PROJECT TUNIS:

FARM.ing ENERGY

IN THE MEDITERRANEAN

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- large scale solar concentrating power plant -

'Social ecosophy will consist in developing specific practices that will modify and reinvent the ways in which we live as couples or in the family, in an urban context or at work, etc [...] Instead of clinging to general recommendations we would be implementing effective practices of experimentation, as much on a micro social level as on a larger institutional scale.[1]*'*

1. THE RESEARCH AGENDA:

1.1 THE CITY AS AN AGRI-URBAN TERRAIN.

After architecture ... a new Nature? As the complexity of contemporary urbanism seems to escape control or planning in the sense promoted by modernity the possibility for a common ground has disintegrated in a multiplicity of possible scenarios. The last two decades have also brought about a revision of the notion of nature, which is gradually losing its meaning as an untamed biosphere to which we must return to or else to preserve in a primordial state. Instead it is expanding to encompass a variety of manmade complex systems like cities themselves; the dissolution of this fundamental dichotomy of architecture vs. nature opens new possibilities in the conception of the city from a non-anthropocentric perspective, that is to say the conception of urban design as an act of breeding relationships between industrial, agricultural, biological and social systems. Translated in urban terms this can be seen as the disintegration of the relevance of the city wall as critical moment of demarcation between the city and the productive landscape of agriculture.

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[1] *Guattari, Felix – the three ecologies*

We propose to investigate this blurred zone of the contemporary city as a fertile terrain for breeding new practices of eco-social experimentation, as much on a micro social level [family run re-cycling workshop or single migrant worker’s market garden] as on a larger institutional scale [introduction of self-organized energy grids, urban recycling networks].

The idea of agri-urbanity establishes a link between the instant/immaterial qualities of contemporary cities and the slow/material qualities that are the inextricable sign of the rural condition and its cycles of growth; this relationship has the potential to generate new patterns of production-consumption to foster a potentially more dynamic and non-linear ecologic-city.

At the core of this relationship we propose a new conceptual persona, a political subject devoted to the creation of new urban economies related to an independent and robust supply chain for food, energy and transformation of waste. This persona is prefigured in the migrant worker, the refugee, the suspect, the political activist, the nomad.

Engaging this political subject may entail a new agency for architecture to be discovered in the friction between the desire of these emergent social groups to participate in the urban society and the inability of planning visions to recognize their existence and define framework which could channel their potentials.

Despite appearances and claims to the contrary, the unconscious drive of capitalism is to produce waste, both material and human. Abandoned from the body politic, devoid of speech or political representation, this surplus to society nonetheless

represents a nascent even thou unarticulated political force.

1.2 CODING AGRI-URBANITY.

Can architects deploy their unique set of skills to draw terrains of dispute and negotiation between the opportunities found in the landscape [such as for instance fertile soils or heritage agricultural typologies], the infrastructures [such as water or energy grids], the technologies of contemporary eco-urbanism [such as smart cities networks] and the ambition of this emerging political force to become part of the contemporary city and society?

We propose to adopt algorithmic design methods to explore a strategic and a tactical form of intervention; in other words we believe that coding [intended here as planning through algorithmic rules] will enable architects and planners to test strategic design intentions across a fluid eco-social terrain, generating a multiplicity of responses and effects; within this design framework the designer’s role is forced to oscillate between articulating tectonic solutions, coding urban protocols, breeding material effects, enabling future tendencies and framing their unfolding in space and time.

Contemporary architects have lost their agency towards key societal issues such as the resolution of the global ecological crisis [food shortage, social inequality, global warming] as well as towards key stakeholders [political leaders, migrant workers, etc]: we believe that relevance can be gained by refusing to hide into the production of fictional or merely conceptual

scenarios, and by engaging with the organisation of matter [the design of new agri-urban prototypes], energy [the simulation of their operational flows] and information [the sensing of stimuli and the actuation of responses] across scales and regimes.

Such framework expose the hypocrisy of the current ecologic design ideology, focused on the construction of reductionist spatial and temporal urban frames, Masdar Eco-City for instance, where a mythical perfect balance of forces is attempted without the ability to engage with the socio-political dynamism of the context. It will be at the core of our agenda to promote a new conception of the city as an agri-urban terrain which incorporates the conflictual dimensions of contemporary peri-urbanities.

As we can only conceive what we can represent or draw, we seek to reinforce the relevance of drawing and model making as critical activities for architecture; to this end, this studio will focus on representing vital flows of:
_matter: such as people’s migrations, land erosion, urban densifications;
_information: such as social interconnectivity, network coverage, urban proximities;
_energy: such as solar radiation, geothermal flows, tidal dynamics;
that too often eludes architectural representation.

The interaction among living systems can only be fully conceived and expressed in real-time, for this reason we aim at designing urban platforms that encourage the emergence of real-time participatory practices; participation here refers to the ambition of envisioning a form of urbanism engrained in the formalization of the opportunities latent within the growing migrant urban communities.

2. BRIEF:THE GEO-POLITICS OF ENERGY: THE CASE OF THE MEDITERRANEAN SOLAR PLAN (MSP).

The Paragraphs 2.1 - 2.2 - 2.3 which follow are a detailed report of the Mediterranean Solar Plan and provide a geo-political context of reference in relationship to the production of renewable energies in the Mediterranean.

The Unit will treat this scenario as the main strategic drive for the development of the above presented agri-urban landscapes.

Students are asked to refer to paragraph 2.4 for more specific data related to the development of agri-urban prototypes for renewable energy in Tunisia and to look at the links provided to start a more in depth research.

The Design challenge in the breeding of the new agri-urban landscape will be to construct grounds of negotiation between these top down strategic intention and the tactics of the emergent political subject mentioned in the paragraph 2.5.

2.1 THE UNION FOR THE MEDITERRENEAN (UFM)

Energy is today at the centre of the global political debate; in Europe as politicians are looking for solutions to introduce renewable alternatives to their countries' dependency on fossil fuels and to the unpopular adoption of nuclear, they are starting to look at the Mediterranean as the stage for a large scale project to harvest solar energy to be then

distributed across the continent; last September news reported that Members of the Union for the Mediterranean (UfM) Energy division have held meetings on the *Mediterranean Solar Plan* with senior Tunisians officials in the energy sector, including Minister of Industry, Mohamed Lamine Chakhari, on the sidelines of a conference held by the Desertec University Network in Tunis from 3 to 5 September 2012.

The conference focused on the establishment of a Desertec Institute for Studies on Socio-Economic Development and Employment in the MENA region (Middle-East and North-Africa region), which could be a valuable partner for the UfM (Union for the Mediterrenean) in the next future.

The Mediterranean Solar Plan (MSP) is a major Euro-Mediterranean Energy partnership for the large scale development of Renewable Energy and Energy Efficiency. Its main objectives, declared in July 2008 with “The Paris declaration” then adopted by all the 43 member states, include:

_attaining by 2020 20 GW of new generation capacities fuelled by renewable energy sources, mainly wind and solar, on the South shore of the Mediterranean which would supply power to millions households.

_supplying the local market with most of the electricity produced while exporting a part to the European Union; revenues generated by exports to the EU will ease the development of profitable and sustainable projects locally.

_improving the energy efficiency of the Mediterranean region and creating jobs and industrial capacities in the Southern Mediterranean countries, such as Tunisia.

2.2 THE SUPER SMART GRID

Accordingly to the official website the main concern of the Mediterranean Solar Plan is how to create large-scale, private sector-driven and ultimately self-sustained markets for Renewable Energy and Energy Efficiency technologies in the Mediterranean that will lead to the emergence and then consolidation of secure, affordable, and clean energy systems in the wider UfM area.

It is claimed that to achieve such result it will be necessary to go beyond the level of projects and think in terms of markets and systems; in fact for just a handful of projects, private companies will simply not be ready to make the necessary large-scale investments on the ground – into power plants, manufacturing firms, and R&D/training facilities – that are needed to fulfill the aspirations of the Southern Mediterranean Countries. Such development aspirations are listed as follows:

- to make use of the excellent natural conditions prevailing in the Mediterranean and turn renewable into a new column of their energy systems,

- to create a sufficiently expansive pipeline of new energy projects (sufficient to respond to the quickly growing domestic demand for energy services),

- to bring the associated costs down (to levels acceptable for citizens),

- to build up local value chains around these new technologies, able to create the needed jobs for their young populations.

It is also claimed that these goals could only be reached by creating dynamic, regionally integrated and private sector driven markets for REEE

products, with a large involvement of the concerned stakeholders and in particular of the Member States. They call this the “co-ownership dimension” of the Mediterranean Solar Plan.

A first step of development since 2008 has been the production of a hi-level masterplan including the definition of the 5 critical building blocks of the MSP; among them it is interesting to highlight the necessity to create a transcontinental grid named “SuperSmartGrid” connecting the two rims of the Mediterranean, reinforcing the network of the Southern countries and granting easier access to the European market.

2.3 THE DESERTEC FOUNDATION

Another key point is to organize a structured pipeline of pilot projects, including the creation of test beds for a mix of large scale solar energy farms and smaller scale projects, such as biomass or algae farming stations. The implementation of the masterplan and of the key building blocks is to be driven by private sector initiatives, the most noticeable of them being the DESERTEC foundation.

The DESERTEC foundation is defined as a global civil society initiative, established on 20 January 2009 as a non-profit foundation that grew out of a network of scientists, politicians and economists from around the Mediterranean, who together developed the DESERTEC Concept.

Key stakeholder in the foundation is the German Association of the Club of Rome, while the research institutes for renewable sources of the governments of Morocco (CDER), Algeria (NEAL), Libya (CSES), Egypt (NREA), Jordan (NERC) and Yemen (Universities of Sana'a and Aden) as well as the German Aerospace Center (DLR) made significant contributions towards

the development of the DESERTEC Concept.

The DESERTEC concept refers to the development of new energy networks composed of large, medium and small scale solar power stations connected by High-Voltage Direct Current transmission lines.

DESERTEC demonstrates a way to generate sustainable power from the sites where renewable sources of energy are at their most abundant. The idea is that all kinds of renewable will be used in the DESERTEC Concept, but the sun-rich deserts of the world play a special role: the foundation claim that “within six hours, deserts receive more energy from the sun than humankind consumes within a year”.

Thanks to heat storage tanks, concentrating solar-thermal power plants in deserts, it could be possible to supply electricity on demand day and night. This makes solar-thermal power plants in deserts an ideal complement to fluctuating energy sources such as wind and photovoltaic power and allows a higher percentage of these variable energy sources to be used in the future electricity mix.

Two key initiatives of DESERTEC have been the setting up in 2010 of a University research network, which includes 4 Tunisian institutions: the Centre de Recherches et des Technologies de l’Energie in Borj-Cedria, the Ecole Nationale d’Ingénieurs de Tunis Université Tunis-El-Manar, the Ecole Nationale d’Ingénieurs de Monastir Université de Monastir, and the Université de Gafsa and the foundation of the industrial initiative Dii GmbH together with partners from the industrial and finance sectors. The Dii initiative has the task to accelerate the implementation of the DESERTEC Concept in the focus region EU-MENA; in April 2011, Dii opened an office in Tunis in order to be in the position to efficiently co-ordinate its activities in North Africa.

2.4 TUNUR: A 10X10 KM PILOT PROJECT IN THE TUNISIAN DESERT.

In Tunisia, STEG Énergies Renevelables, a subsidiary of the Tunisian state utility company STEG, and Dii are currently working on a pre-feasibility study within the framework of a co-operation agreement signed by Dii and Tunisian authorities in 2011. In January 2012, several sites for the development of large-scale renewable energy projects were identified and the TuNur project initiated.

The TuNur project consists of three components:
_a 2000 MW solar power plant producing clean energy in the Tunisian desert.
_submarine cable transporting clean energy across to Italy and to the whole of Europe
_sale of electricity to customers in Europe.

What the detailed TuNur project brief traces is a vision for a power plant so vast that its effects could be felt at the scale of the whole country, creating jobs and stimulating research and the emergence of a local clean tech economy.

Summarized the key points are:

Energy Production:
-Deliver 2000 MW of renewable solar energy

Landscape and environment:
-Analyse impact and contributing to the fight against desertification.
-Analyse water availability and focus on dry cooling technologies to minimize water usage.

-Analyse CSP solar radiation potential in Tunisia which on average has up to 20% better radiation than Europe.
-Analyse potential for large-scale projects on unused land in the desert: land requirement to available surface area ratio.
-Land does not need to be flat, can have undulation: analyse and incorporate local topography.

Prototype and technology:
-The TuNur project would use approximately 100km2 of land, which represents the 0.001% of Tunisia’s surface area.
-Plants built in modular formation of approximately 825,000 heliostats and flat plate mirrors, to achieve 2000MW scale in incremental steps, opening up the opportunity for multiple projects within the large system.
-Deploy CSP Towers, which are much more efficient than other solar technologies and other renewable, working at higher temperatures and requiring lower upfront investment.
-Energy grid design reduces transmission losses of ca. 3%/1000km with HVDC cable technology.

Socio- ecomonic:
-Combine location and the Saharan solar resource with large-scale use of solar tower technology to allow electricity production costs at extremely competitive costs.
-60% of the capital expenditure done locally to produce simple mirrors and similar equipment, so that for the 2GW project up to 60% of the total value-add will be generated locally
-specialist work using local partners and management for project development as well as local engineering firms for geo technical and socio impact assessments and feasibility assessment of site.

-create new manufacturing industries like for example the one to produce heliostat which are needed for the 2GW project and can be manufactured locally
-create jobs during construction and operation: in 6 years of construction up to 1500 direct jobs will have to be created, with a further 20,000 jobs created indirectly across the whole supply chain and during operation
-create future revenues for local governments.

Educational:
-create opportunity for R&D: new technology sector offers multiple routes for new research and development and establishing a new industrial base in Tunisia
-promote the emergence of a University Research Network with multiple bases in Tunisia.

Links:
Union for the Mediterranean Secretariat for energy:
http://www.ufmsecretariat.org/en/energy/
The Mediterranean Solar Plan:
http://www.ufmsecretariat.org/en/a-few-key-points-about-the-msp/
The Super Smart Grid:
http://www.supersmartgrid.net/about/
The DESERTEC foundation:
http://www.desertec.org/
The DII industrial initiative Desert power project:
http://www.dii-eumena.com/desert-power-2050.html
The STEG renewable energies in Tunis:
http://www.steg.com.tn/fr/index1.html
The TUNUR project:
http://www.tunur.tn/

2.5 TUNISIA AS THE TRIGGER OF THE ARAB SPRING

Tunisia in one of the most vital and dynamic country in North Africa when it comes to socio-political participation: on the 17th December 2010 an apparently common incident between a police woman and a local street vendor, Mohamed Bouazizi, resulted in the latter's self immolation as a sign of deep frustration and resentment for his impoverished condition and the arrogance of the regime towards it.

This episode was sufficient to trigger a major popular revolt in the central city of Sidi Bouzid; despite the best effort of the international press not to cover the event, as Ben Ali's regime has been supported by both America and Europe, the news did spread mainly as a result of Al Jazeera coverage of the demonstrations that followed.

The rest is history, with the revolutionary wave spreading throughout the Arab world causing the overthrowing of regimes in countries such a Libya, Egypt and Yemen.

In Tunisia, since the former dictator Ben Ali left the economic condition seems to be further deteriorating, creating a lot of discontent among the poorest social groups, particularly in the southern cities and most underdeveloped regions of the country.

The new government has struggled to tackle the key issues of corrupt bureaucracy, poverty and unemployment; such condition has been stimulus for the emergence of phenomena of self-organization among the poorest group as well as the new educated youth, in the attempt to coalesce as visible political subjects, thus making their voice heard while at the same time attempting to attract the

minimum of investments in the regions typically at the margins of development, such as the outskirts of the larger cities like Tunis and in the traditional internal towns such as Sidi Bouzid.

Lately Salafi extremists groups have gained some level of local control and authority; however the fluidity of this social terrain can be read also as an opportunity for the emergence of other political subjects, perhaps stimulated by the introduction of new socio-economic stimuli such as the ones promoted by the Mediterranean Solar Plan and embodied in our notion of Argi-Urban Landscape for the farming of energy.

3. FARM.ing ENERGY DESIGN SCENARIOS

The geo-political scenario of energy development and the pilot project brief outline presented before will serve as a basis for the studio to re-contextualize the discourse on the contemporary urban sprawl in Tunis and the surrounding region, in opportunistic terms, i.e. in terms of a new artificial landscape of energy generation, waste recycling and food production.

The studio will focus on the conception of urban prototypes offering living and development frameworks designed to support the urban integration of rural migrants. Such prototypes will operate as agents for the development of agri-urban terrains, an urbanity defined by novel practices of farming of energy, contributing to the self-sufficiency of the growing city.

This brief could be seen as a technologically mediated version of heritage models of colonization

of the desert and the Mediterranean coast, where cities or villages would emerge as a consequence of the clever exploitation of local resources thus establishing symbiotic relationship with the landscape and its cultivation/transformation similarly to what happen for instance for the great Moorish tradition of irrigation exported to the invaded southern Europe.

However this practice of hybridization today can acquire a much more radical significance when related to the geo-political scenarios behind large scale developments for the provision of energy and the related global flow of migrant workers and of refugees populating the outskirts of contemporary Tunisian Mediterranean cities or the larger Saharan villages.

Engaging the notion of the “SuperSmartGrid” we will investigate alternative methods to harvest the solar energy, like for instance via networks of medium and small scale algae farming units.

By operating across urban scales and territorial regimes, from the molecular to the regional, the Unit will explore how energy farms can be reformulated as part of new agri-urban landscapes and therefore generate an update of the typical mechanisms of industrial production thanks to the opportunities found at the intersection between the territory, its heritage and the new digital infrastructures.

Like other North African cities as well as the Spanish or Portuguese cities shaped by the Moorish tradition of landscape engineering, Tunisian cities are marked by the patchwork of crops, allotments and orchards that surrounds them. As the urban sprawl erodes such heritage infrastructure, what is emerging is a terrain vague of mixed agri-urban program; rather than counteracting this tendency

our ambition this year will be to actually reinforce this hybridization recognizing its conflictual origins and exploring the resolution of such tensions into novel forms.

Within this context we will ask ourselves the question: can urban self-sufficiency become a mechanism of social inclusion? Can a large-scale strategic plan like the Mediterranean Solar Plan and its first embodiment, the TuNur pilot scheme, engage their latent urban dimension, rather than simply seek refuge in the emptiness of the desert while ignoring the reality of the suburban post-rural communities?

3.1 ADVANCED DETERMINISM AS URBAN DESIGN METHOD

In our brief the notion of Energy Farm.ing Landscape aims to embody an alternative model to represent the city and to prefigure its future development, one that refers to its past and the present configuration,

'[...] as pregnant not only with possibilities which become real, but with virtualities which become actual. Unlike the former, which defines a process in which one urban structure out of a set of predefined plans acquires reality, the latter defines a process in which an open urban problem is solved in a variety of different ways, with actual forms emerging in the process of reaching a solution.[2]'

[2] *Gilles Deleuze, "Bergsonism," Zone Books, New York 1988, p. 97.*

The conceptual difference leads to a vision of the future that could be defined of advanced determinism, based on the non-linear and circular causality of the feedback loop, where the effects of an action reacts back onto their causes.

Within this paradigm the resolution of the conflictual dimensions associated with a plan like the Mediterranean Solar Plan and the TuNur pilot project become drivers of urban morphogenesis, with the technological apparatus of the plan constituting a design medium, a terrain of negotiation for the synthesis of new urban forms and related socio-political subjects.

3.2 A NEW AGENCY FOR ARCHITECTURE

The refinement of such method of urban design and planning can have important consequences in terms of agency for architects; the ambition of our brief is to stimulate a trans-disciplinary discourse that should reach wider academic research networks such as for instance the one working on the Mediterranean Solar Plan; it is evident the relevance of triggering a more radical unfolding of the urban dimension of such project as well as other similar ones that are taking shape globally.

The problem of reducing our society dependence from fossil fuel it’s clearly a socio-political problem. Typically, however, it is treated as a mere infrastructural engineering problem and the most appropriate solutions are chosen from a palette of technically advanced but typologically predefined possibilities in order to solve the issue economically and efficiently; as a result power

plants operate as factories or industrial landscapes disconnected from the city fabric and any kind of urban activities; their operational role is limited and their spatial articulation irrelevant to the evolution of the city.

Tunisia is a perfect case study and a ground for radical intervention in this sense, given Tunis' strategic position in the Mediterranean and in relationship to Europe, its relative stability, the abundance of sun and the availability of space. The TuNur project, in its current state of development, has ambiguous connotations; it can be seen as a revolutionary vision which could provide Europe with 80% renewable energy by 2050, or perhaps as an old fashioned form of exploitation of African soil, only this time with the rather more cynical twist of being presented under the effigy of a global eco-project.

Our ambition will be to rigorously test and unfold these latent scenarios, taking their virtualities to their uttermost extreme, perhaps revealing in the process new forms of actual urban and social organization.

4. **METHOD / DEFINITIONS**

In its 3 years research trajectory the Unit will work on the latent urban dimension of the Mediterranean Solar Plan by engineering a catalogue of prototypical urban-landscapes of self-organization devoted to the production, conversion, recycling, capturing of solar ENERGY in its various forms.

Such prototypical spaces will be described in the form of an operational manual; key elements of the

manual are the framing of topographic regions within the Mediterranean Solar Plan [climatic and energetic zones], the mapping of Operational Fields [fields of energetic intensity, density], the setting up of Virtual Plots [nuclei of production /transformation /consumption], the engineering of Material Systems [techno-urban assemblages], the coding of Operational Protocols [energy production/ transformation/ consumption codes] and the simulation of Behavioral Scenarios of development [emergent energy networks and flows].

Our project proposals will be prototypical in nature. **Prototypes** are here defined as contingent assemblages of a large number of components organized via multiple relationships. The emergent properties of these assemblages exceed the sum of their constituent parts.

Regulated and evolved through feedback loops of interaction, prototypes differentiate in lineages that progressively develop specialist and dedicated behavior, form and actual material organization. As Raoul Bunschoten points out:

“this combination between form – especially diagrammatic form – and the operational mechanism of a prototype together are the link between architectural space and urban dynamics”.

The proliferation and differentiation of new urban prototypes is performed within an information rich environment or milieu. Such diagrammatic terrain will be developed in term1 through the definition of Virtual Plots and Operational fields.

The **Virtual Plots** are urban frames or units of self- organization, the measuring blocks of spatial and temporal articulation. The word virtual does not refer to a negation of the real urban plots or to a simulated version of their subdivision as in a

form of virtual reality. Rather it describes a model to represent the city as *“pregnant with virtualities which become actual”.* Each virtual plot of the city becomes therefore a unit of urban problem solving, within which multiple actors and agents are able to self-organize giving rise to novel local structures and prototypes. The form of these structures can vary greatly and locally, sometimes re-describing the exiting plots while in other occasions operating within or across their boundaries.

Operational fields are the graphic representation of diagrammatic pre-urban structures developed in order to allow cross fertilization and loading of different types of informational fields and urban stimuli within a coherent urban plan. Such coherent spatial organization of multiple stimuli is a precondition for the development of protocols for the occupation of new territories or the redevelopment of existing urban landscapes; within this operational framework ecologic feedback, participation and self-organization become possible. In fact we shall note that urban self-organization requires the definition of an operational medium that generate responses out of urban stimuli; it scans the landscape defining resolutions, scales, regimes of sensitivity, rhythms, and renders fields of material accumulation and informational exchange. Operational fields require a diagrammatic kind of representation and given their machinic nature they depend on the development of dedicated design mechanisms; associative and algorithmic modeling techniques are at the core of these diagrammatic plans.

In term2 the development of the urban prototypes will enter a more specific phase of material definition and spatial articulation. The first step in this direction is the definition of a **Material**

System.

Such definition implies a conceptual shift from the understanding of buildings and infrastructural technologies as the rational assemblage of discrete components, to their formulation as self-similar structures made up of multiple discrete elements; within this paradigm material organization became prominent as the overall capacity of the structure to self-organize will depend on the organizational principles controlling the relationships among the discrete elements. These principles will promote communication across scales, in which the particular is able to affect the general and vice versa.

The overall material properties of such a system will then emerge of an iterative dialogue with the surrounding context, will evolve and adapt to change; moreover this adaptation will be mostly gradual, at least until a tipping point is reached. Organizational principles can be translated into diagrams of material organization; such a type of diagram has the ability to function as a design machine when deployed is a specific context and in relationship to a specific design problem [such as for instance how to optimize the capturing of solar radiation in urban context, or the sorting of post-industrial waste into energy rich components].

In this circumstance the diagram becomes a sort of pre-architectonic platform of negotiation and more broadly debate. Our use of parametric and computational design tools is tuned to the proliferation of specific design diagrams within a specific design context or environment. This allows a design technique to operate as a sieve, scanning the environment and breeding new operational territories of self-organization, our energy farming landscapes.

In term3 students will be asked to deploy their prototypes and develop **Behavioral scenarios.** As the city becomes embedded with relational mechanisms its conception becomes a form of simulation; however the simulated virtual city is not a model of generic digital urban landscape nor a reductive abstraction of the real city; rather it is a meta-space in which the contingent and the accidental are adsorbed and generic solutions are developed through the organization of differences and variations. The actualization of a scenario manifests itself as a progressive acquisition of material and per-formative specificities in relationship to a specific contextualization process; a diverse pool of actors, agents, forces and protocols cooperate to form and reform the urban space.

Such scenarios will be simulated with videos and animated diagrams; as the studio develops we envision scenarios to be tested on site in specific test beds; such testing can be achieved through scenario games involving community groups and/or other stakeholders as well as real testing prototypes or pilot projects.

4. STUDIO STRUCTURE

4.1 RESEARCH TRAJECTORY AND EXPECTED OUTPUT

In the first year of research we will focus on the definition of the Mediterranean Solar Plan and its multiple layers of interpretation; we will rapidly zoom from the scale involving the whole Mediterranean Basin to the region of Tunisia and then to the city of Tunis and other relevant urban villages, proposing a first catalogue of prototypical urban energy farming landscapes.

In the following two years we plan to increase the resolution of our proposals by refining and differentiating the catalogue of interventions.

The three years of work will be collected and summarized in a single:
“Co-Action plan for the FARM.ing of solar energy in the Mediterranean”.

The plan will coordinate the actualization of multiple prototypes or pilot projects and lead to the simulation of scenarios of co-action for the farming and distribution of energy across the Mediterranean Basin and Europe.

4.2 YEAR ONE DETAILED SCHEDULE

TERM1 will be devoted to building up the tools and expertise to represent the region involved in the TuNur project as a terrain of contentions and opportunities.

Two will be the main tasks of the term:
_to produce a research book, scanning Tunis, its surrounding landscape and the Mediterranean Basin to register the most relevant aspects of FARM.ing solar energy, through the tree lenses: typology, archaeology and territory.
_to develop a series of specific computational design protocols to draw and simulate the urban dimensions associated with FARM.ing solar energy by compiling what we have defined operational fields plans.

Research book content: the initial research work will be conducted in the first two weeks of studio and a first draft of book compiled on the third week; it is meant to gather a more direct and precise knowledge of the multiple characteristic of

farming energy in relationship to the current condition of Tunisia, its landscape, its traditions and the current socio-political situation.

The content will look at various domains of life, from the social aspects, to the technological, to the environmental and climatic ones. For instance part of the research will look at the history of farming in the region, the emergent patterns and models of urbanisation associated to nomadic farming and farming settlements.

The material will be gathered individually in chapters using the book layout provided and then shared among the whole Unit.

Below is a provisional table of content that will guide the student’s research: each student must select a chapter; the final table of content will be written all together at the end of the third week of work.

PART1: Territory

Microclimatic Systems
-ms1: Microclimatic regions of Tunisia [incident solar radiation, rain patterns, desertification]
-ms2: Seasonal flows triggered by climate differentials [human, wildlife, water]
-ms3: Mechanisms of adaptation to life in extreme environments [water channelling, building underground]

Geographic Systems
-gs1: Topographic regions [Water bodies, Oasis, Wadis, dunes formations, agricultural plots, forests]
-gs2: Water system and water table levels in Tunisia

-gs3: Algal Diversity in the Landscape and Water systems of Tunisia
-gs4: Energy networks: the Mediterranean Solar Plan and the SuperSmartGrid project
-gs5: Energy networks in Tunisia and energy provisions to Tunis
-gs6: Waste water networks: collection and distribution of waste water within Tunis

Social Systems
-ss1: Patterns of mobility and urbanisation in Tunisia
-ss2: Racial, religious and Cultural diversity in Tunis' suburbs
-ss3: Farmers and workers organisations or trade unions in Tunisia
-ss4: The Arab Spring and the emergent socio-political subject

PART2: Archaeology

Social Systems
-ss4: Map of nomadism in Tunisia [ancient trading routes and tribes]
-ss5: Historical social and political boundaries in Tunisia

Economic Systems
-es1: Ancient Trading economies
-es2: Cultivating the desert: relationship between agricultural, pastoral and nomadic practices in Tunisia.

Geographic Systems
-gs7: The history and relevance of Tunis as a Mediterranean trading post

Urban Systems
-us1: The morphogenesis of Tunis and other main trading villages in relationship to local resources
-us2: The morphogenesis of key urban typologies in response to climatic variations across Tunisia

PART3: Typology

Technological Systems
-ts1: The TuNur pilot project
-ts2: Algae Farming Types in Tunisia and North Africa
-ts3: Techniques for water sourcing and managing in the desert
-ts4: Energy sourcing systems

Economic System
-es3: The socio-economic strategy of the DESERTEC concept and the TuNur prototype
-es4: Informal economies in Tunisia and North Africa related to energy and waste recycling

Week 4-5 will be occupied by intense computational modelling workshops and the development of first operational fields drawings and (laser cut) models.

The term will end with the 2 weeks city workshop with Elia Zenghelis; we propose for our group to work on the first definition and modelling of solar FARM.ing landscapes, networks of urban metabolic units centred on a specific energetic supply chain.

Each unit is described through a prototypical operational scenario, taking into account cultural, technologic and social factors related to that specific supply chain.

The simulated networks will then represent novel relationships between the FARM.ing of solar energy and urban space.

TERM1 submissions:
26/11 + 27/11 DESIGN STUDIO SUBMISSION:
End of term Jury
_Operational fields plan drawings (individual group submission)
_Research book draft.01 (unit submission)
13/12 + 14/12 ELIA ZENGHELIS WORKSHOP:
Workshop Jury

In **TERM2** we will start with the evolution of the operational fields drawings with the introduction of more specific material conditions; week 2 and 3 will be devoted to the production of large CNC and laser cut models of the operational fields. Week 4-5 will be devoted to more research and the planning of the field trip, which will be conducted by each group in relationship to a specific site and network of stakeholders.

After the field trip the work will focus on the definition of solar FARM.ing prototypes; shifting in scale from the urban all the way down to the molecular we will consider and articulate the organisation of flows of solar energy through novel material frameworks and technological assemblages. Performative aspects will be dissected and operational protocols defined, including the actors and agents involved and the economic feasibility of the system.

TERM2 submissions:
18/2 + 19/2 DESIGN STUDIO SUBMISSION: Midterm Jury
18/3 + 19/3 ELIA ZENGHELIS WORKSHOP: End of term Jury

TERM3 will focus on the production of design scenarios within the specific sites of choice; in this first year students will be invited to visit and explore scenarios by group thus opening up different strands of research within the Unit.

Such scenarios will provide urban test beds for the actualization of the TuNur pilot project, a 10X10 Km solar city for 20.000 people. Time based scenarios of implementation/actualisation will be critical to this stage of development.

TERM3 submissions:
13/5 + 14/5 DESIGN STUDIO SUBMISSION:
Mid-term Jury
10/6 + 11/6 DESIGN STUDIO SUBMISSION:
End of term Jury
3/7 + 4/7 + 5/7 DESIGN STUDIO SUBMISSION:
Final Jury

Presentation of Design Project (individual groups):
1. Movie.
2. Models.
3. Drawings

Submission of Studio Research Folio (Unit):
Studio Research Folio.

In **TERM4** the critical discussion of these scenarios of actualisation, developed in groups, in relationship to the proposed Mediterranean Solar Plan and related TuNur pilot project, will constitute subject for final individual student dissertation.

In the Thesis each student will articulate the design challenge explored in the proposal of the new agri-urban landscape. Each individual student will speculate how this newly constructed grounds of negotiation between the top down strategic

intention of the Mediterrenean Solar Plan and the local tactics of self-organization stimulate the emergence of new political subjects.

TERM4 submissions:
26/8 DESIGN STUDIO SUBMISSION: Thesis book

4.3 TERM ONE DETAILED SCHEDULE:

Week1:
Monday 29th of October: Marco and Claudia: Unit introduction
Tuesday 30th of October: Marco: Intro research book

Week2:
Tuesday 6th of November: Claudia: Tutorials research book
Friday 9th of November: Claudia and Marco: Review research book

Week3:
Tuesday 13th of November: Marco and Claudia/Andrea: Operational field algorithmic drawings.1
Friday 16th of November: Marco: Tutorials research and operational fields

Week4:
Tuesday 20th of November: Claudia/Andrea: Operational field algorithmic drawings.2
Friday 23rd of November: Marco and Claudia: Review Final Research Book printed + Reviews drawings.

Week5:
Tuesday 27th of November: END OF TERM JURY
Friday 30th of November: Claudia/Andrea: Algorithmic 3DModels.1

Week6:
Tuesday 4th of December: Claudia and Marco: Tutorials algorithmic drawing & modelling
Friday 7th of December: Marco and Claudia/Andrea

Week7:
Tuesday 11th of December: Marco and Claudia/Andrea
Friday 14th of December: CITIES WORKSHOP JURY

FIELD TRIPS:
Field Trip1_beginning of term2: THE TUNISIAN REGION
Field Trip2_end of term2: THE CITY OF TUNISI

5. UNIT BOOKS:

Systemic Architecture: operating manual for the self-organizing city_ by Poletto, Pasquero published by Rutledge.

The World Dubai Marine Life Incubators_AA INTER10_ ecoLogicStudio Publishing.

Network Oasis_AA INTER10_ecoLogicStudio Publishing.

Suggested term1 readings:
1_Atlas of Novel Tectonics _ Reiser+Umemoto_ Princeton Architectural Press
2_Deleuze&Guattari for Architects _ Andrew Ballantyne_Routledge
3_The tree ecologies_Felix Guattari_Routledge
4_A thousand years of nonlinear history- Manuel De Landa_Swerve
5_Walkscapes, walking as an eastethic practice _ Francesco Careri_ GG
6_Constant's New Babylon_ Mark Wigley
7_Weak and Diffuse Modernity_ Andrea Branzi_Skira

8_Le jardin planétaire – il giardiniere planetario _ Gilles Clement _ 22publishing
9_A thousand Machines_Gerald Raunig_ semiotext(e)
10_Occupying and Connecting _ Frei Otto _ Menges
11_Emergent technologies and design_ Hensel, Menges, Weinstock_ Routledge
12_Landscape Urbanism, A manual for the machinic landscape_ Ciro Najle_ AA Pubblications
13_Space Craft, Development in Architectural Computing – David Littlefield _ RIBA Pubblishing
14_Environmental Tectonics _ AA Publication
15_Fibrous Room _ GG Gallery Pubblications
16_The Informal City, Caracas Case _ Brillenburg, Klumpner _ Prestel
17_The Architecture of Emergence_Michael Weinstock_Wiley
18_Future City_ Catalogue_Thames and Hudson