Refracted Cairo:
Mapping Change on the Move, from Within

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Abstract: This paper reports the current stage of an experimental project, Cairo Refracted, initiated within the Department of Architecture and Urban Studies at the Politecnico di Milano in 2011. The intent of the research is simultaneously descriptive, disseminative and strategic. It has been developed in the context of learning activities both in Milan and in Cairo, Egypt. The area of study is an informal development east of Giza, Egypt, known as Ard el-Lewa. The research aims to inform a representation of urban space as it is socially produced in peri-urban encroachments of Cairo, to reveal configurations of spatial practices, and finally to support a change of perspective in the way that informal cities are traditionally studied. The project adopts participatory counter-mapping as a research method and Open Locast (http://locast.mit.edu/) as its main tool. Students and voluntary local participants in Cairo used a w eb application and a mobile application, both built with Locast, as informational tools, for the production of interactive maps of geo-referenced user-generated content. The resulting map is a constellation of places and practices, where pieces of media (video and pictures) are attached to a geographical map that is open to further expansion and exploration. Content is articulated in five themes and tagged accordingly. Empathic observation, participation and later on navigation across the map, confrontation and discussion, all served as starting points for an informed urban design exercise conducted by the students.

Introduction

The Misura & Scala Lab – Politecnico di Milano – is challenged with the following issues when starting every new research project: the particular time and size of each urban development model, both formal and informal; specific social and economic emergencies; and considerations of positive trends and sustainable conditions in urban development that are already spontaneously achieved or that need to be better highlighted and defined. Moreover, each research project attempts to define the

places where such sustainable development may be based in order to manage the new scale interchange and densification. Our interest is the possibility of an evolution of the local informal model of urban life and its possible growth/transformation. On such premises, the approach experimented by the Misura & Scala Lab moved towards flexible operational and working methods related to the progress of information technologies (Corner, 2006) to adap t design to the multi-scale nature of contemporary urban landscape, and to draw maps as powerful representations of actual and desired patterns of the urban life. The necessary technical

landscape, and to draw maps as powerful representations of actual and desired patterns of the urban life. The necessary technical tools are therefore dedicated to a new mapping project through a hybrid mapping: the use of specific computational tools may build a series of topological models that describe and bring into connection the main formal and informal mechanisms that generate the physical space. By simulating an on-going reality it may be possible to obtain, through a critical reading of the pre-configured scenarios, forecasts and models of sustainable development that are characterized by a close link with the physical and cultural context.

The city, operating through dynamic processes of exchange more than as a static system, can be considered through an ecological approach; under such perspective the urban ecosystem seems to be articulated by fluxes of infrastructures, information technologies, energetic supply chains (such as water, power and fuel), people and goods populating and layering the urban field of action. The processes of spontaneous transformation, whose self-regulating, non-linear behavior – as resilient adaptation to any disturbance – may be observed and acknowledged (Kay, 2008). The resulting overtaking of the concept of hinterland and the progressive merging of natural and cultural environments references recent theories in the field of urban geography, such as those of landscape urbanism (Waldheim, 2006), where a demand for an appropriate description of the interactions transforming the contemporary city is clearly pointed out with reference to a "performative urbanism" (Shane, 2006), whose exchange network systems articulate space beyond boundaries. Space, when intended as praxis, may indeed be physically perceived by means of mobility, including physical movement as well as imaginative, virtual and communicative travel, may be structured by different speed and timing, may be articulated by hierarchies of accumulation and finally may be represented by malleable but recurrent mental maps.
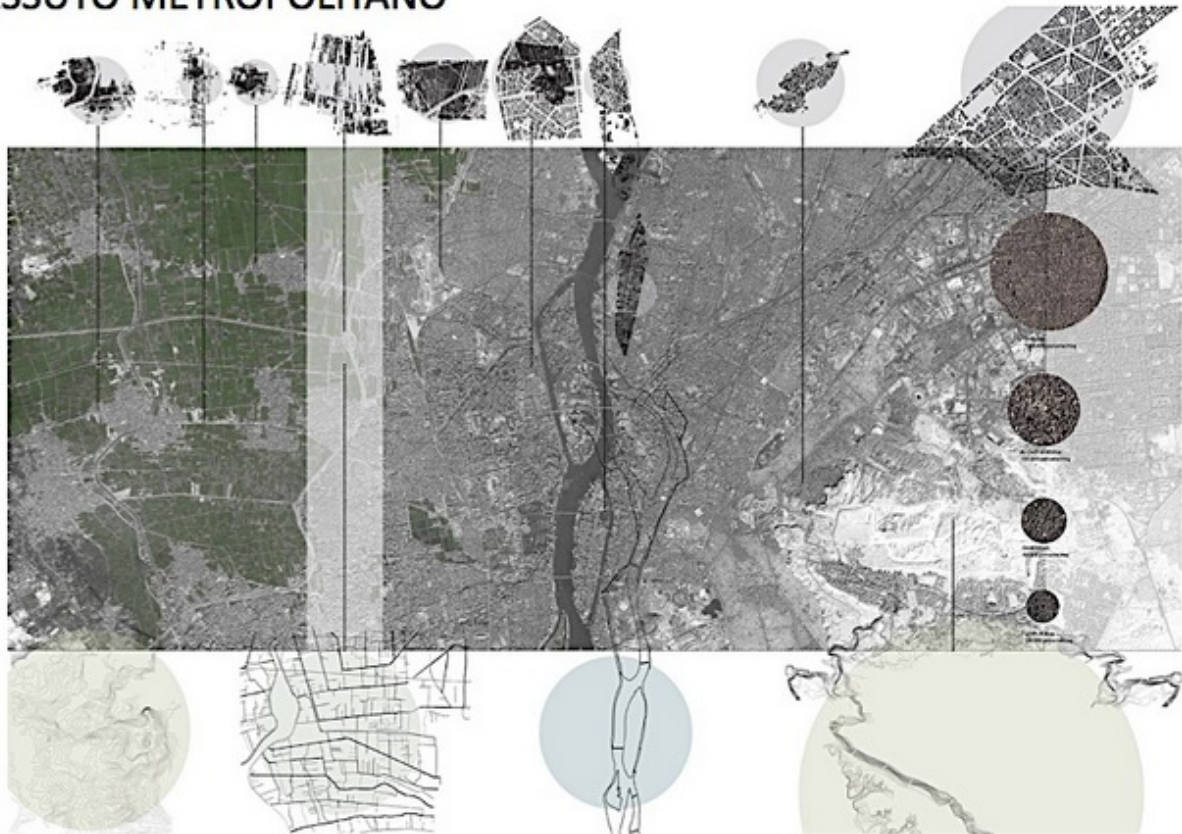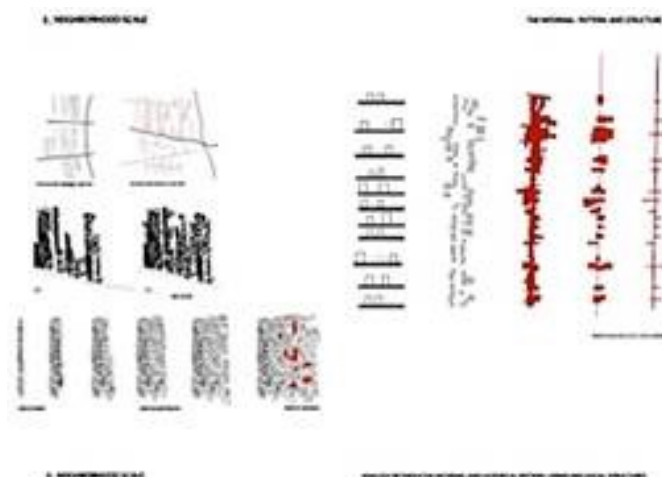

Figure 1. Cairo Ard el-Lewa: Patterns of urbanization

General Framework

Cairo Ard el-Lewa: Challenging Issues

Cairo Refracted is an experiment initiated within the Misura&Scala Lab (DASTU, Politecnico of Milan), coordinated by Antonella Contin, and the Metropolitan Architecture Studio (Ma Arch) co-held by Antonella Contin, Grahame Shane (Professor at Columbia University) and Pedro Ortiz Castaño (Senior urbanist consultant, World Bank, Washington, DC, USA). The research, focusing on a case study as proposed by Omar Nagati and Noheir Elgendy (Cairo University) (Nagati and Elgendy, 2013), is enriched and technically supported by the MIT Mobile Experience Lab, through the application of the open source platform Locast. Strongly

technically supported by the MIT Mobile Experience Lab, through the application of the open source platform Locast. Strongly design-oriented, it investigates the informal urban development of Cairo outskirts within the Ard el-Lewa area, with special focus on the huge ecological implications raised by the accelerated pace of the urban expansion on former long-established agricultural land (El-Batran and A randel, 1998). Of the 17.3 million inhabitants of the Greater Cairo Region, currently increasing at a 2%yearly rate, 63% live in informal settlements (Sims, 2010). Such trend of transformation from agriculture to residential land use started in the 50s and 60s, and has seen extreme acceleration in recent decades, filling at a strong pace the gap between the city and the ancient villages and small towns that once structured larger areas of the rural landscape (Séjourné, 2012). Avoiding any negative meaning of the word "informal" (Sims, 2010) while considering the long-established and extensive dimensions of the unplanned city as well as the high variation in occupations and incomes of its inhabitants, the research investigates recent urban development as highly hybridized and fragmented; mixed patterns of agriculture and residential fabric co-exist as the result of a sp ontaneous and highly unpredictable way to produce the city, operating from the inside fabric. Its structural image is defined by a fine grain, due to tiny different patterns of exchange among elevated numbers of people, goods and infrastructures. The progressive subdivision of the rectilinear agricultural patterns, both from piecemeal sales of private holdings and division from multiple inheritances [1],[2], remain geometrically unaltered even in a state of increased heterogeneity and density: canals for irrigation, rural pathways and property boundaries simply turn into roads and disposition lines for residential lots. The expensive and slow process needed for property registration (UN-HABITAT, 2010) reinforces informal market, which proceeds at a much faster pace than the red tape compliance may enable. Its prosperity is indeed due to its flexibility, easier accessibility, and offer differentiation; in addition, it is supported by an elevated social cohesion whose patterns of stability depend on well-established relations among families and communities. Even the 2010 UN-HABITAT report on African cities warns for a "chaotic proliferation of unplanned subdivisions" deriving from a lack of authority control and c ausing the establishment of two parallel transaction systems[3]. As a consequence the notion of urban boundaries is being questioned by the blurring liminality of peri-urban areas and the traditional separation between rural and urban becomes obsolete: urban territory includes indistinctively compact built areas, productive landscape, old rural towns, and even military colonies in the desert.
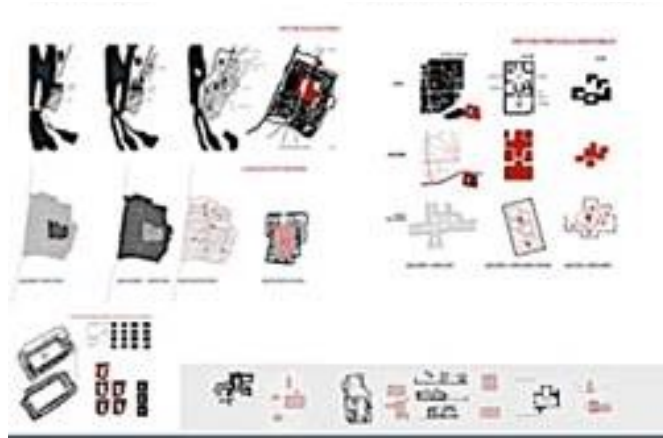
Figure 2. Cairo Ard el-Lewa: Patterns of urbanization at the urban scale

Moreover, themes of resilience, sustainability and scarcity of resources emerge from such complexity as thorny and pressing, since they may be related to the peculiar mechanisms of a delicate urban condition: Subtle but consistent, localized and yet multi-scalar, such dynamics appear as highly reluctant to be detected. One of the most concerning issue is, as mentioned, the shortening of fertile land, which, given the geographical and climatic location of Cairo within the regional scale, is extremely limited. Since the transition from fertile to unfertile land is so abrupt, aridity is a matter of proximity, grazing the urban area by only a fifteen-kilometer gap of remaining agricultural landscape. Egypt is facing the fact that the actual capacity of agricultural land hardly satisfies the demand for food production, which, in consideration of the increasing population, is prominently raising the amount of food imports. A further implication of such an expanding urbanism is related to the unscrupulous exploitation of water: An excessive water drainage may negatively affect Nile's salinity and its biological diversity, modifying chemical balance and biological components, especially in the Delta region and in the Northern Egyptian Lakes. Since water is a natural infrastructure, and its structure is articulated in a system of flows, the perpetration of damages, as well as of benefits, involves an entire watershed region. Informal exploitation for agricultural and above all residential functions is probably underestimated, and the real amount of pumping drains is hardly detectable. Informal energetic plug-ins of the legitimate networks emerge mostly as local brownouts, since too many unplanned connections to the supply system produce unintentional drops: as for power, water is dispatched intermittently. The city is therefore composed by fluxes of infrastructure, information technologies, energetic supply chains such as water, power and f uel, people, goods and waste mobility. Boundaries are dissolving, since the field of urban action is spatially elastic, relatively balanced, multi-scalar and in a state of constant transformation. Mapping such transformation, given the extreme delicate conditions of the socio, political and economic context, is one of the most important goals to achieve. By increasing the knowledge of the small scale and mapping the most intimate urban fabric, investigations conducted through Locast may highlight the resilience of informal day-to-day practice, which spontaneously filled the lack of provided services, in order to include the informal in a more integral system with the traditional city and blend its efficient practices (El-Batran and Arandel, 1998).

With reference to specific request of the local administration, facing both an energetic and cultural impasse in such urban landscape, a more integral, up-to-date comprehension of both agricultural and urban environments is required in order to design effective strategies of development and achieve a multiplier effect on the complementarity of both the formal and informal system. Such perspective is not only a possible aggregative outcome, but also, indeed, achieving synergies and multiplier effects can be the outcome that will benefit the city, the metropolis, the region, or the country (Ortiz, 2011). According to Pedro Ortiz, without denying the final objective of the formal realm, informality can be seen as an intermediary stage that should not be interpreted as the enemy of formality, but as a stepping stone to the more desirable stages of formality. In this respect, informality can, and/or, should be fostered, having the necessary controls i n mind, instead of being denied or persecuted. The objective then is to establish the harnessing processes to avoid the flagrant breach of human rights and social duties informality could hide, and to establish the procedure for an incremental path towards formalization in an undetermined time horizon. The approach is no longer to prosecute and illegitimatize informality. It is a real change of paradigm. New technologies can help us improve it in two ways: as an analysis tool, and as an instrument that allows for the production of a more porous city, improving informal dynamics and new metropolitan relations.

The Hypothesis of a New Centrality

The Ard el-Lewa New Centrality is meant to be a new "center" for the western area of Cairo where the integrated infrastructural scale of the metropolitan net-city will appear. Accordingly, the whole city of Cairo has to be considered as a "brand" and the new

railway station for the national and regional trains will be an emblematic big project as a vehicle for redeveloping the centrality of the west. We studied a way to regulate its growth: the evolution in scale of the informal settlement of Ard el-Lewa. This consists of a design method that allows us to describe and design urban phenomena related to the change of scale, which determines the mutation of types of urban space morphologies and landscapes. It is a paradigmatic reform of the city shape: the new paradigm for growth is not linear but a net. We started studying geographical and historical situations, considering the scales of the metropolis in relation to its potential uses of time. Then we selected various topics:

- The design of integrated functions
- The design of a city fabric at different scales
- The issue of "time thickness" in the urban biography
- The scene of the public realm as a section of landscape

In short words, our research concerns the study of cities, which grow in size with a view to establishing a clear synergy between the parties, considering the moments of crisis and the strengths. So we define potential scenarios, through a Vision – a moral idea for the city. For this reason we consider the importance of the genotypes of the city fabric as a system that determines a state. They are identified through the sampling of agricultural figures within and without the city, through the sampling of the urban landscape, and in the relationship between public spaces.

We consider, first, the invariable backbone of the city: mobility, services, spaces, as a dorsal figure, as a support of the city, on which to verify a problem of scale. Then, we add the theme of the new presence of a culture that interprets the image (Lynch, 1960) as a vehicle for a new urban interior landscape. To do so, we intend to use new technologies. One of the main issues of the project is the continuity of a network of public spaces through different types of green voids, which creates a movement from the inside out and vice versa, determining a network of continuity, facing a public but not social space.

The Ard el-Lewa New Centrality is between the ring road and the railroad, where the city should be thickened (to get density) to express the importance of what is happening there: a new urban articulation. The question of the project is how to get this side of Cairo back into the game involving mainly the informal parties: an integrated junction of the parties by adequately equipping the area. In fact, we think that everything can be put back into the game through a new rule of form. The net allows for the continuity of the network in the territory through a precise engagement for rebalancing while the grid of the water system becomes a new form of writing the territory, as it is rich of programmatic intentions and figuratively undefined. All this determines new nuclei that are oriented in a net and are capable of attracting, while the old poles are changing their use and enhancing their symbolic value. There are points between the different landscapes, which establish a new way for urban dynamics: the metropolitan dynamics that

re-connect the broken sides of the territory through the design of the areas of transition.

We approach the issue of density as a qualitative one. Actually, we speak of epicenters as potential qualities distributed into the city and which constitute the basic structure to which the atmosphere, the landmark and the fabric quality has to be added. The informal is considered as body art in motion: temporal and rhythmic quality of experience that defines the deep sense of belonging to a place of citizenship, which stimulates the creativity of generations at the present time and the memory of the past. This is what quality of life means: cultural identities, social solidarity, which in fact, are factors of productivity and efficiency for a society as a whole. Its exchange value is not an economic value linked to the promise of becoming the city, but a value in use: the familiarity between places and people, able to share aesthetic issues as well as shared symbols. We need, then, to improve a micro-project through new devices (Contin, Bellaviti, & Frigerio, 2013).

Figure 3. Studies for the Ard el-Lewa new centrality

To sum up, our concept for the informal settlement project is the gradient of formality. This means starting from the infrastructural hinge where we have to face the real estate development; we have to go down to the different grain size of the informal settlement, where we improve the water and waste chain system, the energy system and social mobility. Then, we act on the section of the tiny streets. We thought about a flexible infrastructural system that can transport all the energies, defining a sort of "natural interchange" to support the traditional market along the informal street, and delineating small basic urban services as stamina cells within the informal settlement. Such an agile structure is produced by a set of components but as Alexander said: "We create a structure that emerges complete, but lightly, which gradually strengthens, but that remains flexible. And only at the end it becomes quite strong and robust" (Alexander et al., 1977). New technologies are part of this project. We try to consider the public realm within the net, this means that, for example, considering Wi-Fi as a space, the public space has to be re-thought considering new topological relational geometries, new functions, and then is possible to integrate the informal mechanisms into the urban management of culture inside the informal/illegal settlement; following Pedro Ortiz, we named it "the uncontrolled independence of Peter Pan's shadow" and we have to be able to analyze it, and express its potentials to the rest of the city (Ortiz, 2011).

Figure 4. Studies for the Ard el-Lewa new centrality

The complexity of the project will be clear if we consider different issues related to the various points. First of all we have to take into account the resolution of the inner urban structure of the settlement and the need for structuring the urban fabric and provision of utilities and facilities (3). The metropolitan centrality, between the formal and informal settlement (1), has a huge potential of creation of jobs for the inhabitants. The border of the urban fabric (5), between informal and the countryside requires the creation of a desakota metropolitan fabric able to contain the uncontrolled sprawl that eats up the valuable agricultural land and reduces the sustainability of the Cairo structure. And finally, (2 and 4) in relation to the intersections among those structures we have to create hybrid projects of relation between these different urban structures.

Following Ortiz we can say that the local requirements are: social facility locations such as: health, education, parks; productive facilities: industry, offices, commerce; public transport accessibility; urban centralities and links to neighborhood communities. The metropolitan requirements that define the new role of Ard el-Lewa in the metropolitan context, actually, are: a commuter station; the station accessibility; BRT's, bus routes and a metropolitan centrality. Therefore, our project for Ard el-Lewa New Centrality

the station accessibility; BRT's, bus routes and a metropolitan centrality. Therefore, our project for Ard el-Lewa New Centrality defines a NORTH-SOUTH strip (between formal and informal city fabric) where we have a big interchange system: a national, regional and local railway station linked to a BRT system. From this point we build an infra-city fabric interconnection with the metropolitan architecture project able to give new services and new symbolic images to the existing poor city fabric. The character of such strip is quite urban.

Our metropolitan architecture project, also, defines another EAST-WEST strip whose character is quite metropolitan. It unifies the main railway station with a metropolitan point close to the ring road: This one will be a well-connected window for a metropolitan function (university, hospital). This point builds an infra-intra-city fabric interconnection; it is in fact in-between the formal/informal and the informal city fabric and the countryside. Therefore, it needs to work closely not only with the informal, with stamina welfare cells, but also has to define a system able to defend the agricultural field from any other occupation dealing with the ground section.

Locast Use and Implementation

Locast in a Design-Oriented Research at the Metropolitan Scale

Therefore, the main objective of this phase is to create learning, interpretative, interactive and experimental instruments through the identification of an apparatus (Locast Platform) which collects the spatial data related to informal cultural use of the city and – simultaneously – returns the information in crossing scales. Pursuing the metropolitan dimension scale, we also used the Locast platform developed by Prof. Casalegno of the Mobile Experience Lab at MIT, and Paolo Patelli, Arch. PhD. of the Politecnico di Milano. The technical support of the open source platform Locast by MIT represents a useful and appropriate design-oriented tool for the observation and interpretation of Cairo informal processes of urbanization. By increasing the knowledge of the small scale and mapping the most intimate urban fabric, investigations conducted through Locast and in collaboration with several academic research centers (http://mobile.mit.edu/proj/locastu/) may highlight the resilience of informal day-to-day practice, which spontaneously filled the lack of provided services, in order to include the informal in a more integral system with the traditional city and blend its efficient practices. Moreover, such a platform is a powerful tool for engaging the Cairo community with our students' work.

In general, what we want to say is that the sustainability model linked to formal quality "scientific" ratios must be respected of course, but the metropolitan city model that we propose gives us the rules for the possible presence of new metropolitan quantities and qualities for an urban and architectonical non-standard project. We have, in fact, to try to think about a time feasible for a development in the short and long term, and about formal and informal way to use the city, so, for a compatible development between the two times and the two city models, without having to forget one of them, with a strong concern about the physical/cultural informal space that is the only real guarantee for a participate development not imposed to the citizens.

Figure 5. Studies for the Ard el-Lewa new centrality

A project, in fact, must be sustainable regarding the three investments: economic, energetic and cultural. To foster that, the background of this proposal is the growing production and availability of cultural information within new shape of public spaces and devises. Cities are now capable to produce cultural localized informal knowledge and to contribute, through local engagement and by the use of widely diffused technologies, to sensing aspects of the urban environment. Hence, new technologies can be deployed to integrate informal cultural data into the formal spatial dynamics of the city. That fact produces huge audiences for informal cultural productions at local and regional levels. It increases and represents a stronger incentive for investors and operators, potentially supporting the development of the media and cultural sectors.

The project aims at reinforcing the awareness of a shared culture and setting synergies between formal and informal dynamics to foster cultural economies and to produce or implement social capital. This can be envisioned giving structure to the relation among digital media as catalyst tools and urban regeneration as spatial rooting device. The action plan links meanings and places, analysis and projects in order to extract patterns of perception of city spaces. The project will develop a strategy to archive and diffuse cultural data extracted from different cultural sources: formal and informal.

The spaces and places of twenty-first century cities provide contexts for communication serving not only to shelter and protect their inhabitants, but also to ground and sustain meaningful interaction among them, and to construct community. Emerging critical practices have proposed new models to describe the city that stress the collaborative, constructionist dynamics of the mapping processes. Web 2.0 applications, the growth of online mapping tools and the development of networks of "sensors" capable of recording and geo-referencing a variety of signals can turn human beings into potential "sensors" that not only have the intellectual ability to process and interpret what they "feel" but also to geo-localize the information (sometimes involuntarily) and spread it globally through the Internet. The combination of these factors produces and disseminates an immense amount of geographical information which can be: voluntary/conscious and inv oluntary/unconscious. The first type stems from web mapping activities, while digital footprints generate the second type. Web users in cyberspace, in fact, leave these traces, without being aware they are producing geographic information. Traditionally, experts and institutions have produced geographic information: So certain formal types of information have been preferred and other informal types ignored or marginalized. VGI (Volunteer Geographic Information) represents a powerful shift in sources, content, characteristics, and modes of data production, mining, sharing, dissemination and use.

The data display and diffusion will be provided through the Locast engine, which is a helpful way to understand how the informal cultural data are perceived within a city and how they can be managed. In order to increase employability of beneficiaries, the project platform will work as a catalyst in setting synergies between formal and informal cultural economies. Under a city management setting the general framework, through the time local stakeholders and cultural associations will operate as curators able to coordinate activities at the local and inter-regional scale of the network and to work on the formal-informal interactions. The awareness of the presence of renovated cultural opportunities related to the hidden meanings in the chosen area will reinforce the need of new professional figures as cultural private and public administrators, curators, and producers.

In general, informal hidden meanings and occasions of performances in the city context do not produce durable skills for cultural operators. The relations between cultural operators, decision makers and citizens have to be enhanced in a more structured way. Only acting constantly, cultural operators will better influence their political, administrative and economic environment.

The possibility of finding meaningful ways to inquire citizens' patterns of use, cultural spatial experiences and related perceptions of the urban environment, brings, in fact, many important promises to the fields of urban design and planning. Starting from the city analysis and passing through interpretation instruments, the project focuses consequently on the contextualization of informal cultural data. Through an urban design and network analyses, in fact, the project identifies a cultural behavioral and semantic

background for the chosen area, related to the informal values of a place, making it possible to extract and depict specific patterns of subjective perception and use. In this way the proposed Locast platform's use would also help the whole range of stakeholders involved in decision-making processes related to planning activities, urban design and urban policies, in order to improve the responsiveness of urban systems to the cultural requests of citizen s and customers.

The Locast platform should give hints to public administrations and practitioners willing to adopt a human-centered design approach toward cities' transformations and would empower citizens to take local action related to the improvement of the informal spatial and cultural data as well. With the project's focus on the operational level of the city, on its everyday informal aspects rather than on formal activity patterns, the aim is to constantly extract indications on city cultural uses related to the deep identity of places.

In particular the Locast platform will allow end-users to analyze users' perceptions related to specific geographic areas, detect the lack of structures related to the culture offered by institutions and city administrations, discover possible emergent structures and bottom-up initiatives responding to uncovered needs and desire, discover meaningful relationships and connections between

places, people and informal cultural uses. The platform would be useful in measuring the performability of public spaces in term of cultural informal uses and in understanding where, when and how to act more efficiently, which would result in an improved responsiveness of urban spaces to the cultural requests of citizens and customers.

In this perspective the Locast platform will foster economies of scale for the informal sector that could determine a spatial rooting of the platform in specific urban spaces suitable to host permanent or temporary, profitable or non-profit activities linked with the themes of our project. According to this dynamic media initiatives can become engine of spatial regeneration. Urban or built context in need of regeneration could take advantage from the settlement of stakeholders from the cultural informal sectors. The economical balance is reached through an equilibrated management of profit and no-profit initiatives mixing stakeholders at various scales, sponsors, investors and NGOs. An informal cultural sustainability framework can make the informal cultural industry sustain the local emerging realities and promoting education. The gathering of actors around specific spatial nodes will transform them into Ard el-Lewa antennas amplifying and transmitting the meanings of p laces to the region and the world promoting cultural and economical exchange among scales and part of the Cairo city.

From this perspective we consider informal cultural values "a process for future city life." They are part of Common Good: an environmental issue that transcends the immediate interest. Finally, this project aims to define new visual paradigms able to determine infective effects on the informal settlement, through the new map image conveyed with this new device. It is a way of defining the art of blending: to change, to attend, to transform the existing city through recoding languages and to define cities such as experiential territory. The metropolis, then, becomes a set of interchangeable possibilities.

Mapping on the Move, from Within

As mentioned, the processes of peri-urbanization that are currently shaping Cairo are resulting in dispersive urban growth that creates hybrid landscapes of fragmented urban and rural characteristics. In this context, our focus is on the spatial and temporal mechanisms of a poly-rhythmic urban metabolism and on the transformative interactions between people and their environment. Within these peri-urban encroachments, urban patches whose identities are not only ambiguous, but often hesitant between different ideas of informality, Cairo Refracted adopts counter-mapping as an experimental tool for identity-building, moving beyond a solely observational scope. Cairo Refracted aims to highlight patterns within shared and intentional representations of everyday im(mobilities) and dynamics of place-making, by enabling subjects and local communities to share individual and collective representations of their environment online through pieces of user-generated media on a map. As activities are documented through the dedicated web and mobile applications, shared and collective urban narratives might emerge from subjective constellations of spatial practices and memories.

We adopt public participatory mapping (a form of counter-mapping), or to map beside dominant power structures, and try to depict the lively details of urban areas that are often represented through homogeneous grey hatches. We see in community mapping the possibility of finding a shared expression of values, and of beginning to assert participatory ideas, for taking care of the places and their situated relationships. Through the mapping process, we hope to discover and document routes, practices, memories, losses and transformations: the mobility of people, things, information and ideas. Informal space turns into place as it is represented through praxis, people's everyday spatial motifs (De Certeau, 1984). Any space that might be revealed and observed rearticulates the relation between subjects, communities and the city. Such process presupposes networking as a mode of inquiry: We aim to create a network of correspondents, where citizen s, students, researchers and even institutions can contribute to

We aim to create a network of correspondents, where citizen s, students, researchers and even institutions can contribute to overcome a tendency to overlook the knowledge of women, minorities, and other vulnerable, disenfranchised groups – what Foucault labeled "subjugated knowledge" (Foucault, 1975) – turning visibility from a surveillance strategy to an empowering condition for such subsets of society. The project defines new landscapes of observations, to investigate possibilities and reciprocal adaptations between everyday life and urban design, socio-political landscapes and media-spaces. It wishes to do so while on the move, from within, with a human-centered perspective (Patelli, 2013).

In a preliminary stage, we considered several available tools, which currently offer the possibility of mapping the territory collaboratively, through texts and pictures. Twitter and Instagram are both social networking services allowing everyone to share geo-localized user-generated content. They are both popular in Cairo, although less so in its peripheral sectors. Their downside, though, is that they are services provided by private companies who, besides storing personal data about their users, finally hold the rights to any shared content. We finally did not invite participants to adopt such services, but only collected and analyzed content that was already shared across the social web. We opted instead to use the Open Locast platform. Open Locast offered us the opportunity for a leap forward, as the voluntary participants were finally able to share content over which they maintained complete control. Hence, Open Locast, as it was released by the MIT Mobile Experience Lab, appeared to be a useful and overall appropriate design-oriented tool for fostering engagement and participation, enabling immersed observation and interpretation of place-making. The use of mobile devices and of dedicated applications made possible a new kind of mapping, one that highlights peculiar features and strengths of the urban fabrics at the smallest scale, where everyday tactics fill the lack of planned services, integrating spontaneous, informal practices with the existing city (El-Batran and Arandel, 1998).

The experience of the research took place during two different residencies in Cairo, the first in November 2012 and the second in April 2014. Our first on-site surveys highlighted that the population in Ard el-Lewa is seeking for institutional acknowledgement. This part of the city suffers from lack of accessibility to primary services and infrastructures. Therefore, the population wants to make its presence vivid and make the city and its administrators witness its existence at a personal and legal level. During our first visit, ten students from the Politecnico di Milano and ten students from Cairo University worked together with a teaching staff composed of professors and assistants from both universities. All the participant students were from similar background studies, enrolled either in architecture or urban planning programs. All of them were already involved within the relative programs in the study and development of design proposals for an empty strip of land be tween Dokki and Ard el-Lewa, between the planned city and its informal encroachments. The area of study is the only available lot between the two sectors and it is situated between a triangularly shaped railway junction and a railway siding. During a ten-day workshop, the students were asked to work in groups of two people, and each visiting student was coupled with one resident student, so that they could collaborate and share the same experience. Each group, then, was asked to develop their own mapping project, starting from one of the themes the teaching staff proposed them. The five themes were: "Rural / Urban Lifestyles;" "Human / Animal Cohabitation;" "Work / Residential Space;" "Infrastructure Mapping;" and "Resource Mapping." Each group, then, was introduced to local representatives in Ard el-Lewa. Through the mediation of the representatives, the students could get in contact and engage a number of residen ts. The voluntary participants were of a satisfying social and demographic diversity, in terms of age, gender and status.

The methods the students adopted to explore the chosen themes within the streets of Ard el-Lewa with the local participants were two: semi-structured interviews, and participatory video-production. Both were applied while walking in group composed of one student from the Politecnico di Milano, one student from Cairo University and one voluntary participant. The participant would choose between three and five places from his "mental map" of the neighborhood and would lead the two students from one place to the next. Hence, the path for each walk was determined by the peculiar geography of everyday activities of the individual participant. The questions aimed at unveiling and documenting the everyday spatial practices of women and men living in the Ard el-Lewa area and often also led to hand drawing simple maps. At the same time, the participants were invited by the student to discuss issues related to their theme of choice ("Rural / Urban Lifestyles," "Human / Animal Cohabitation," "Work / Residential Space," "Infrastructure Mapping," or "Resource Mapping"). During the walks, the Locast mobile application was used to take pictures of the local environment. Each picture is geo-localized and tagged with the anonymized ID of the participant and the theme it relates to. After two days of mapping into the fields, the students convened at Cairo University to share their experiences and data.

Each interview was already spatialized. Everyday spatial motifs were scattered on the map of the city, and every spot on the map was documented with a short video, catching a brief extract of its atmosphere. The results of the mapping activity are a rich representation of inter-subjective everyday life patterns, unfolding across the narrow streets of a very dense neighborhood.

The produced data could be read through different lenses and categories. Such structure was meant to allow an ontological

The produced data could be read through different lenses and categories. Such structure was meant to allow an ontological exploration of the ecological functioning of the city, as subjects and communities operate it. As a second step, the students formed new groups around the themes they had mapped on the field ("Rural / Urban Lifestyles," "Human / Animal Cohabitation," "Work / Residential Space," "Infrastructure Mapping," and "Resource Mapping"). From analyses and discussions around the themes, triggered and informed by participation and empathic observation, the students developed ideas and design proposals, aimed to upgrade existing – often deteriorated – physical structures, integrating small-scale changes within the Ard el-Lewa informal fabric, fostering the capacity of this district to adapt. The street is often the scenery of the students' proposals, which merge existing structures, self-bu ilt spaces, with ideas for pilot projects. Here they place experiments and prototypes of urban recovery and implementation.

During our second visit, in April 2014, the same methodology was tested at a smaller scale. Two researchers, hosted by an art space in Ard el-Lewa, organized two workshops and engaged voluntary local participants around the single topic of "inverse infrastructure" (Egyedi, Mehos, & Vree, 2009).

Local participants mapped actual infrastructural systems in Ard el-Lewa, with video, in order to use their features as starting points for "infrastructure fictions" (Dunne and Raby, 2013). Videos were shot in the streets, whenever infrastructure-related activities were encountered: a wagon pulled by donkeys transporting gas cylinders, waste pickers collecting garbage, or residents burning trash. Facts were than mixed with fictional narratives and presented at the art space.

Open Locast was used among other tools, specifically to collect and geo-localize videos and pictures, without the need to connect to WiFi or 3G networks.

Research Openings

For future workshops, intensive, extensive and comparative use of resources may be ideally mapped through Locast and included into the map. For example, the same research team would be interested in gathering and interpreting information of, among others, water drainage points, food distribution and systems of conservation, refrigeration, cooking, animal breeding within residential spaces, waste collection, and cultural patterns.

Every time, as a result, attention is driven to a number of selected urban spaces, which are recurrently mentioned in the mapping process. In future workshops these spaces would be object of a second selective survey. With the help of local associations and academic partners, photo, video and textual descriptions would be uploaded on the Locast platform for a much longer period of time, possibly months. The interviews and the resulting map would be intended as triggers for a further stage of the project, a community mapping process that doesn't rely on the intervention of external agents, but is self-sustained and self-directed. This last step is extremely meaningful, as it shows how we are not ultimately aiming to map the "territory" of a community based on the cumulative observations of others, but instead, mapping the inhabitants' own recollections of their own activities. In fact, we hope to generate both centripetal and centrifugal processes. Th e community would open up environmental and political aspects for debate, rising awareness and solidifying identity within Ard-el-Lewa. At the same time, the area itself would become better known and possibly attractive for the rest of Cairo citizens. Informal space turns into place, as soon as it is represented through people's everyday motifs.

This project deals with topics that are potentially sensitive: They might sometimes be private, stressful, sacred; it deals with fear of stigmatization of informal areas. In response to this we protected individuals and groups who form the sample, following guidelines developed at the beginning of the process, to identify and nullify risk.

Students and researchers were also affected by some inherent risks and issues, mostly due to the current Egyptian political situation (as of late 2012), which unfortunately decelerated the implementation of the project.

Some reluctance to share information by research subjects, due to possible legal implications of exposing informal activities, may constitute a risk for research development.

Uneven access to digital tools might also be an issue for the further implementation of the project, as digital divide is still affecting the level of digital literacy of a large sector of the population. Our collaboration with the many and very popular internet cafes within the informal area of Ard el-Lewa, though, is an attempt to make access to such tools more horizontal and communitarian.

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Cairo Refracted is an experimental project conducted in Ard el-Lewa (Giza, Egypt) by Paolo Patelli. It was initiated within the Misura & Scala Lab, a research group at the Department of Architecture and Urban Studies of the Politecnico di Milano coordinated by Antonella Contin. Students from the Metropolitan Architecture Studio (MSc Architecture) taught by A. Contin, G. Shane and P. Ortiz during the Fall semester of 2012 took part in the project. Cairo Refracted also builds on research premises about ecological urbanism and informal urban dynamics currently being applied by Antonia Chiesa to the Cairo metropolitan context at the Harvard Graduate School of Design. Such studies lend analytical and theoretical grounding within the tradition of urban studies to an overtly empirical experiment. The project was made possible by the collaboration with Cairo University, who facilitated our first approach with the community in Ard el-Lewa, and the technical support of the MIT Mo bile Experience Lab, who developed and released the technology behind the Locast platform as open source software. The design studio Parcodiyellowstone (http://yellowston.es/) contributed to the implementation of the web application. Voluntary participants, local representatives, activists and artists at the Artellewa art space (http://artellewa.com/) contributed enormously in the adaptation of schematic forms of interactions to a peculiarly local context.

End Notes

[1] As Sims states, the average size of a muklafa (agricultural land holding) was only over one-third of a hectare. (Sims, 2010, p. 29)

[2] Legacy of Ottoman and colonialism form of tenure combines in fact a complex system of primary and derivative rights, where ownership of shares of a land parcel can be held by different individuals, and, since 1897 Ottoman statute, mostly private.

[3] "Where agricultural land has been converted to urban uses without any authorization, land property rights have been transferred through private notarial acts without the title registration procedures. This has established two de facto, parallel property transaction systems." (UN-HABITAT, 2010)

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