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Urban sprawl processes characterize the landscape of the areas surrounding cities. These landscapes show different features according to the geographical area that cities belong to, though some common factors can be identified: land consumption, indifference to the peculiarities of the context, homogeneity of activities and building typologies, mobility needs exasperatedly delegated to private cars.

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SPATIAL RESILIENCE OF OUTDOOR DOMESTIC SPACE IN MOZAMBIQUE

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ABSTRACT

Historically, the people of Mozambique have faced oppression and social spatial segregation and responded in a way that has reinforced rather than dismantled their traditional values. Since pre-colonial times, the population's strategy for escaping from environmental and foreign political disruption has been to reinvent tradition, based on the principles of resilience, resistance and self-reliance. The development of decentralised human settlements, involving the appropriation of land for domestic space and the self-organisation of neighbourhoods, were strategies to protect communities from adversity and secure collective self-reliance.

Following Mozambique's conversion to globalization, the post-colonial 'cement city' is now the core of neo-liberalism, as a node of the global economy, where foreign donors and international market economy control national political economy, exacerbating the premise of the negation of self-sufficiency that continues to evolve resiliently at its margins. The adoption of a neo-liberal model of development during the 1990s, completely bypasses the realities of Mozambican society. This paper argues that the strategy of self-production of space regarding the household/Outdoor Domestic Space unit, which existed previously as a resistance strategy, first of all against colonialism and secondly, against the statist definition of socialism, thirdly, has become a successful strategy for survival, as the building block of the decentralised Agrocitcity, in the face of a global economy which totally neglects both the people and the land.

KEYWORDS:

Outdoor Domestic Space; Urban Resilience; Political Ecology; Decentralised Urbanisation; Mozambique

1 SPATIAL RESILIENCE, RESISTANCE AND SELF-RELIANCE: THE HISTORICAL LEGACY

The city is both a spatial product of civilisation and a spatial product of nature in the sense that man is part of nature's processes. Moving away from the conventional argument that population growth and urban sprawl are a source of multiple problems, the notion of 'city' in this paper emphasises a symbiotic social connection with nature. The decentralised and resilient nature of the case study provides evidence that the informal city can play a vital role in ecological development by contributing towards local economic growth, ecological improvement, adaptation to climate change, enhanced social identity and individual self-esteem, mitigation of urban poverty, ecosystems and conservation of resources, amongst other factors. The collective decentralised practices of the dominant Mozambique cityscape prove that the city itself is central to creating opportunities both for human development and natural regeneration, which generate benefits beyond municipal boundaries. As a result, a city that expands by self-regenerating its own growing natural ecosystem not only improves the quality of the urban environment but also reduces human pressure on natural resources in peri-urban areas.

Historically, the people of Mozambique have faced oppression and social spatial segregation and responded in a way that has reinforced rather than dismantled their traditional values. Since pre-colonial times, the population's strategy for escaping from environmental and foreign political disruption has been to reinterpret and reinvent tradition, based on the principles of resilience, resistance and self-reliance. The spatial resistance and resilience expressed through the development of decentralised human settlements, involving the appropriation of land for domestic space and the self-organisation of neighbourhoods, were strategies designed to protect the population from successive adversities. During colonial oppression, they were used to counter discrimination, forced labour and taxation, and later, as a reaction to and a rejection of the post-independence Frelimo militarist national development agenda, and recently to halt the Guebuza government's increasingly intolerable food and energy prices¹. Following this tradition of popular spatial insurgency and the post-independence urban boom, the Mozambican city has gained more substance and autonomy to enable itself to create the conditions for urban survival and improved welfare in times of hardship.

The future of Mozambique's urbanisation would benefit from acknowledging and reinforcing the potential developed by people living in informal neighbourhoods, which has proved more advanced and effective than neo-colonial planning approaches as a means of effectively meeting the real needs of the population and helping them deal with urban challenges. The existing ODS practices found in the case study of Dondo are considered crucial to the emergence of an alternative urban development paradigm based on self-organised urban space. The extent to which ODS is shaping a ruralised urban form challenges the imported post-modern urbanism top-down approaches to the relationship between the expanding informal city, the growing urban population and the deteriorating environment which, instead of improving urban life, exacerbate social inequality, spatial segregation and urban poverty. Based on this scenario, in which the vast majority of the urban population rely on family subsistence production using ODS, I suggest that through awareness, recognition and collaborative processes, the spontaneous urban expansion of informal settlements arising from spatial resistance, resilience and self-reliance, contributes not only to a legitimate and more sustainable form of urban development but also to a positive environmental change through which society recreates itself in a way that effectively builds a sustainable living environment.

¹ This refers to the 1-2 Sept. 2010 'Maputo Food Riots'.

What is initially a social response to crisis inherently becomes a response to environmental challenges too, if the balance between humanity and nature is precondition for survival, although this response may not always improve the environment at all or may even make it worse². Nevertheless, the evidence from this research still reinforces the argument of recent literature that self-organising social systems are very efficient (Allen, 1997). Through resilience, decentralised urban space not only has the ability to return to its previous equilibrium in the face of shocks, but can also reinvent a new state of equilibrium. Continued crises in Mozambique have made social systems resilient enough on a basic survival level. Yet, during this process they have gone one step further to move beyond simple survival and create a new dynamic form of equilibrium that is ready to respond to present and future challenges, gradually moving towards a new kind of equilibrium in the relationship between humanity and nature.

2 THE PRE-CAPITALIST DOMESTIC SETTLEMENT'S SYMBIOTIC RELATION WITH NATURE

The Great Zimbabwe State was a very hierarchical society that prospered from domestic and collective cultivation of land, mining and trade of surplus with foreigners on the coast of Mozambique. Over about 1,000 years the state developed to reach a peak population of 35,000 to 40,000 inhabitants before it was abandoned in AD 1500 (Rita-Ferreira, 1999). The decline of the Great Zimbabwe State was apparently caused by environmental constraints associated with overexploitation of the surrounding resources and the tsetse fly, which collapsed the fragile political and social balance (Garlake, 1973). More aware of urbanisation, the impact of cultivation on resources and the effects of successive floods and droughts on urbanisation, the Monomotapa State learned lessons and minimised these effects by establishing itself in the region through a network of settlements instead of a single larger one, and by relying on intercropping collective farms combined with hunting, cattle raising, mining and trade activities. The possible reasons for the decline of the Monomotapa State are not related to the environment itself, but to socio-economic and political factors in which the Portuguese played a decisive role³. Although it was a highly centralised state it proved resilient to a certain extent, notwithstanding the predatory actions of foreign intrusion. Within this segregated settlement structures, the community at the base coexisted through highly resilient self-organisation to secure livelihoods in the face of imposed hardship (Newitt, 1987). Away from the Monomotapa regime, there were dispersed family kinship-based societies that lived from subsistence agriculture and cattle raising. The traditional swidden agriculture of the small family communities scattered around the territory was not environmentally disruptive but in those days was actually quite evocative of a close knowledge of nature's living systems. Through spatial resilience and resistance, this innate symbiotic relation with nature has endured until today in the marginalised neighbourhoods of the Mozambican dualistic city.

² In the case of Lagos, the use of self organisation and adaptation to solve the problem of waste by creating artificial islands resulted income source from waste recycling but in the pollution of the lagoon and damage to the entire ecosystem ('Welcome to Lagos', BBC, 2010)

³ Rita-Ferreira (1999) considers that the great transformations that occurred during the pre-colonial period in the present-day territory of Mozambique were the result of (a) environmental factors – soils, rainy seasons, droughts, vegetation, diseases, etc.; (b) the introduction of American and Asian edible plants; (c) contact with foreign cultures through trade; and (d) migration flows caused by economic and demographic factors.

3 ECOLOGICAL TRANSFORMATION OF URBANISATION UNDER CHANGING REGIMES

3.1. COLONIALISM

The process of land alienation and occupation firstly through the *feiras*⁴, then the *prazo*-system⁵ and later the International Charter Companies involved the uncontrolled use of land, people and resources, and inaugurated a period of massive exploitation through subversive practices. Firstly, the colonial cities and towns created urban environmental health problems in the neighbourhoods, given the sudden high population concentration and lack of sanitation, inadequate water supply and lack of waste management. Later, and gradually, knowing they could only rely on themselves, the communities in the 'reeds' neighbourhoods were forced to organise in a way that enabled them to be as resistant and self reliant as possible, by reinventing traditional knowledge⁶.

3.2. POST-INDEPENDENCE

The post-independence nationalisation of land, the departure of Portuguese residents and the destabilization war with Renamo led to a very accelerated rate of urban growth from a massive rural exodus to the cities and towns of Mozambique, which led to a dramatic deterioration in urban environmental health conditions and put pressure on the surrounding land resources (Raposo, 1988). Frelimo's rural development policies of extensive and intensive collective state farming and nationalisation and collective lifestyles in the Communal Villages developed a form of socialism which in practice was closer to a form of collectivism. The State Farms led to the deterioration of the environment and the impoverishment of the population in rural areas. Since the official rural development programme was insufficient to feed the cities and was seriously compromised by the pressure from the Renamo forces attacking from the countryside and destroying the linking infrastructures, the peripheral resources rapidly became depleted. The growing economic and general paralysis during the war years spread hunger to both rural and urban areas, leading to the continuation of urban farming, both in the neighbourhoods and the 'cement city' (Sheldon, 1999). A series of floods and long droughts increased the already severe impoverishment of the population at national level due to internal and external factors, creating stagnation in agriculture and urban collapse. This gave rise to collective and resilient forms of self-organisation.

4 THE POLITICAL ECOLOGY OF SPATIAL RESILIENCE

Outdoor Domestic Space is a multifaceted space that refers to the external space surrounding the built house and which, in the case of Mozambique, is where daily life takes place, involving strong social, ecological and productive functions. Under successive periods of political economy oppression and environmental adversity, the Outdoor Domestic Space has been adapted and refined to ensure collective self-reliance. Shaping a green and ruralised urbanisation at the margins of the Mozambican post-colonial

⁴ Portuguese word for "market" or "fair". Feiras were trade centres built temporarily and distributed into inner land along the rivers for dissemination of Portuguese trade seeking land and trade dominance which was reinforced by the Portuguese Jesuits in the 16th century.

⁵ *Prazo*, *Emprazamento* or *Terras da Coróia* was the first Portuguese colonization strategy in Africa in the 16th century and consisted in the lease of large land areas in the Zambezi river valley to Portuguese and Goan colonizers under a semi-feudal estates system.

⁶ E.g. since the men's wages were inadequate and women were not absorbed into the labour market, urban farming by women became widespread in the neighbourhoods' ODSs and open spaces within the city (Sheldon, 2003 and Guedes, 1971).

dualistic city, which I call the Agrocitcity, the Outdoor Domestic Space is resilient because it is able to adjust domestic space as a strategy to secure livelihoods, provide urban food, commerce and services, maintain vital kinship relationships and produce a comfortable and clean microclimate across the spontaneous neighbourhoods (see Figure 1). This spatial resilience is the feature underlying the self-organisation of neighbourhoods with a new way of overcoming alienation from nature, which suggest the continuance of an innate relationship between society, the human habitat and nature.



Fig. 1: Outdoor Domestic Space transformation and livelihoods self-organisation in the spontaneous neighbourhoods of Dondo Municipality

Outdoor Domestic Space is considered here as the individual building block or cell unit in the wider whole, the Agrocitcity, whose definition is explored in terms of the details of the larger operative system, its dynamics and overall implications (socio-cultural, economic, ecological and institutional). The cell is resilient and incorporates both modern and traditional knowledge, providing the basis for the resilience of the wider system – the human habitat - to shocks. Historically, the human habitat, as a space for production and human concentration, has been viewed as a source of conflict, reaching its peak during capitalism. In contrast, this case study demonstrates that other forms of human settlement and production are possible – the use of ODS, the production process and the neighbourhood self organisation are themselves expressions of the material-energy exchange in the relationship between society and nature. The Agrocitcity dissipates social differentiation and power relations, promoting inclusion through collaborative networking. I analyze the Agrocitcity metabolism as a self-regulatory system (Lovelock 1979, Girardet 1996) both separate and derived from technocratic post-Modernist (colonial and neo-colonial) urban models connected to wider processes of political and economic historical change.

Following its failures during the post-independence period and rejecting oppression from either left or right wing authoritarian regimes, socialism in Mozambique is now reinventing itself from below in a more genuine and legitimate fashion with apparently greater chances of success. Likewise, the current global political and

economic crisis, peaking oil and climate change resulting from the ongoing breakdown of the capitalist system are creating the opportunity for revolutionary change.

4.1. RESILIENCE OF THE HOUSE UNIT

It has been reported that in pre-colonial cities, the home also served as a workplace (see Figures 2 and 3) and a gateway to the outside world (O'Connor, 1983). An analysis of the evolution of the Mozambican house from the traditional *muti*⁷ to the agro and business-based ODS in the neighbourhoods of Dondo, reveals how significantly outdoors domestic life has been adapted into a survival and production tool. Traditional domestic space strategically becomes a productive advantage by providing shelter, food and income based on creatively adapting ancient family economic traditions that favour kinship, networking, diversity and flexibility. Whilst the built house has undergone several changes in terms of quantity, size, technology and style to keep pace with constantly changing challenges, the ODS has become even more important in daily life than in the past.

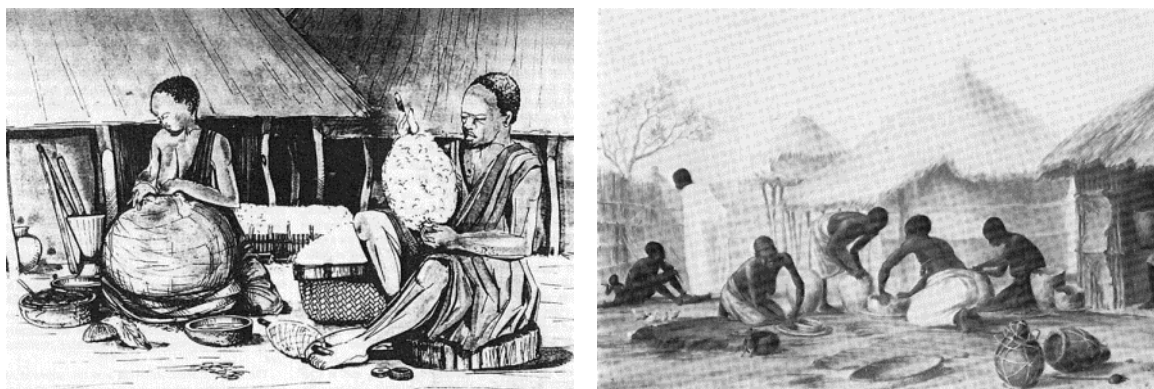


Fig. 2 and 3: Spinning, pottery manufacture (left); and Outdoor domestic production and making pots (right)

With the massive exodus of rural people escaping Renamo attacks in the countryside, informal settlements spread from the city centres outwards and became vast and densely populated, requiring rapid adaptation to urban conditions, such as the lack of space for the traditional large domestic area. On arrival in the city, temporary shelters were built using traditional materials such as reed or recycled city waste materials until a more permanent wattle and daub, cement block and corrugated zinc, or wood and corrugated zinc house could be built (Guedes, 1971). Although space was scarce and the plots closer to the central services in the 'cement city' were much smaller than those in the villages, when food became scarce, urban cultivation on any available piece of land, even roof terraces and balconies, proliferated (Guedes, 1971). This settlement pattern endured as a reaction to the poor urban food supply, food prices and urban poverty, given that high unemployment rates reinforced the self-organisation of the traditional subsistence family economy practiced by most of the Mozambican urban population to ensure subsistence in many innovative ways.

Facing the phenomena of gradual modernisation, the house type, materials, technology and use of space as well as livelihoods, community organisation and management of natural resources have been subject to a

⁷ A large domestic settlement or hamlet of several house units large enough to be small villages. The *muti* reflect forms of life and production in harmony with its natural surroundings: location, space use, building technologies and materials, forms of production and use of near resources are based on subsistence family-based production.

process of self transformation and rediscovery. This is the result of a set of changing factors, including: (a) growing modernised tastes, due to many foreign influences through history, urban migration, media and proximity to modern house models; (b) a general desire for 'Western-style progress' directly associated with the stigma traditionally equated with backwardness; (c) increased purchasing power to build costly modern houses and buy large modern items of furniture; (d) less time (and will) to collect natural materials and carry out traditional house maintenance due to changing lifestyles; (e) the scarcity of natural building materials in the city and their rising prices on the urban markets, together with the abundance of recycled or gradually more affordable industrial building materials; and (f) the fact that houses with right angles are easily built and are more adaptable to different building materials and technologies, (and to modern furniture) leading to the gradual replacement of the traditional circular *maticado* Mozambican house with a quadrangular or rectangular design (Bruschi et al. 2005, Raposo 1988, Verissimo 2010). However, this 'modernisation' is more obvious in Maputo than in the rest of the national cityscape, which is composed of medium and small cities where, according to fieldwork and statistical data, the prevailing built environment and skyline in the neighbourhoods apparently remains traditionally built and green (see Figure 4) (INE, 2007).



Fig. 4: Bare and plastered maticado houses (left); and decorated wall in earthen plaster 'matope' with corrugated zinc roof (right)

People living in the informal settlements in Mozambique are as poor as urban residents in the poorest cities in the world and also lack adequate infrastructures and services to ensure proper standards of urban life. However, excluding the denser cities like Maputo and Matola metropolitan area and Beira, in medium-sized cities of Mozambique such as Dondo there may be neighbourhoods without a 'slum' environment, since they feel surprisingly like intimate, cosy ruralised cities, apparently resultant from adapting the family subsistence agriculture tradition to the urban context. Therefore, I find it more appropriate to call these informal settlements as 'neighbourhoods' rather than as 'squatter settlements', 'slums' or even 'low-income settlements', mainly because (1) houses are traditionally adapted to the local climate and are environmentally friendly, comfortable and relatively well maintained because they are a means of livelihood security and the greatest asset people have; (2) the few but gradually increasing cement houses seem to deteriorate more rapidly because the finishings and maintenance are expensive, meaning that they are usually left unfinished, and also require costly materials and skilled labour; (3) abundant vegetation and trees grow throughout the neighbourhoods providing shade and a good, cool environment; (4) large plots for domestic farming reduce the density of the conventional urban built environment, improving the urban atmosphere. In denser residential areas that show early signs of overcrowding and neighbourhoods with

factories obviously have poorer environmental conditions. These factories in Dondo are, on the one hand, a negative presence imposed on the neighbourhoods' residents and, on the other hand, a source of opportunities, i.e. jobs, cheap access to materials and useful waste (e.g. wood, sawdust, cement and asbestos plates that are used as building materials and for crafts, furniture, cheap domestic fuel, etc). However, the self-organised urban community management tries to minimise their negative effects with vegetation and tree planting, street cleaning, maintenance of open drains, improvised bridges over drains, buffer areas and so forth (Veríssimo, 2010).

The levels of ODS transformation also depends on the varying intensity of the following two variables: the scarcity of the natural resource base and access to alternative building materials. Scarce and overpriced traditional building materials increase the vulnerability of minority social groups such as the disabled, the elderly, widows and the poorest households, who face greater difficulty in carrying out necessary regular maintenance work on the house which would otherwise collapse after being exposed to the elements for a certain period of time, especially during rainy season. In more densely populated cities such as Maputo or Beira, away from bush areas, the poorest in the population manage to build their houses from waste materials, although these are equally unstable and unhealthy, whilst others buy cheap recycled and new materials such as flattened paraffin tins, corrugated zinc and asbestos plates, to build more permanent houses (INE, 2007). As long as there are regenerative ways of maintaining a local supply of natural materials within the neighbourhoods without compromising resources in peri-urban areas, and some households can still afford and are interested in 'upgraded housing'⁸, the majority of the urban population will continue to build and live in an ecologically safe built environment. If the natural resource base is preserved in peri-urban areas and reproduced in urban areas in a way that ensures positive natural regeneration levels, its products may be available sustainably to all. The continuation or even optimisation of affordable and self-built construction technology may improve the self-reliance, security and well-being of urban communities. This could also accumulate environmental and health benefits through the use of lightweight natural materials which, in addition to being naturally degradable, have a low thermal mass, hold in little heat and cool easily at night. In contrast, zinc and asbestos roofing, cement blocks and concrete are heat conductors, do not cool down easily and are highly carcinogenic. There is a local perception that, for the reasons stated above, houses built using modern materials represent a superior and more dignified standard of living and that traditionally built houses therefore imply a 'poor' standard that people aim to reject, even if superficially⁹. It is necessary to find ways to reaffirm not only the cultural but the overall validity of natural traditional materials, so that they are appreciated and preserved instead of being viewed as a sign of poverty or backwardness. Despite the assumption that housing in informal settlements are always built with recycled or new modern materials, this case study demonstrates that spontaneous neighbourhoods may renew themselves by making use of traditional building technology using natural materials in a sustainable manner.

Whatever direction the house in the neighbourhoods of cities in Mozambique may take in the future, field findings indicate that the traditional use of Outdoor Domestic Space might continue to evolve as a productive tool to ensure secure livelihoods based on agriculture, commerce and services (see Table 1). Findings suggest that the factors encouraging the growing productive use of ODS include: (1) the legacy of pre-

⁸ An 'upgraded house' is locally perceived as a more durable house structure built with cement and concrete structures and a zinc or asbestos roof, that usually remains unfinished, leading to a number of building pathologies that are commonly associated with malaria and air-borne diseases.

⁹ According to fieldwork, this 'house upgrading' does not involve improvements regarding sanitation, space, ventilation or any other factors that might improve comfort and well-being.

NEIGHBOURHOODS	<i>Exclusive (sole) source of ..</i>		<i>Complementary (significant) source of ..</i>		<i>Supplementary (back up) source of ..</i>		<i>Only as a source of fruit and not a source of income</i>	
	Food	Income	Food	Income	Food	Income	Food	Income
NHAMAYABWE 32 households	-	26	12	3	12	-	7	-
MAFARINHA 25 households	-	19	8	4	6	-	11	1
THUNDANE 3 households	1	-	2	3	-	-	2	-
TOTAL 60 households	1	45	22	10	18	-	18	1

Tab.1: Households Dependency Level on ODS for Livelihoods: food security and income

colonial agro-based cities based on family relations and mutual aid - household and community self-organisation; (2) colonial social spatial segregation which enforced the continuation and adaptation of decentralised traditional forms of housing, use of space and an agro-based family subsistence economy; (3) the present restricted opportunities for wage-earning, which have led to the updating of new self-organised family income strategies; (4) medium-sized cities and low-density urban growth patterns which allow for spacious house plots that facilitate urban domestic farming and family businesses, as well as environmentally regenerative urban community self management; (5) the innate connection with nature due to the population's continuing high dependence on a natural resource base and the knowledge of ecological systems from uninterrupted agro-based experience; (6) the legacy of domestic urban food production dating from pre-colonial and colonial urbanisation: cultivation on domestic terraces in the Monomotapa cities and the domestic cultivated ODS of colonial and post-independence neighbourhoods due to the poor urban food supply, many food crises, natural disasters, unemployment and very low wages.

Colonially imposed land alienation, forced labour, abusive taxation, displacement of people and racially discriminatory laws led the population to settle in scattered remote areas as the only means of escaping oppression. Later, with industrialisation from the 1950s onwards, the reverse shift towards the city gradually increased, marking the earliest stage in the 'reed' city neighbourhoods and the emergence of dualistic urbanisation in Mozambique.

4.2. RESILIENCE TO NATURAL DISASTER AND CLIMATE CHANGE

The variable climate, involving periods of heavy rain followed by periods of drought, is a natural phenomenon in Mozambique. Since the hunter-gatherer and agro-pastoral societies of pre-colonial times, people have learned to cope with nature's lifecycles and the severity of extreme weather conditions by intercropping combined with flexible and diverse production modes. These were used extensively in the Monomotapa State, and nomadically in the pre-capitalist agro-based family domestic settlements. The transformation to a state and market system did not prevent the majority of the population, as in Dondo for example, from resorting to their ancient knowledge of natural living systems to adapt to new scenarios – domestic farming combined with urban-based income strategies through a modified use of Outdoor Domestic Space and modes of production based on flexibility and diversity.

Nevertheless, current levels of climate variability have become more extreme, increasing the population's vulnerability to floods, drought and heat waves and undermining their ability to adapt in order to deal with the growing impact. Although Africa is the continent with the lowest ozone depleting gas emissions, it is highly prone to the actions of climate change (Boko et al. 2007, African Development Bank 2007). According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, (1) agriculture production and food security are severely threatened by climate change, with small-scale producers being the worst affected; (2) climate change is also expected to increase pressure on water availability and quality; (3) several ecosystems are changing at a faster rate than expected, particularly in Southern Africa; (4) the rise in sea level creates larger flood-prone areas in low-lying land, therefore increasing the socio-economic and physical vulnerability of cities, particularly in East African coastal areas; (5) disease vectors are changing – the spatial and temporal transmission of malaria, dengue fever, meningitis, cholera and diseases caused by climate change undermine human health (African Development Bank 2007).

In Mozambique the important agricultural sector is affected by the climate, involving major economic impacts, whilst the dependence of the population on natural resources and agriculture, the general poverty, poor infrastructures, low capital, limited municipal resources and environmental degradation are also factors that increase the country's vulnerability to climate change. This is the reason why attention must be paid to emergent resilient sustainable practices, since they are better equipped to deal with severe and unexpected catastrophes.

5 SUSTAINABLE URBAN METABOLISM

The urban metabolism approach involves the creation of cycles, or loops, in the system to enable the footprint and waste of the city to be reduced by addressing aspects of the city perceived as hazardous. Obviously, in terms of livelihoods, the population essentially concentrates its efforts on protection against those hazards. However, since the urban metabolism can be approached from a top-down or bottom-up manner, there are, on the one hand, the centrally planned, highly technocentric 'ecocities' driven by neoliberal centralised control systems, such as the Tangshan Caofeidian in China and Masdar Abu Dhabi in the United Arab Emirates (Joss, 2010). On the other hand, the emergent decentralised cities developed by the people to ensure the security, survival and progress of the community, such as Dondo. The technocentric top-down approach does not cope effectively with the problems associated with urban degradation because it cannot be widely distributed and transplanted. The only way it can be effective is through a decentralised system which is more resilient to shocks and is self regenerative¹⁰, as in Dondo where the indigenous improvised system reacts to the partial collapse of the central system by reconstituting itself from its individual cell, whereas in the central approach¹¹ if the centre collapses, the whole system falls apart.

The resilience of the metabolism is what enables the Agrocitcity to adapt to new adverse scenarios. It is a metabolism which evolves like a living organism with properties, components and dynamic relationships. However, the emergent properties of the Agrocitcity cannot be fully deduced from the individual cell, the

¹⁰ As in the starfish model, a metaphor for decentralised systems, in which, like a starfish the decentralised open system has no head, i.e. no ruler or central intelligence, which instead is spread throughout the system. When cut, it replicates itself in each limb, i.e. the system is self regenerated (Brafman and Beckstrom, 2006).

¹¹ According to Barfman and Beckstrom, the centralised system is the spider which has a central body with legs - when the head is cut off it dies (Ibid., 2006).

household-ODS, because it is not self-contained and interacts dynamically with other components. The urban metabolism of the Agrocity may be defined as a fluid, complex and dynamic framework that is self-organised on the principles of resilience, resistance and self reliance, and is sustainable because its functioning implies the creation of feedback loops in which products are no longer waste, but energy for the self-regenerating living system. These feedback loops may be negative, causing entropy of the system, visible in the form of environmental hazards¹², or positive, when hazards are converted into energy by the metabolism.

Usually, and partly in the case of Dondo, the environmental transformation to which cities are exposed is related to uncontrolled industrial waste in residential areas, and capitalist exploitation of natural resources such as the intensive cut down of trees by the forestry industry, which may generate environmental problems related to (a) consumption of resources that changes the natural surroundings and endangers the population's natural resource base, and (b) the production of waste in the form of pollution that affects all life forms. This affects local food security and welfare, since livelihoods are highly reliant on land resources for food, fuel and materials. Likewise, people are usually either forced to consider settling in more remote and better-preserved natural areas or moving further into the urban neighbourhoods for waged work. Lacking infrastructures, and being close to factories and other hazardous locations produce environmental problems inside the neighbourhoods that threaten human welfare. Common features of denser neighbourhood environments may easily lead to the following problems: (a) the spread of biological pathogens (air, water, food, soil, animals, insects or other disease vectors and carriers); (b) contact with chemical pollutants (unmanaged toxic industrial waste, poor sanitation, and open fires); (c) the absence of scarce and distant hazards such as fires, floods and drought (Hardoy et al., 2001). Yet, the population living in the neighbourhoods of the Agrocity, in the real case of Dondo and also as a hypothesis, are less vulnerable to



Fig. 5: Thermal comfort, environmental upgrading and food security. Top from left to right: Trees and greenery provide a healthy urban environment and minimize lacking infrastructure; Streets are safe and pleasant places for playing, strolling, rest and chat; Primary school teacher cycles back home. Bottom: fruit and shade trees, food growing and poultry at the ODS.

¹² Environmental hazards are associated with degradation of the rural environment and urban environmental problems, with impacts on human health, the natural resource base, local ecosystems and global life-support systems. Although this threatens the majority of urban livelihoods, the system is able to cope with adversity by reducing its impacts.



Fig. 6: Self-organising resilient and autonomous livelihoods. Top from left to right: This household sells sodas, cell phone credit and SIM cards, the husband is a prophet and traditional healer at their ODS; A carpenter works from his ODS where he raises goats, chickens and also cultivates cassava and fruit trees; A movie and TV 'saloon' charging entrance at ODS. Bottom from left to right: A carpenter displays his work at his door front while across the street someone sells cooking oil; door front stalls (cell phone credit and snacks) under a shade are a great place for gathering; Domestic grocery stall at ODS facing street; Selling building materials and used steel pieces for melting at door front facing busy street.



Fig. 7: Urban inclusion, security and community urban management. Top from left to right: Chatting on the way to work in the neighbourhoods; Children play freely in the neighbourhood's streets along with neighbours chatting; Teaching her daughter a new hair style under a mango tree shade while drinking lemonade at their ODS. Bottom: Streets are collectively maintained clean.

these impacts because they collectively manage domestic waste, sanitation, street cleaning, and drains maintenance, as well as planting dense vegetation in the Outdoor Domestic Space to produce food, income, fresh air and a pleasant environment in an attempt to minimise the negative impacts of being poorly served with basic infrastructures (see Figure 5). The neighbourhood community is also self organised at Outdoor Domestic Space level to provide urban normal amenities and services such as health care, child care, public safety, religion, hostels, taverns, nightclubs, cinema, carpentry, groceries, etc, for the population, as in any other ordinary city driving social inclusion and a sense of local identity and community (see Figures 6 and 7). When a negative feedback loop occurs in the urban metabolism, caused by environmental or political and economic pressures, the communities in rural areas, local ecosystems and natural resources become affected by (a) greater urban dependency on the natural land in peri-urban areas for food, fuel and building

	OUTDOOR DOMESTIC SPACE (ODS)	AGROCITY
Social	<ul style="list-style-type: none"> . Individual and collective satisfaction and improved self-esteem . Poverty alleviation . Health upgrading . Integration of vulnerable groups through domestic work, social and business networking, kinship relations and economic participation . Self-employment . Safety and security in food and fuel production (household-community-city) . Recreational and educational farming 	<ul style="list-style-type: none"> . Urban communities food and fuel security . Food sovereignty from sustainable urban farming . Security of livelihoods and social inclusion . Safe, productive and sustainable urban growth
Economic	<ul style="list-style-type: none"> . Generation of household cash income . Negotiated municipal taxation . Encouragement of entrepreneurship and urban work . Participation in economic system through commerce and services provision . Food supplier to city food system . Reduced need for imported food . Contribute to macro-economic development 	<ul style="list-style-type: none"> . City food supply . Participation in local economy . Informal markets growth . Household income and entrepreneurship
Political	<ul style="list-style-type: none"> . Improved level of infrastructure and services provision . Participatory urban policies and plans . Partnership for urban environmental management . Information and support to minimize health risks from ODS . Micro-credit support 	<ul style="list-style-type: none"> . Support, partnerships and community engagement in collaborative governance
Ecological	<ul style="list-style-type: none"> . Urban farming and biodiversity productivity . Waste composting . Natural pest control . Small energy emissions . Reuse of solid waste for composting and water for irrigation . Direct positive impact from the house space . Greening improve micro climate conditions . Improved soil nutrient cycling . Conservation of soil, water, biodiversity and landscape . Flood control . Low energy intensity food and other produced products . Energy conservation involved in conventional market food (transport, cooling and packaging) . Reduced interest in harvesting natural resources . Reduced need to cultivate in forest areas . Urban income reduce pressure on resources . Preservation of natural habitats and biodiversity . Continuation of cultural traditions 	<ul style="list-style-type: none"> . City production of natural resource base . City management of waste . Richer urban ecosystems . Reduced urban waste and pollution . Improved public health . Protection of peri-urban areas (forest, waterbeds, farmland, etc) . Resource base conservation by local reproduction

Tab. 2: Socio-Economic, Political and Ecological Potential Characteristics of ODS-AGROCITY Closed Metabolism

materials; (b) intensive extraction of raw materials for local industry; (c) rapid urban sprawl; and (d) increased urban waste. Given that the Agrocitry is an urban metabolism that 'mimics' nature in the sense that it is part of it, it is therefore supposed to integrate into its cycles and processes in a mutually beneficial manner. When exposed to entropy within the system, the resilient property of the metabolism enables the Agrocitry to reverse the damaging effects and regenerate its living systems by a positive feedback loop to ensure that life is preserved. Today, the food consumed in Dondo is largely produced inside the neighbourhoods, which benefits the natural ecosystems through clearance for cultivation purposes, although the urban food supply is still partly dependent on rural production and imported products.

The devastation caused by the forestry industry and the increasing scarcity of firewood near the neighbourhoods implies travelling further for collection and charcoal production, rising market prices, rural people driven further away to better-preserved areas and greater deforestation and soil erosion. Natural resources are fundamental to commercial and subsistence activities and their degradation compromises the majority of the population's welfare and their capacity to become involved in local economic development. Therefore, the system has to be autonomous. The urban system in Dondo has been responding positively by increasing urban food production in the ODS and open spaces within the neighbourhoods developed in an environmentally safe way, as well as planting trees and vegetation, not only for a clean and comfortable environment but also for fuel and building materials, which are available sustainably, to increase local self-reliance. The availability of bamboo, wood, reed, thatch and clay inside the neighbourhoods allows residents to continue building resistant, comfortable, low-input, traditional housing that is adapted to the climate, in pleasant neighbourhoods that are also close to the formal services in the 'cement city' (see Table 1). If this could be intensified, the regenerative capacity of the urban metabolism could improve life both for society and nature.

6 THE RESILIENT AGROCITY METABOLISM

Man confronts the material nature as one of his own forces. He sets in motion arms and legs, head and hands, the natural forces of his body, in order to appropriate the material of nature in a form suitable for his own needs. By thus acting through this motion on the nature which is outside him and changing it, he at the same time changes his own nature.

Karl Marx cited in Schmidt 1971: 77-78

The whole Agrocitry, as an open dynamic system, evolves from the dynamic interaction of the ODS cell with other components within the system as a whole. Metabolism was socially and ecologically defined by Karl Marx as 'It is not the *unity* of living and active humanity with the natural, inorganic conditions of their metabolic exchange with nature, and hence their appropriation of nature, which requires explanation or is the result of a historic process, but rather the *separation* between these inorganic conditions of human existence and this active existence, a separation which is completely posited only in relation of wage labour and capital.' (Marx 1973: 201) in order to explain the dialectics of society and nature through labour as a natural process in which humanity not only participates, but belongs. Likewise, the Agrocitry includes a metabolic process with a 'complex system' organization: it is made up of sub-units (the spontaneous neighbourhoods) composed of individual cells or basic units (the Outdoor Domestic Space) and evolves through spatial production by a decentralized society. The Agrocitry is therefore self-organised on two levels: the first level is the individual cell - the Outdoor Domestic Space building block, which is internally self-

organised by the household and resilient in the sense that when perturbation occurs on the overall system it manages to survive, and the second level is the interaction between similar cells to form the neighbourhood which the Agrocitcity system sub-units. Since the ODS cell connects easily to other components of the system, the Agrocitcity self-organisation within the neighbourhood sub-units may expand to other levels, such as the 'cement city' and urban-rural linkages, as well as other elements from the external environment. So, there is interaction between the household at the ODS and other components within the Agrocitcity. In an analogous way, at a global scale the Agrocitcity interacts with other components as a part of the wider system, which is emerging ecosocialism.

This paper deals with this particular Agrocitcity as found in Dondo case study, but there are other similar emergent formations elsewhere which interact both locally and globally. Although the conditions of the ensemble cannot be predicted by the individual cell, the paper is focused on understanding and explaining the behaviour of the Outdoor Domestic Space individual cell and the process of local interaction between the ODS and other diverse components that generates local relationships. Exploring further the Agrocitcity built by the society of ecosocialism, the Agrocitcity becomes the individual cell of the emergent process of ecosocialism as a whole, which is analogous to the way in this study ODS shapes the Agrocitcity. Understanding one particular building block that explains the process of self-organisation of ODS cells and the way they form neighbourhoods contributes to understanding the Agrocitcity and hypothetically its important processes to understand a new ecodevelopment/ecosocialism.

Summing-up, resilience is the main feature of the Agrocitcity metabolism, arising out of internal and external changes to its system after it has reached a state of disorder, to enable it to regain its balance. Through resilience, society is able to restore sufficient order to the system to allow it to continue satisfying demand whilst avoiding hardship for the whole system, as for example it was the case with the transformation of domestic space in Mozambique when people escaped to the city during the war. The positive system dynamics depend on the wide and rapid distributive capacity of resilience within its component parts. This feature is crucial in securing the balance of the urban system in terms of food security, clean water, repositioning resources and so forth during crisis events, and this proves that resilience is linked to the innate relationship between the human habitat and nature.

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IMAGES SOURCES

Fig. 1: Outdoor Domestic Space transformation and livelihoods self-organisation in the spontaneous neighbourhoods of Dondo Municipality (source: Veríssimo, 2010); Fig. 2: Spinning, pottery manufacture (source: Sinclair, 1987, pp. 116); Fig. 3: Outdoor domestic production and making pots (source: Newit, 1973, pp. 285); Fig. 4-7 and Tab. 1-2: (source: Veríssimo, 2008 and 2010)

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