically 5m between the fin walls, which run between the structural concrete frame. These are constructed of rammed earth blocks made on site. Internally, the timber used is reclaimed where possible. Any external timber is preserved using a dilute borate solution that has a very low toxicity. The roof is planted as part of the allotments and further reduces the U- value. The construction of the roof garden is fairly standard with integration of insulation and heavy-duty waterproof liner beneath a protective composite barrier to avoid being punctured whilst the community rotates the topsoil. The windows are highly efficient triple glazed units, the frames are timber and also treated with borate preservatives. Heating and cooling is delivered through the plenum floor through displacement ventilation. All services are fed under the suspended floor. The floors and ceiling slab is purged through night time cooling.

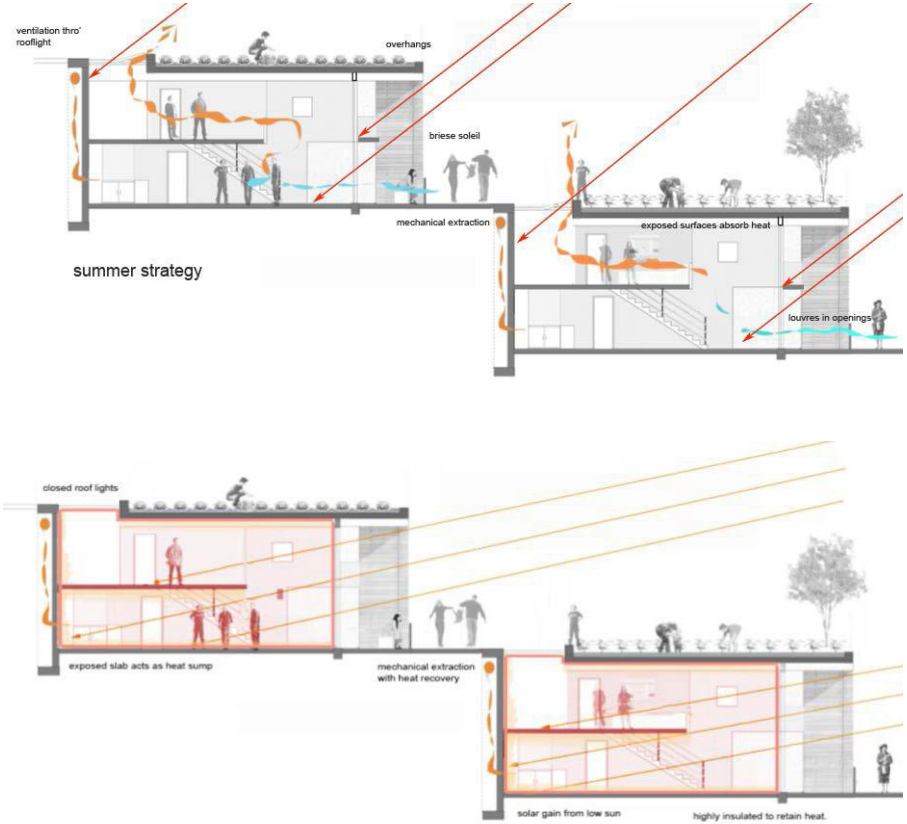


Fig. 27_ Solar diagrams

Organicity Use of Passive Solar strategy

Summer Strategy

In the summer the overhanging roof plane, balconies and briese-soleil give solar shading, and the stale air is drawn out through the roof lights on the upper floors. Clean air replaces the stale air by opening the windows and roof lights. The thermal mass moderate's internal temperature by absorbing heat.

Winter Strategy

In the winter, the development utilises solar gain from the low sun. The thermal mass is exposed, particularly the ceiling. This facilitate a more thermally consistent internal environment and a heat source to radiate back into the rooms. Any heating that is required will be recovered. The roof-lights can be closed to trap in the heat. All glazing is super-efficient argon filled triple glazed units. Stale air is replenished with clean air through heat recovery units, warming the incoming air.

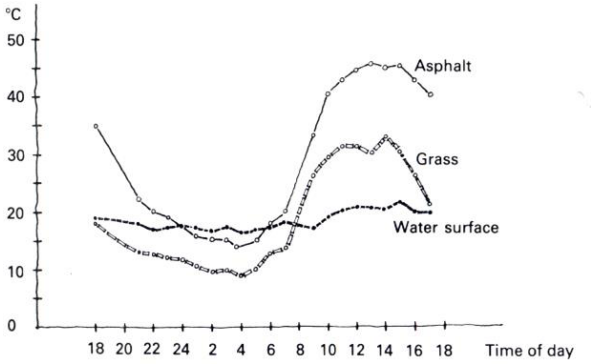


Fig. 28_ Illustrating the use of vegetation as an insulating material

Fig. 29_ Temperature variation of different materials

Natural Environmental Methods used throughout Organicity

We intend to clad many of the buildings with growing facades. Doernach (1979 cited in Hough 1984 p40) calculated that there is some 50000 hectares of vertical surface in Germany alone which is available for planting vegetation, potentially lowering street temperatures in the summer by as much as 5dgC. Vegetation also acts as insulation by trapping air within the fauna. Doernach also calculated that heat loss in winter could be reduced by as much as 30%. Vegetation also helps alleviate problems with drainage that is often overwhelmed by the run-off from the ever-increasing hard surfaces that are being constructed in cities. By planting on rooftops, and using porous materials, the speed of water run off is reduced – the natural planting and soil works as a natural soak away. A single tree can transpire as much as 100 gallons of water a day, Giradet (1996). The immediate disappearance of water down the drain in the urban landscape also reduces the cooling benefits of standing water. Hard surfaces reflect noise, consequently urban environments are difficult places to live and work in the modern city. Another benefit of vegetation, within our cities, is its capacity to absorb and attenuate noise.

Air Pollution is generated principally in urban areas- these pollutants include heavy metals, and oxides of sulphur, carbon and nitrogen as well as hydrocarbons. The problem with pollution in the city is two fold:

- Pollution raises the temperature within urban conurbations through the 'heat island effect'

- It also has a detrimental effect on our health; this is clearly demonstrated through increased levels in certain types of cancer, and inflated levels of respiratory diseases.

The Biodiversity by Design Guide produced by the TCPA, (2004) highlights that a blanket of dust particles carried in the air, and gaseous pollutants- coupled with the heat island effect- can increase the temperature in urban locations by as much as 5 degs. Consequently cities accept and store heat, Miess (1979) cited in Hough 1984 p31) studied the increase in temperature of different materials within the city and found that hard surfaces, such as asphalt, can show as much as a 30 deg increase over the course of the day (see fig 29). To counter this, we intend to use open porous surfaces where possible as well as vegetation. Open, diffuse structures, such as trees and bushes, trap heat in their canopies, while lower levels remain cool. Increased temperature is usually dealt with by artificial means such as air conditioning, which further compromises the external conditions in cities. Research undertaken by Johnstone and Newton (1996 cited in Whooley 2003) revealed that trees could also reduce the dust particles in cities by 10-15%. Trees and shrubs also have the capacity to absorb pollutants. The species and age of the tree is important; certain fauna is better than others at removing free radicals. Hough (1984 p43) comments that a 15-inch Douglas fir takes 43.5lbs of SO2 out of the atmosphere each year. The absorbed pollutants seemingly have no apparent effect on the trees and shrubs. In cities vertical walls and paved surfaces reflect solar radiation between surfaces and conduct heat much quicker than vegetated surfaces.

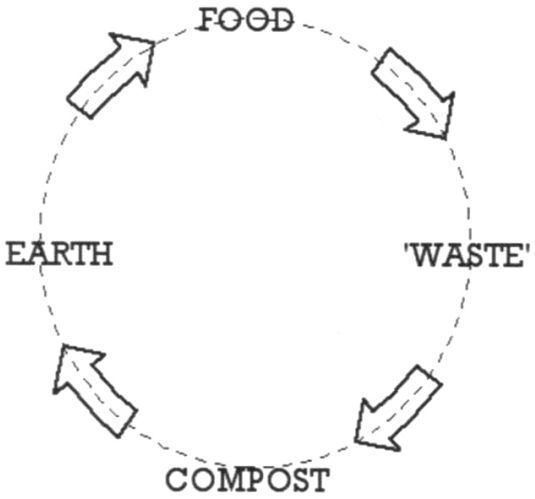


Fig. 30_ Linear approach to waste

Fig. 31_ Circular approach to waste

Issue of Waste

The concept of 'waste' is exclusive to our species and loses all meaning when applied to the rest of the biosphere. Every single, naturally produced, organic product- including the lifeless organism itself- is broken down by microbial action and fed back into the food chain. Even the gaseous emissions from breathing animals is absorbed by plant life. Conversely, there is comparatively little or no recycling of waste with our species. The production of waste is the inevitable consequence of mass consumption of resources, (see fig. 30). The old symbiotic relationship between the city and the surrounding landscape has disappeared as a consequence of industrialised agriculture. Modern waste is far more diverse and difficult to deal with. The accepted practice has been to dispose of it in landfill, even if it can be reused, or used to derive energy. The issues associated with landfill are many, particularly the pollution of land and watercourses. There is also the additional problem of methane production due to the decomposition of garden and food waste. Despite the marginal improvement in recycling by the UK, for instance, in the last decade, a staggering 50 million tonnes of household waste is still disposed of in landfill each year. Of this huge amount, 18 million tonnes is food waste, Stuart (2012). This breaks down and forms methane, which is 20 times more damaging as a greenhouse gas than carbon dioxide.

Hough (1984, p24), argues that we should see waste management as a closed loop, where waste becomes the input to another system. We could alleviate the problem of waste generation (see fig 31). Organicity has an integrated waste management system. Waste is collected from block recycling stores and handled by a recycling plant on site, which looks to maximise the return of valuable resources, otherwise seen as waste, to the community in the form of recycled products. Clean human and organic waste (i.e.no chemicals and pollutants) generated by the development, that would ordinarily be destined for landfill, will be incinerated in a CHP. Organic kitchen waste and sewage is conducted down tubes, behind the deck levels, to the anaerobic digesters at ground level. The gaseous, liquid and solid products of this process are all put to good use. The methane generated by bio-digestion is added to producer gas and burnt; the liquid effluent and solid sludge (after further processing) are dried and also burnt. Burning waste in the CHP isn't particularly environmental- but ultimately sustainable- due to the large amounts of heat and power generated from this material that would otherwise be taken to landfill. The clean ash can be used on the allotments. Ash can not release methane back to the atmosphere through its decomposition. Carbon laden air from the CHP is conducted by mechanical Ventilation through the ductwork at the rear of the domestic units to the greenhouses. This air is purified at night by the plants and oxygen is produced through photosynthesis and is released to the atmosphere.

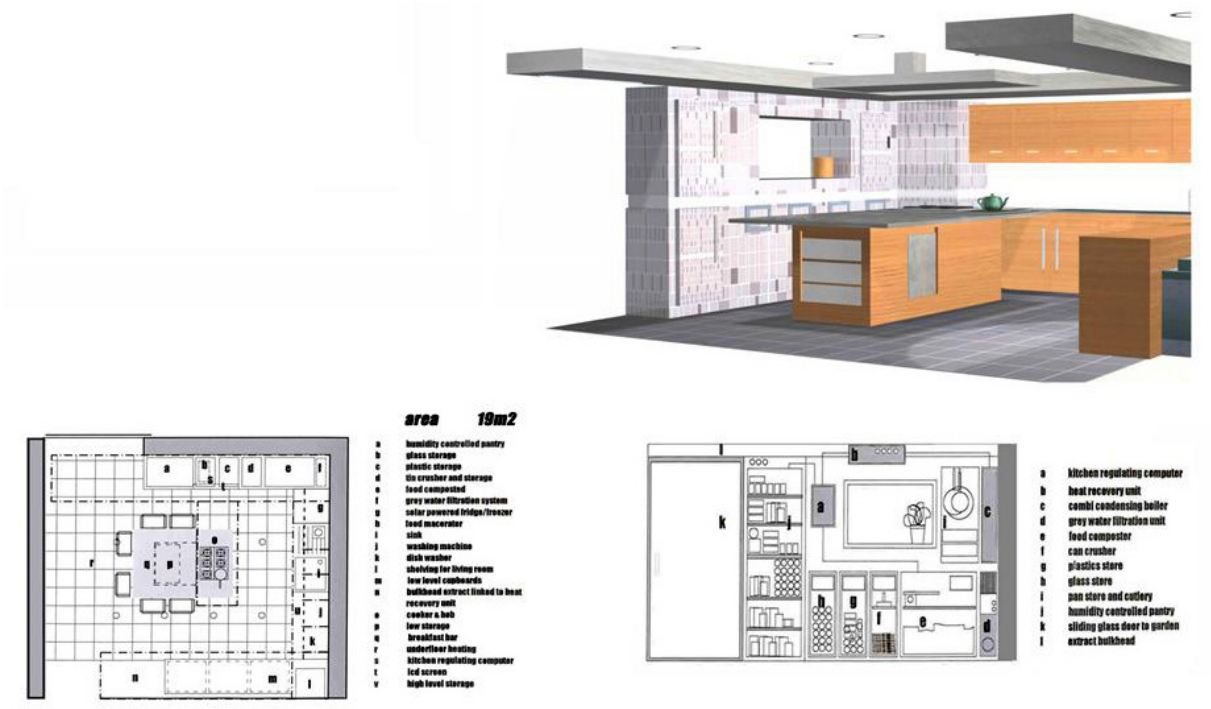


Fig. 32_ Domestic recycling unit

Domestic recycling unit

The kitchen interface is a flat pack unit that can be modified to suit different plan configurations. The unit contains recycling stores, energy saving devices and a computer that regulates the energy use of all the appliances (see fig 32). The unit actively recovers heat from the appliances and the heat is fed back into the dwelling. It recycles and collects family waste for collecting paper, cans, bottles, and tins etc. This interface is connected to shoots at the rear of the accommodation that dispenses the glass, food, plastic, and is dropped into the block recycling units in the bowels of the infrastructure. There is no traditional refuse collection, the block recycling units are emptied and then the waste is redistributed to the recycling plant on site. Residents are responsible for the items that they bring into the development and the materials that they discard, forcing them to reconsider the material possessions and waste that they may otherwise readily dispose of. ◘

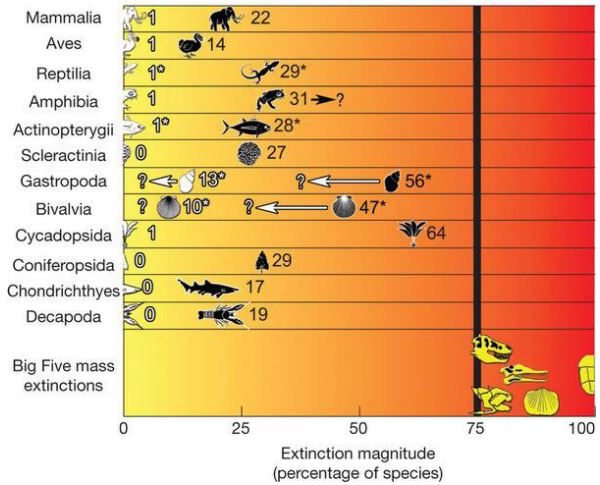
12. Question 3

How can we encourage, and better integrate nature and biodiversity, as well as promoting the production of food within urban developments?

Method

Text based secondary data analysis of research (papers, report and books). including:

Specifically:
- environmental and sustainable theories and technologies
- building and urban design precedents



Research context- Biodiversity and Nature

We argue that promoting biodiversity within the development is fundamental to the health and success of the community and the biosphere in general. It is universally accepted that humans need contact with nature and that it certainly improves our well-being. Whoolley (2003 p3) argues that urban quality depends on the creation and protection of green spaces in cities for amenity and recreation. The beauty of our landscapes, and the diversity of our wildlife, enriches lives. Biodiversity in our environment also helps to sustains our lives through the pollination our crops, thus protecting our species and habitats. Cities of the past were a haven for nature. Modern cities have become hard places, that comprise of concrete, steel and glass; nature struggles to gain a foothold in this environment. Urban designers often privilege the aesthetic over biodiversity in urban settings, limiting their palette to a few species. Diamond (2005) argues that we have virtually abandoned living in bio-diverse landscapes, but this was all that homosapiens were aware of for their first six million years on the planet.

The resource demands of our cities, particularly in terms of foodstuff, favour intensive agricultural methods. These intensive techniques require chemical fertilizers, pesticides, and genetic modification. This has wreaked havoc upon the environment. Both watercourses and the land have been severely affected. This pollution has wiped out thousands of species. Biologists are now suggesting that we have entered a sixth mass extinction event. Unlike the mass extinctions of the past, this event has been brought on by the actions of mankind . There are thousands of other species that are now regarded by biologists as functionally extinct (the population is no longer viable to sustain the species). These species will disappear and trigger the extinction of many more, Barnosky et al (2011). There are many species that have also disappeared locally, again due to manmade changes to the environment. Some species are in decline, but their numbers could be stabilised through conservation programmes, and could be reintroduced, if their environment is restored.

Organicity sets the stage for a new kind of integration between the human and the non-human species. It is not new for our species, but new for inhabitants of modern cities. Organicity is designed to have a public space that is not just common for human residents, but common to other animals too. Diamond argues that humans got used to living with nature- it is only in the modern era that we have become estranged. All social animals associate with each other and with other animals of different species for their mutual benefit. Kropotkin (1902 cited in Newman 2001) calls this the *'predominant fact of nature'*. By reintroducing nature, we hope to draw wildlife back to the city. We intend to plant native species which are supportive of an array of animals.

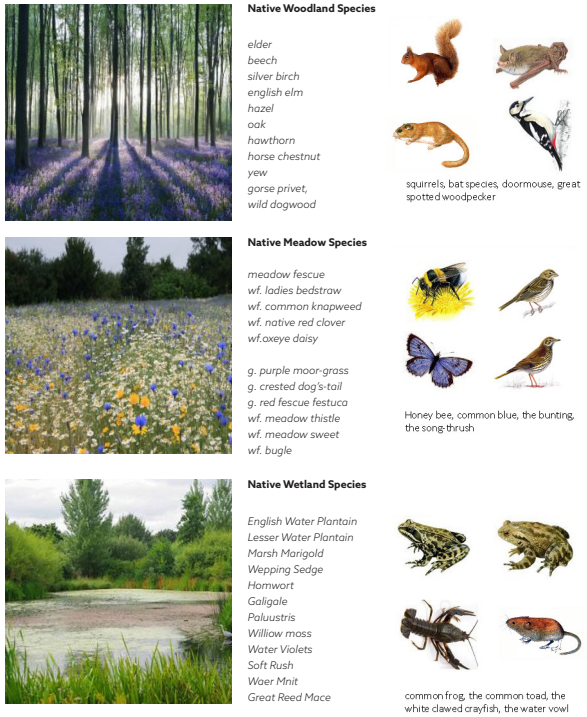


Fig. 33_ (a,b,c) Native species

The Organicity communities will incorporate habitats that promote and support biodiversity. We have looked at three distinct habitats: woodland & hedgerow, meadows, and wetlands. These will be planted within the nature corridors that separate the communities (see fig 33). Once the plant species (as indicated to the left) are established then this space will be considered as a no-go area for humans. The animal species will also be introduced (examples shown to left, see fig 33a) and benefit from the chosen fauna. For the purpose of this report we have chosen UK specific plants that are under threat and would benefit from support within urban areas.

Native woodland plant species

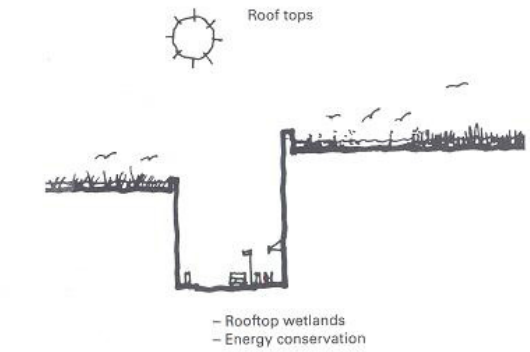
Native woodland and hedgerow have been in decline for thousands of years, almost entirely due to the activities of man. However, the rate of decline has accelerated since medieval times. Trees support an enormous number of plants and animals. Research carried out by Nicholson-Lord (1987 as cited in Whooley 2003 p58), states that a native oak can support 284 species; the willow tree 266 species and the a birch tree 149 species (see fig 33 a); we intend the maximise the inclusion of these species in the external areas. The woodland will help to enrich the lives of the residents and wider public. The clippings from this fauna will be chipped to be burnt in the CHP. Forest corridors will also help to take CO2 out of the atmosphere, especially when the trees are in their infancy.

Native meadow plant species

Meadows are very important for biodiversity, they can support as many as 40 species of plants per square metre. The high range of flora in turn leads to a high diversity of invertebrates and birds. Meadows form the basis of a complex ecological system that is very hard to replace with any other type of environment. There are typically three categories used in the community: lowland species, grass and wildflowers. Blocks will be seeded with meadow plants specific to the geographic context of the project.

Wetland plant species

In particular locations, wetland species may be more suitable than forest and other biologically diverse environments; they can be compared to tropical rain forests and coral reefs in terms of the level of biodiversity they support. See species in fig 33c.

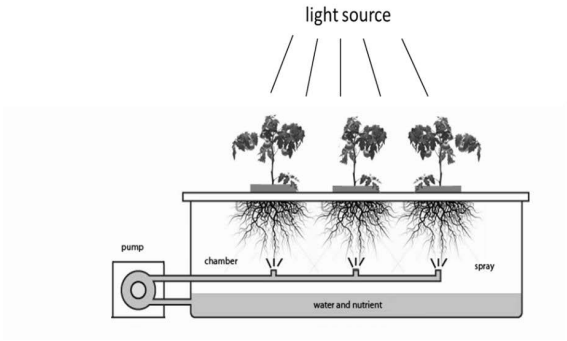


The layout of the proposal encourages interaction between nature and mankind. We have designed the environment so that hedgehogs, people and squirrels etc. can wander freely across the site between the levels, with the use of the ramps and stairs. Not only is the local habitat integrated, but the human component is blended effortlessly into the mix. Bio-diversity at last includes the human animal.

Nature and food production.

Perhaps the greatest threat to global biodiversity has been the propensity to convert diverse and complex environments to monocultures for food crops and to feed livestock. It is widely recognised that the amount of food that a typical city consumes is untenable, drawing resources from all over the world. In the UK, for instance, 70% of our nutrients are imported. An ever-increasing urban population, coupled with decreasing quality environments to grow food abroad, will in the future force cities to produce much more of their own food. Jane Jacobs (1970) predicted back that for cities to remain viable, they would have to assume the role of supplier of resources, as well as consumer. Green space in the form of gardens, allotments and city farms are very much an underexploited resource. Hough (1984) estimates that a standard 300m2 allotment has the capacity, under the correct management, to Yield 3.5 tonnes of produce- enough to feed 10 people. The allotment terraces alone could feed 800 people for a year.

The available space for food production in the city is limited, however, the potential for roof level gardens is huge (see left), especially with new build projects. The excessive weight of rooftop garden can be prohibitive to some developments; however, Hough (1984) refers to experiments in Switzerland that showed 7 cm of soil can support over 150 species; and with as little as 30 cm almost anything can be grown- perhaps with the exception of trees. The depth of the soil where trees are to be planted would have to increase to at least 60cm. Each terrace of the development will be principally used for the growing of crops; chosen for their suitability to the climate. For non-native species, south facing greenhouses are constructed on the upper tier. As well as the greenhouses there is also plenty space in the central spaces of the building, without natural light, for new agricultural techniques such as aeroponics, hydroponic and aquaponics to guarantee yields. It is important that we consider alternatives to meat eating. Aquaponics would provide the community with enough fish and crustacean species, principally mussels, crawfish, tilapia and trout for their necessary protein intake. By producing the majority of the food for the community, significantly less food will need to be purchased from supermarkets. This in turn, would eliminate the waste that goes into packaging of food in small individual portions, made necessary by our present atomized living arrangements.



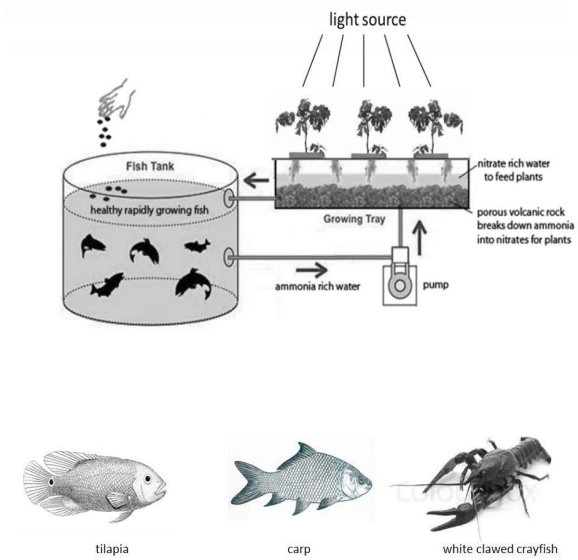


Fig. 34_ Aeroponic agriculture

Fig. 35_ Aquaponic agriculture

Aeroponics

Aeroponic farming is a method that suspends the roots and lower stems of a plant in a closed chamber where they are sprayed with nutrient-rich water solution. Outside the chamber the canopy of the plant grows up a trellises. Inside the chamber the environment is controlled preventing pests and diseases from affecting the plant's health- it is therefore a closed system(see fig 34). This type of agriculture has been seen as an alternative to current agriculture practice as high yields of excellent produce can be almost guaranteed.

Aquaponics

Aquaponics is a more complex process than aeroponics and is less suited to vertical farming. It is an holistic approach to sustainable food production that has been developed in recent years, combining existing aqua-cultural practices, (the cultivating of freshwater and saltwater fish under controlled conditions) with hydroponics (the cultivating plants using mineral nutrient solutions, in water, without soil). These techniques work together in a symbiotic environment. In aquaculture, effluent is built up in the water through fish excrement. Over time the water becomes toxic and poisons the fish. In aquaponic farming, the dirty water is filtered out by using porous volcanic rocks, as a sub base, sprayed with nitrifying bacteria. Over time this bacteria converts harmful ammonia, from the breakdown of the fish excrement, into nitrate-rich nutrients that can be absorbed by the plants. The clean water is re-circulated back to the fish, see fig 35. The fish and plants grow rapidly, especially in 20 deg+C environments. In a recent study in Canada, Wilson (2005), recorded increased yields in all species trialled, some crops showing a 70% increase in yield. The fish also showed better than average growth rates, compared to normal conditions. Another major benefit of this type of farming is that is uses only 10% of the water that traditional soil-based farming uses, and also produced good quality protein through the growing of the fish. ◘

13. Question 4

What are the financial mechanisms available to make this development economically viable and challenge current developer-led mechanisms?

Method

Text based secondary data analysis of research (papers, report and books). including:

Specifically:
- alternative community development and real estate ontologies

* Advice on this question was sought from Prof. Paul Greenhalgh and Dr Michael Crilly who both have extensive knowledge of real estate funding for community-based developments

Research Context to the question

There are many speculative, sustainable urban developments that have been proposed in recent years based on similar principles to Organicity. Few have considered how these developments would be funded. The commercial developer- led mechanisms that exist generally thwart projects of this nature, as they are governed by the primacy of de-risking strategies and substantial – quick - returns on investment that developers expect. As a result, we now invest in land and property as quantitative, hard physical assets, and ascribe or assign no measurable value to the qualitative, socio-economic substance of our urban systems – in other words, what communities actually "are". Developers de-risk their functions, but communities bear long-term risks in terms of loss of biodiversity, social fragmentation, environmental degradation, energy and transport costs, and more- while developers maximise their profit.

Organicity- an alternative development ontology

Our approach is to invest in communities- not just property. Drawing on this sensibility, we propose that the best way to plan and finance a development like Organicity is not to have one big idea, but rather to have multiple approaches through a regulatory framework that establishes value-based rules for urban development. The delivery organisation proposed has to be a model that is replicable at a variety of scales, while also ensuring local ownership and an appropriate level of control gained through the use of a quasi-legal *asset lock*. There will be a flexibility written into the model to accommodate for different legal structures, but the recommendation for the initial phases of any new sustainable, community-owned development will be to set up a *Community Interest Company* (CIC). This is a legal entity that facilitates social enterprises to use their profits and assets for the public good. The use of a CIC would have a clear 'statement of community interest' in the promotion of sustainable, affordable and high-quality urban development. As such, there would be a requirement to quickly establish a revenue stream to undertake initial stage project planning, professional fees and the business justification. This would be reinforced by a *spatial asset lock* for the proposed development location. In other words, the development's assets (usually land to begin with) would be retained within the CIC or be used for the community. To be able to exploit alternative financial models, the CIC would be used to enable access to both public and private finance. The initial management structure of the *Organicity* (CIC) would include existing community stakeholders, municipalities, and perhaps ethical investment companies. We would also anticipate the close working and early engagement with a registered provider of social housing to undertake partnership working, advice and the financial underwriting of the initial stages.

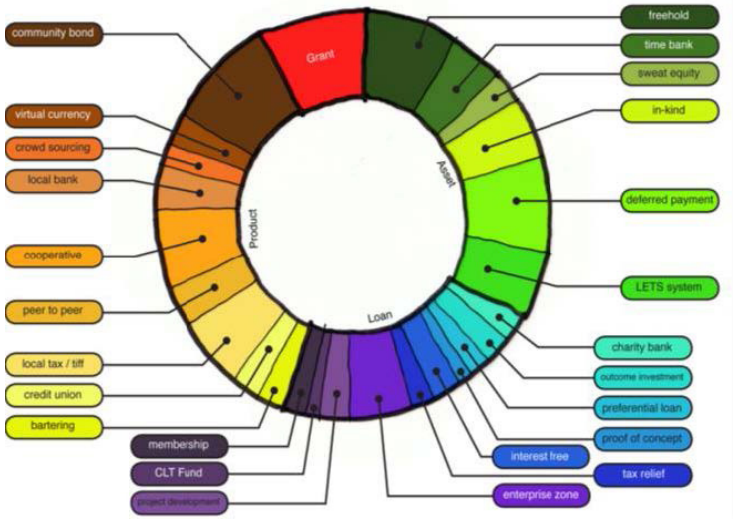


Fig. 36_ Alternative approaches to funding

Financing Organicity

There are multiple mechanisms available to fund Organicity. We present here approaches that move away from traditional finance models. The basic development finance ontology is structured out around the grant, loan, asset and product. These are not necessarily mutually exclusive ways of supporting the development, as the financing o f d evelopment proposals is an extremely dynamic area of activity. We have to keep the mixed bag of development funding options open. See fig 36.

Direct public funding is rare in the modern era, but in recent years public sector bodies have regularly passed ownership of their non-profitable assets (usually land) through *gifted freehold* to non-public organisations such as *Community Interest Companies*, as noted by Findlay-King et al. (2017). A gift of land to the Organicity CIC by a council for instance has collateral value; finance from suitable commercial lenders such as cooperatives and ethical investors could be sort based on this equity. As Bhattacharya et. al (2016) note, cooperatives recognise long-term value in quality and sustainable infrastructure projects and are often receptive to offering preferential loan rates and utilising non-standard investment routes. This finance could be used to pay for initial start-up costs and professional fees. *Local Asset Backed Vehicles* (LABV) have been developed as a concept for community regeneration projects. Here public sector bodies (usually councils) see opportunities for improved social and economic value, but don't have the funds or resources to deliver the project themselves. They instead support others to do so- usually CICs, or equivalent legally constituted community organisations. Preferential loan rates can be accessed through local government by applying to the *Public Works Loan Board* (PWLB) on behalf of community (or international equivalents) by them acting as guarantors, passing the benefits on to community-based organisations. The PWLB is a statutory body of the UK Government that provides loans to public bodies from the *National Loans Fund*. Community bonds could also be issued; they are increasingly popular, where residents (in this case) invest in the capital project. These bonds are typically not-for-profit, being instead value-driven investments. Residents can also invest money into the development in return for a share of the asset. Income could also be generated through rates and rents from those businesses that take up space within the community. Companies may also wish to invest in the capital works so as to own their premises or pay lower rent as a result of an initial investment. Perhaps the most powerful finance method is to approach an *Energy Service Company* (ESC) who would potentially pay for capital costs for building work by awarding them contracts to provide energy to the development over a long period -usually 25 years- and the capacity to lease renewable plant, such as wind, solar or combined-heat-and-power, to the community.

Primary energy strategy

An ESC or a green investor willing to invest £175.5 million in the power plant for new garden village could have a significant return on their initial investment if they received a guaranteed 3% per annum (including compound interest)- over a 30 year term.

Such are the costs to consumers for energy bills that ESCs are increasingly offering to pay for capital works for being awarded energy contracts (not limited to renewables) in terms of building works and landscaping. In this way there would be no start-up costs for the community. Even if this offer is only to cover energy generation, it still represents a significant contribution usually accounting for 20-30% of the total capital cost. The ESC would be guaranteed a modest, but consistent, return on investment.

Substantial contribution to development revenue from Power generation

The initial costs for installing a renewable CHP energy plant, solar and wind turbines are considerable, but the potential returns- for whoever finances the initial installation- are enormous, approximately 350% the initial investment over a 30 year return (the expected life span of the plant). The returns could be shared between the investor and Organicity.

The size of the plant

According to Ofgen the current electricity consumption of a typical UK household is 3.3kWh. - Size of Installation 2500 homes (375000m2) x 3.0kWh (average peak demand) = **7.5 mWh**

The size of Installation of commercial and community premises 344660m2 x 5.0 kWh (average peak demand) = **17.3 mWh**

At 50% capacity (due to different usage times) = **12MWh**

The cost of installation for 1mW of wind power = £3million (source: offgem)

Total cost of installation and CHP =**£156million** (19.5 m/MW -source:offgem)

The estimated cost of pipe work =£13.5million

Maintenance package (over a 30 year term @ £200000/yr) =**£6million**

Total Cost =£175.5million

Revenue from Plant

The average combined household bill in the UK is for heating and power (Source: offgem) = £1275

Over 30 year term = £38250

Residential use (2500 homes) over 30 year term =**£95.6million**

Commercial use (based 1.034million m2 available floorspace) =**£263.8million**

Total Revenue = £359.4million

□

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15. Illustrations