Favelas and Social Housing: The Urbanism of Self-Organization.

Nikos A. Salingaros, David Brain, Andrés M. Duany, Michael W. Mehaffy & Ernesto Philibert-Petit (all members of *ESRG — Environmental Structure Research Group*).

Abstract: *We offer here a set of evidence-based optimal practices for social housing, applicable in general situations. Varying examples are discussed in a Latin American context. Adaptive solutions work towards long-term sustainability and help to attach residents to their built environment. We draw upon new insights in complexity science, and in particular the work of Christopher Alexander on how to successfully evolve urban form. By applying the conceptual tools of "Pattern Languages" and "Generative Codes", these principles support previous solutions derived by others, which were never taken forward in a viable form. New methodologies presented here offer a promising alternative to the failures of the standard social housing typologies favored by governments around the world, which have proven to be dehumanizing and ultimately unsustainable.*

SECTIONS 1-4: BACKGROUND AND CRITICISM.

1. Introduction.

This paper outlines promising new solutions for the future of social housing. It has been prepared as a comprehensive report by one of the authors (NAS) for Brazil, and is generally applicable to all of Latin America. One of us (AMD) is designing social housing in Jamaica and elsewhere in the Caribbean. Two of the authors (AMD & MWM) are directly involved with the reconstruction after the hurricane Katrina devastation in the Southern United States, which faces similar, though not identical, realities. Another author (EPP) has researched the pedestrian connectivity of the urban fabric, and is involved in providing government-assisted housing solutions on a massive scale in Mexico. The remaining author (DB) has long studied the influence of urban form on social wellbeing and community sustainability, a crucial factor in our discussion.

The challenge of social housing is a major component of world urban growth, and we wish to present here a comprehensive methodology for radically improving its performance. Success will be measured in human terms: i.e., the physical and emotional wellbeing of the resident. We consider a project to be successful if it is maintained and loved by its residents, and also if the urban fabric joins in a healthy and interactive way to the rest of the city. On the other hand, we consider as unsuccessful (and hence unsustainable) a project that is hated by its residents for a number of different reasons, wastes resources in initial construction and upkeep, contributes to social degradation, isolates its residents from society, or decays physically in a short period of time.

The essence of the approach presented here is to apply a sustainable PROCESS rather than a specific IMAGE to design and building. The way it was done in the recent past is to build according to a prepared image of what the buildings ought to look like, and how they should be arranged. By contrast, no image of our project exists at the beginning: it emerges from the process itself, and is clear only after everything is finished.

We can move toward a more thorough and satisfying solution by drawing upon Christopher Alexander's work — one of several pioneers who proposed that urban fabric should follow an organic paradigm — and can include theoretical and practical work that for various reasons is not widely applied. What we offer is supported by the evidence from many examples of traditional practice over centuries. Governments instead choose to impose schemes and typologies that ultimately generate hostility for the fabric of social housing from its occupants. We will analyze the reasons for this hostility in order to prevent it in the future. The relatively simple solutions presented here are generic. Therefore, though geared to Latin America, they can be adopted by the rest of the world with only minor modifications. This study outlines ideas that are general enough to apply to countries where local conditions that produce housing might be very different.

We can learn from innovative approaches to government-sponsored housing, developed by independent groups in many different settings and conditions. Out of many projects built over several decades, very few can be judged to be truly successful using our criteria of the residents' physical and emotional wellbeing. Those few excellent solutions tend to be neglected because they fail to satisfy certain iconic properties (which we discuss in detail later in this paper). Perhaps surprisingly, we also draw upon successful typologies developed for sustainable upper-income communities.

This paper combines two mutually complementary approaches (and will contrast these with existing methods). On the one hand, we will give some explicit practical rules for building social housing. Any group or agency wishing to get started immediately may implement these — with appropriate local modifications — on actual projects. On the other hand, we will present a general philosophical and scientific background for social housing and its cultural implications. The aim of this theoretical material is to "give permission" for common-sense arguments; to create the conditions that will safely allow and support what in effect comes naturally. People, acting as intelligent local agents, may then apply methods that evolved during millennia of successfully performing owner-built housing — as part of the production of healthy resident-built communities.

This methodology recognizes and incorporates the self-organizing features of the most robust human settlements throughout history, by utilizing a "complexity-managing" approach, rather than a linear, "top-down" approach. We propose channeling the design talent and building energy of the people themselves, acting as local agents, within a system that we manage only to help generate and guide its evolving complexity. In such an approach, "bottom-up" processes are allowed to develop organically, though within constraints based upon prior experience. On the other hand, "top-down" interventions must be done experimentally and carefully (i.e., with feedback), allowing more interaction with smaller-scale "bottom-up" processes.

Our proposal goes beyond housing that is literally owner-built in the sense that owners hammer nails and pour concrete. It is important that they experience the process of design

and building as THEIR process. It's all about establishing connection and engagement. The key point is a process that accommodates real engagement, that is agile enough to be responsive to adaptive processes, and that can engage without being driven by the social dynamics of inequality into unfortunate directions. Most important, the process can take advantages of both technology and expertise. We are proposing something far more than letting the poor fend for themselves — we wish to empower them with the latest tools and a highly sophisticated understanding of urban form.

As many authors have described previously (e.g. Alexander *et. al.* (1977), Jacobs (1961), Turner (1976)), established planning practice has tended to follow an outmoded early industrial model. That model arose in the 1920s, and was widely adopted in the period following World War II. It was based upon a hierarchical "top-down" command-and-control paradigm, leading to predict-and-provide planning. Research amply demonstrates that this model does not sufficiently reflect the kind of scientific problem a city poses, because the model ignores the tremendous physical and social complexity of successful urban fabric. Incredibly, it does not even address human interactions with the built environment. The resulting failures and unintended consequences are well documented. As science develops more fine-grained and more accurate research tools for the analytical study of such self-organizing phenomena (which include cities), it is necessary now to propose a radical new urbanism. We wish to empower people with the authority of a new methodology, grounded in recent urban research.

The problem isn't just the lack of physical complexity. The key to urban place making is really the relationship between the complexity of spatial form and the complexity of social process. If it were just a matter of physical complexity, one might imagine that a top-down process could be created to simulate that complexity — say, a computer algorithm. The crucial point is that this physical complexity embodies and expresses social life. It is, in certain respects, social relations by other means (e.g., artifacts and built spaces). To some extent, the answer begins by re-conceiving the built environment itself as social process, not just as product or container. This becomes important later when we talk about maintenance, since the processual character of this kind of ownership merely begins when residents move in.

This paper is very complex and deals with many issues, so we need to map out its exposition. The first four sections provide background and criticize current practices. Section 2 introduces the competition between owner-built settlements and government-built social housing. Section 3 reviews the standard practices and typologies of top-down social housing programs, and recommends replacing them (or at least complementing them) with a bottom-up procedure. Section 4 pinpoints how a "geometry of control" ruins even the best-intentioned schemes by making them inhuman.

The next six sections offer specific tools for design. Section 5 turns to mechanisms for establishing emotional connections with the built environment. Biophilia, or the need to connect directly to plant life, is a crucial component. We also discuss sacred spaces and their role towards establishing community. Section 6 reviews the work of Christopher Alexander, especially his recent work on generative codes. Section 7 argues against the fixed master plan approach, suggesting instead an iterative back-and-forth planning process. Section 8 reviews Alexandrine patterns and outlines their transition to generative codes. Section 9 gives, in the broadest possible terms, our methodology for planning a

settlement. We suggest getting building permission for a process rather than for a design on paper. Section 10 contains an explicit set of codes describing the armature of services in a social housing project. Section 11 introduces the complementary design tools by describing the generative codes needed for such a project.

The next four sections continue with practical suggestions for making projects work. Section 12 suggests appointing a project manager to direct the application of generative codes. Section 13 argues for using appropriate materials: cheap but permanent; durable but flexible enough to shape; solid but friendly to sight and touch. We also discuss the proper use of industrial modules such as a plumbing box. Section 14 broaches the topic of funding a project, recommending the involvement of a non-governmental organization that focuses on the small scale. Section 15 is political, delving into how one can best cooperate with existing systems geared to producing social housing that follow very different, industrial typologies. Section 16 offers strategies for getting residents to maintain their settlements after they are built.

The final four sections identify some of the problems. Section 17 faces the difficult problem of retrofitting the favela to make it an acceptable part of urban fabric. Sometimes it cannot be done. We discuss a reinforcement strategy for when it is feasible to do so. Section 18 analyzes some failures to understand the life of a squatter, such as their economic need for proximity to the city. This makes new social housing built far outside the city unattractive. We also warn against grand schemes that can turn into economic disasters. Section 19 blames architects for imposing modernist forms on social housing. That geometry makes them hostile for residents. Section 20 blames the residents themselves for rejecting adaptive housing and urban typologies, wanting instead the sterile images of modernism. Section 21 reviews how conditions are different today from the past several decades, and offers optimism for a broad acceptance of adaptive housing.

The Appendix contains an explicit generative sequence for social housing on a greenfield or open brownfield.

2. The Ecosystem Analogy.

Here is a basic incompatibility: organic urban fabric is an extension of human biology, whereas planned construction is an artificial vision of the world imposed by the human mind on nature. The former is full of life but can be poor and unsanitary, whereas the latter is often clean and efficient but sterile. One of these two contrasting urban morphologies can win out over the other, or they could both reach some sort of equilibrium coexistence (as has occurred in most of Latin America). In the movement for "self-construction", the government accepts that owners will build their own houses, and provides materials and training to help establish the networks of electricity, water, and sewerage.

"Social housing" is usually understood as a project for housing the poor, built and financed by a government or non-governmental organization. Occupants could purchase their units, but a usual practice is to rent them at low subsidized rents, or even to provide them for free. In the latter instances, the residents live there by courtesy of (and are subject to varying degrees of control by) the owning entity. A "squatter settlement", on the other hand, is a self-built development on land that is not owned by the residents, and which is

4

frequently occupied without permission. Since squatter settlements are illegal, the government generally refuses to provide the means of legally purchasing individual plots of land. In most cases, it also refuses to connect those residences to the utility grid (electricity, water, and sewerage) of the rest of the city. As a result, living conditions there are the worst among peacetime settlements.

Social housing and squatter settlements are regions where more than one billion of the world's very poor live. We are going to discuss these two urban phenomena side-by-side, and offer to resolve the ideological and spatial competition between the two. As a basic starting point, housing for the poor represents the lowest level of the world's urban ecosystem. Different forces within human society generate both types of urban system: either government-sponsored social housing, or squatter settlements. Christopher Alexander (2005), Hassan Fathy (1973), N. J. Habraken (1972), John F. C. Turner (1976), and others recognized this competition before us, and proposed an accommodation of the two systems. Turner helped to build several projects in Peru and Mexico, and advised others on implementing such ideas worldwide.

The ecosystem analogy also explains and to a certain extent justifies the vigilance by which governments prevent squatter settlements from invading the rest of the city. If not restrained by law and direct intervention, squatters move into private and public land. We are describing a species competition for the same available space. Each species (urban typology) wants to displace all the others. Squatter settlements can take over the entire city if allowed to do so (for example, in Cairo, they have taken over the flat roofs of commercial buildings; in the USA people build temporary shelters in public parks and under highway overpasses). The government, in turn, would like to clear all squatter settlements. Governments the world over assume that they must construct planned housing to replace owner-built housing. That is too expensive to be feasible.

Like all truly organic systems, cities are better off without central control. Accommodating competing urban systems never became standard practice, however. Although the basic ideas about traditional settlements were in place, several key elements of understanding were previously missing. We are now offering expertise in housing as a DYNAMIC process (by combining pattern languages with generative codes: see later sections). Interventions are needed, starting from scratch in new housing projects. The same dynamic process can also be applied to already built environments, in seeking to adapt a large number of informal unplanned housing projects (favelas or others) by bringing them up to acceptable living conditions.

Competition occurs among all economic strata ("species") that either use urban land, or profit from it. In Latin American cities, urban land speculation leaves a large amount of undeveloped land with all the services already in place wasted. The poorest population then has to find plots on the outskirts, and pay steep prices for water and other services, without having the benefit of living close to their main source of income (the central city). This creates a severe problem for the government. Rather than characterizing the practice as "unfair" (which does not lead to any change), we point out its tremendous cumulative costs for the future.

Throughout all the various schemes for social housing tried over the years, it is widely accepted (with only a few exceptions) that the unplanned owner-built favela is

embarrassing to the government, and has to be bulldozed as soon as possible. Yet that assumption is wrong. Very few in a position of authority seem to consider the urban and economic advantages of existing shantytowns. The geometry of buildings, lots, and street patterns has for the most part developed (evolved) organically, and we will argue here that this self-organization affords a number of very desirable features. With all its grave faults, the favela offers an instructive spontaneous demonstration of economic, efficient, and rapid processes of housing people.

The favelas' disadvantages are not inherent in the urban system itself. Their organic geometry is perfectly sound, yet it is precisely that aspect which is vehemently rejected. It simply doesn't fit into the stereotyped (and scientifically outmoded) image of what a progressive urban fabric ought to resemble — neat, smooth, rectangular, modular, and sterile. A favela's organic geometry is linked with the illegal act of squatting, and with a pervasive lawlessness. The geometry itself represents "an enemy to progress" for an administration. We cannot build living urban fabric (or save existing portions) until we get past that prejudice. The favela has a self-healing mechanism absent from most top-down social housing schemes. Organic growth also repairs urban fabric in a natural process, something entirely absent from geometrically rigid housing projects.

Ironically, the organic geometry of the favela is typically at odds with the imperatives of both the Left and the Right in a modern state, given its interest in responding to social issues in a manner that is appropriately controlled. Some of that interest in control has to do with a literal interest in the kind of rational administrative order that is tied to social control. Nevertheless, much of it may reflect either the state's need to legitimate its interventions by demonstrating its rationality, or its need to maintain the bureaucratic rituals of accountability when distributing public resources, or its respect for the conventions of private property. It could also be a sincere reformist concern for elevating the living standards of the poor in a way that is both efficient and procedurally fair, in a manner motivated by democratic principles.

An ordered geometry gives the impression of control invested in the entity that builds. Whether this is intentional (to display the authority of the state) or subconscious (copying images from architecture books), governments and non-governmental organizations prefer to see such an expression of their own "rationality" through building. Departure from this set of typologies is felt to be a relaxation of authority; or it raises possible questions regarding the legitimacy of distributions of resources that aren't subject to careful bureaucratic accounting procedures. Both of these are avoided because they tend to erode the authority of the state, particularly under regimes where the rights of private property are an important part of the legal and regulatory systems. Morphologically complex squatter settlements are usually outside the government's control altogether. One way of asserting control is to move their residents to housing built by the government. In a sad and catastrophic confirmation of our ideas, various governments in Africa have periodically bulldozed owner-built dwellings, driving their residents to live out in the open.

3. Antipatterns of Social Housing.

Let us summarize some of the current beliefs and typologies that drive social housing today, so that we can replace them with an entirely different framework. We will suggest

6

using solutions that we feel work best as the more enlightened alternative. Much of our criticism focuses on top-down control. That approach leads to simplification in the planning process. However, one cannot design and build complex urban fabric using top-down tools. There is more to criticize in the specific images people have of modernity. That concerns both architects, who carry with them a false set of desirable images; and residents, who are invariably influenced by those same images through the media.

1. Existing public housing projects are conceptualized and built as cheap dormitories, and thus follow a military/industrial planning philosophy: build as many units as possible, as cheaply and efficiently as possible. We should abandon this mindset and build urban quarters instead. Building an urban quarter is a much more complex undertaking, and one that requires complex engagement beyond the small circles of policy-making and professional elites.

2. To erect a housing project most efficiently, the directing entity wants to have maximal control over the geometry and building process. This practical requirement means that user participation is excluded.

3. The very name "social housing" implies that only a dormitory is built, and not an urban quarter. Following World War II, monofunctional zoning became the established criterion by which governmental interventions were carried out. Those ideas were in place before the War, but post-war reconstruction and expansion gave the opportunity to apply them on a much larger scale.

4. The industrial building typology relegates plants and the natural environment to a purely decorative role, or eliminates them altogether. Nevertheless, human health is possible only if we connect to plants and nature in our immediate surroundings: the "Biophilia Hypothesis" (Kellert, 2005).

5. An urban quarter is comprised of complex social networks, and requires the appropriate urban morphology of a network. It is never monofunctional, and it is not homogeneous. It cannot be built in a top-down fashion by central government. Individual villages (*Pueblos* in Latin America) have been evolving far longer than 500 years; they possess a rich inheritance of a mixture of many cultures that comes from the deep past, e.g. indigenous cultures such as Toltec, Mayan, Incan, Carib and incoming cultures such as Spanish, Portuguese, African, Islamic and so on. There are many lessons that we can learn from this evolution.

6. A conventional social housing project is seldom concerned about social accessibility to the urban network, since it is usually built in disconnected (many times rural) areas. All too often, the issue is understood only as a matter of "housing", with measures of success typically in terms of quantities of "units" and immediate impact on individuals, rather than the quality (or sustainability) of the community life that results.

7. The typical location of social housing projects in rural areas has to do with a powerful economic reason: the land owners have managed to get a change of land use and have obtained for themselves an extraordinary surplus value. This is part of the sprawl-oriented development in our cities. Furthermore, the project itself, the government, and the users seldom benefit in any way from this surplus value.

8. A typical social housing project conceived as a disconnected "urban island" has an awful impact on the environment. It is disconnected from local and from global economic cycles.

9. The geometry of a conventional social housing project and the configuration of its constituent units give few or no ways to affect further development. They present a number of geometrical obstacles for its evolution over time. This impediment frustrates the inhabitants' hopes, and suppresses their prospects for social and economic improvement.

10. Architects, government officials, and future residents all carry within their minds an "image of modernity". This set of ingrained images generates a building typology that is hostile in actual use, and presents one of the greatest obstacles to adaptive social housing.

Governments are still stuck in the mindset of social housing serving jobs in a particular place. The reality is different: healthy urban quarters connect into an urban conglomeration, and people work wherever they can find jobs. By contrast, unhealthy urban regions are isolated, disconnecting people from each other and from employment opportunities. Despite strong social and economic forces leading to isolation, our aim is not to codify this isolation in the buildings and urban form. To do that is to compound the problem. We should instead use the urban geometry to counteract social isolation.

The above list of typologies and practices leads to unhealthy housing projects, creating unsustainable social conditions. To achieve a more adaptive approach, those typologies must be reversed, and the forces that lead us to repeat the same mistakes over and over again should be redirected. Some errors arise simply out of inertia: copying failed solutions because it has become a habit to do so, and not identifying viable alternatives. Those errors are very easy to resolve once the situation is better understood. There is another class of errors, however, which arise because the same forces lead to similar expressions in practical applications. Those conditions cannot be changed, and must instead be redirected. Failure to understand the difference between the two problems means that we will never be able to improve the current situation.

One principle becomes clear: there is no point of designing "social housing" as such. We need to design and build complex, mixed-use urban fabric, and to make sure it fits into existing complex mixed-use urban fabric. Social housing, and housing in general, need to be part of a healthy (and socially inclusive) process of urbanism. The very notion of monofunctional housing is obsolete, discredited because it never worked to connect residents to their environment. All of the planning measures we reject — originally well intentioned — were adopted as a means to improve efficiency in facing a serious urban challenge.

The underlying reasons for their failure have never been officially admitted, however. As a result, there has been a tendency for the debate to focus on problems with the design of social housing as buildings: as if it were merely a matter of coming up with a better design idea to be imposed with more or less the same apparatus of top-down control. Usually nowadays, an architect's idea of a good design is impersonal and oppressive to the actual users. Some more recent public housing initiatives in the USA (such as the HOPE VI program) have made an effort to incorporate resident participation in the process, but relatively superficially and with very mixed success. Our key point is that the process of producing living places that incorporate social housing has to be changed at its root. It

must accommodate more fundamental and meaningful engagement, grounding the generation of urban form in a process that adequately respects the organized complexity distinctive to the nature of cities.

There is a need to mix social classes for a healthier social fabric. The mix can occur naturally through the process of upgrading. It is also important that people who have a choice remain in the neighborhood. The comprehensive approach to creating a village would seem to make sense in places like Latin America where whole settlements of previously rural people create shanty towns and squatter settlements on the periphery of big cities. In that context, there may be no option but to catalyze the generation of whole urban quarters built by the residents, with help by us. Generally, we would want to be cautious about building urban quarters specifically for the poor. Healthy urban fabric is not monofunctional, and neither does it strictly contain one income level. We are aware of the tremendous social difficulties of encouraging mixed-income housing, because of the perception that no one would ever want to live next to people even slightly poorer than they are. However, we can find encouraging examples of social mixture in historic towns and historic city centers all around Latin America (the *Centro Histórico* of Querétaro is a good example). The difference lies in the perception of community (which can overcome income differences) versus perceiving a house strictly as real estate. Mixed income communities are not only possible, but are more resilient.

It is not just a question here of physically separated urban quarters on the urban periphery. How does one create a unique pattern-generating process for these urban quarters, without creating enclaves that stand out dramatically from the rest of the city? In other words, how does one plan for low-income buildings without creating "projects", barrios, and ghettos? It seems to us that it is crucial that this rethinking of "social housing" has to be a rethinking of everybody's housing — i.e., of urbanism — such that "social housing" is subsumed by a more general process of creating a city of healthy networks (Salingaros, 2005). Connecting to the global networks of the city: major streets, the public transportation system, political and social networks, etc., is of the greatest importance.

Part of the mindset of government is that "social housing" has to follow a specific set of policies directed at a specific problem, and administered in and through specific sites. We have super block projects (which are dehumanizing but easy to administer), or we have something like the Section 8 voucher system in the USA, which subsidizes rent for low-income residents. In the case of the latter, social housing becomes an abstract category — defined only in terms of the pathologies of individuals who need assistance, and addressed in the form of payments to property owners. In the latter case, the "site" is a category of individuals, severed from community connections.

Typically, the poor already have complex social networks upon which they rely heavily for survival. At the same time, however, the relative isolation of these networks is a serious problem. Although often very densely connected in a "peer group society", the poor tend to have limited connections outside those circles, and are isolated in their own villages. They are bound into small networks, but have no sense of themselves categorically as residents of a neighborhood. They also tend to distrust people from outside their networks. Essentially, they have no capacity to identify with or care about the neighborhood as a neighborhood. The problem from a network point of view becomes how to strengthen the pattern of weak ties in such a way that one can incorporate low-income populations into

civic life. Moreover, this has to be done without disrupting the strong networks of mutual assistance on which those residents rely. The solution requires organizing these local networks into a network that works on a larger scale.

4. A Geometry of Control.

The psychological process of control influences urban form and the shape of social housing to a remarkable extent. Control may be manifested in architectural geometry and also in urban layout. A rigid, mechanical geometry dictates the shape of individual buildings and urban spaces, while the geometry of their layout determines the relationship among separate buildings and the shape of the street network. There are many opportunities to express control in urban and architectural terms, and we find them all in government-built social housing.

Examples of organic/bottom-up *generated* urban structures are found along a universal timeline starting with the first cities registered in the Neolithic period, through modern times. The mechanical/top-down *fabricated* urban structure is found in our timeline ever since patterns of *colonization* first appeared in history. Thus, we have models of this mechanical structure dating from the imperial periods of Greece, Rome, or China until today. In the 20th Century, an exacerbated mechanical structure was imposed on cities by the machine culture of modernist thoughts and values. This last period has been decisive in configuring the structure of present day cities, and is set to dominate those of coming years. In the near future, spatial fragmentation could become the ultimate consequence of the recent past. Alternatively, we may enter the period when the emerging paradigm of networks could be wisely used to connect our spatial structures and patterns again, working instead against fragmentation.

There exists a clearly recognizable "geometry of power" (Alexander, 2005; Salingaros, 2006). It is most clearly expressed in military and Fascist architecture of the Second World War (and long before that), but has been adopted by governments and institutions of all political persuasions (from the most progressive, to the most repressive). Such buildings are shaped as oversized rectangular blocks and are placed in strictly repetitive rectangular grids. High-rise blocks give the impression of control of their occupants, who are forced into a military/industrial typology that is obviously the opposite of the free urban geometry of the favela. We have two contrasting geometries: housing units massed into one or more blocks, versus having them spread out irregularly. The psychological impression of control follows the possibility of ACTUAL control, as the entrance to a high-rise housing block can be easily sealed off by the police, something that is impossible in a rambling cluster of individual houses.

Government officials and developers share these views about control, and this in turn tends to eliminate any other approach. The local government would prefer to have better access to the site through regularly shaped blocks. Administrators are fooled by the notion that simplistic geometric shapes are the only typology we can use to create efficient new dwellings.

An administration can build many smaller units rather than high-rise blocks, but rigidly fixed to a military/industrial grid on the ground. Individual housing units are exact copies

of a single prototype. Control here is exercised by not allowing individual variations. One modular house is repeated to cover the entire region, with careful attention paid to strict rectangular alignment. Complexity and variation are perceived as losing overall control — not only of building typology, but also of the way decisions are made — and are thus avoided.

Several factors provide powerful motivations for standardization and relatively rigid regulations: administrative efficiency, accountability, maintenance of standards on which the success of the administration will be assessed, and the requirements of both transparency and procedural fairness. The efficiency of modular production, falsely tied to economic progress, is used as an excuse for the military/industrial geometry. Building variability is perceived as a threat, and is countered by arguments about excessive production costs. Those arguments support the belief that central planning is an economic and social necessity. Yet, such arguments have been shown again and again to be invalid. It is once more the industrial, mechanical paradigm of linear production (and linear thinking) that does not allow developers of social housing to consider variability, heterogeneity, and complexity as essential features in their projects.

In a manner similar to the application of new technology to factory production, a justification is often presented in terms of cost and efficiency, but the underlying logic is a logic of control. In the context of the modern state, it is often more crucial to maintain standards, transparency, and accountability than to reduce cost in absolute terms. As a result, it has become all too common for the structures of bureaucratic administration (with the best of intentions, and regardless of ideological leanings of Left or Right) to impose standards that disrupt the very thing they hope to accomplish.

Adaptability to individual needs requires design freedom so that every unit could be different, with its shape and position decided in large part by its future residents. It is indeed possible to do that. Nevertheless, both sides of the political spectrum strongly oppose design freedom. The Right considers poor people not to deserve such attention, and that a custom-made house is the exclusive privilege of the wealthy class. The Left, on the other hand, stands firmly behind its belief of fundamental equality, which it misinterprets as forbidding houses in a social development from being in any way different from each other. Institutions such as banks, construction companies, and land surveyors get frightened by the prospect of having to deal with individual variations.

Control is exerted in other, more subtle ways as a result of standardization. A cheaply produced building module available in the marketplace, if it is large enough, replaces other, better alternatives. Modular components restrict design freedom, because they influence the final product resulting from their assembly (Alexander, 2005; Salingaros, 2006). Governments that sponsor social housing do like to promote industrial modules and components, and to discourage construction that is shaped individually. Nevertheless, local production could be achieved more cheaply, and solves part of the unemployment problem. An industrial geometry embodied in architectural and urban typologies is eventually reflected in the built environment.

The natural environment becomes one more casualty of the geometry of control. Nature and life are visually "messy". Topographical features such as rocks, hills, and streams; as well as trees and plant life, pose challenges to a flat, rectangular geometry, and are thus

usually eliminated. Local governments put in effort to eradicate organic elements from the "ideal" sterile environment. Sometimes (but not always), this act of aggression against nature is mollified after the fact by planting a few non-native trees in strict geometrical alignment and making up a phony rock landscape as a visual sculpture. Existing native plant species are regarded as unwelcome, and only an artificial-looking lawn is acceptable (because it is sleek and does not grow unevenly like other plants). In low-income housing, even that is considered an unaffordable luxury, so in the end, the project acquires an unnatural, lifeless character, totally lacking in connections to plant growth.

SECTIONS 5-11: SPECIFIC TOOLS FOR DESIGN THAT HELPS ESTABLISH INTELLECTUAL OWNERSHIP.

5. Biophilia, Connectivity, and Spirituality.

The notion of "biophilic architecture" establishes that human health and wellbeing strongly depend on the geometry of the environment, as expressed in particular configurations, surfaces, materials, details, light, and accessibility to plants and other forms of life (Kellert, 2005). All of these factors contribute to the success of any building, and to social housing in particular. Evidence-based design is based on knowing how a human being is affected by his/her environment.

The appropriate geometry that promotes human wellbeing is unsurprisingly the opposite of the geometry of power described in the preceding section. A living geometry is loose, complex, and highly interconnective. It is the geometry of the owner-built favela, and also the natural geometry of a river, a tree, or a lung. Without any imposed constraints, human beings will build according to this natural geometry (Alexander, 2005; Salingaros, 2006). Note that many self-built projects do not entirely follow this generative geometry, because the government defines a rectangular grid of plots before giving the land over to individual builders. Thus, it already imposes an industrial grid that is impossible to change. We will discuss later how this restrictive practice can be avoided.

Geometry and surface qualities either help or hinder an emotional connection with the human beings who use them. We should balance the study of structure with the study of form and pattern. In the study of structure, we measure and weigh things. Patterns of interaction cannot be measured or weighed, however: they must be mapped, and they have to do more with quality. To understand a pattern we must map a configuration of relationships. We believe in the concept of the city as an organism, not only in the sense that it tries to develop an *organic* structure, but also because of the complex relationship this structure establishes with the organizational patterns of its users. Here is a list of some key concepts that we need to work with:

1. People become psychologically sick and hostile in an environment devoid of nature. Biophilia is innate in our genes. Urban quarters need to blend with and not replace natural habitats.

2. We connect to plants through their geometrical structure, thus some geometries are more connective to the human spirit than others. We feel comfortable with a built environment that incorporates complex natural geometry showing an ordered hierarchy of

subdivisions.

3. Residents should love their homes and neighborhoods. That means that the form of the immediate built environment must be spiritual and not industrial.

4. Industrial materials and typologies generate hatred for the built environment. We grow hostile to surfaces and forms that do not nourish us spiritually, because we feel their rejection of our humanity. If not hatred, they often generate a kind of indifference that might actually be worse for human communities. The use of these materials and typologies has commonly been presented as dictated by the nature of building technology and the economic realities of the day. The result is that people often take for granted the unavoidable alien character of a built environment that delivers quantity without meaningful qualities.

5. The sacred character of traditional villages and urban quarters cannot be dismissed as outmoded nonsense (as is done nowadays). This is the only quality that connects a village on the large scale to people, hence indirectly to each other. We need to build it into the urban quarter.

It is not easy to identify the sacred structure of any settlement, let alone plan for it in a new one. We need to look at the patterns of human activity in traditional settlements, and ask which activity nodes are valued above all others. Usually, it is where local residents come together to interact. Those nodes (if they are present at all) could be interior, but very often they are elements of urban space (Gehl, 1996). People can connect to plants and to other people at the same time in properly designed (configured) urban spaces. Those places are then responsible for the societal cohesion of the neighborhood.

Something is "sacred" if we attribute to it a value above and beyond its material structure. A good rule is to ask if we are willing to fight to protect it from damage or destruction. Do many persons, some necessarily strangers, feel the same way about this? Do we consider a place to have meaning for the community as a whole so that a group of people will actually come together to protect this particular object or site? In ancient societies, an old tree, a large rock, prominent high ground, a particular stream or spring could be considered sacred (in the deepest religious sense), and thus protected from damage. Those societies built towns around sacred spaces, and endowed parts of what they built with a sacred meaning. Today, that quality is unfortunately dismissed as anachronistic.

For example, the oldest social nodes are a water source (community tap or well), place of worship (Church or Temple), gathering place (cafe/bar for men), children's playground, etc. In the case of a Church, we do have a genuinely sacred structure, and it is most often built in the original geographic center of a settlement. It serves the cohesive function of community: "ecclesia" is the gathering together of common worshippers, which is just as much a cohesive social act as it is a purely religious act. It is no coincidence that the non-religious gathering place, the coffeehouse, is often situated in front of the Church in a traditional village. The coffeehouse substitutes as an alternative gathering place for those who do not subscribe to the sacred meaning of the local religion.

Another node of the sacred structure is the central plaza or open square, which, in temperate climates, accommodates social life in the evenings. The Latin tradition of the

evening walk around the central square establishes a value for the plaza in the social cohesion of the community. What we refer to as "sacred structure" in this paper refers to ALL of these cohesive functions. We see cohesion as a natural device, and interpret its various manifestations as simply differing degrees of connectivity on overlapping channels. A central square is a place for social cohesion, whereas a church connects its worshippers to the highest level, which is their creator.

Non-religious societies in some cases successfully substituted secular "sacred spaces" to hold their societies together. For example, communist countries built the "House of the People" or "Workers Club", which took the role of a gathering place for at least part of the community. In upper-income suburbs (for example, in gated communities) the same forces apply, but are unresolved because of total automobile dependence. There is no sacred space, no common meeting point and place of social interaction. Contrary to the intent of developers who build them, a clubhouse and community swimming pool in high-income suburban clusters do not serve this function. The urban geometry never establishes a common social value among the residents, hence leads to a serious lack of socialization.

The sacred place that we are describing is absent from contemporary urban construction (Duany *et. al.*, 2000). We see superficial copies created without any understanding of their deep cultural meaning. Consequently, a dramatic decline in the sense of community leads to a dramatic increase in social alienation. Certainly both the Right and the Left have never recognized the need for spirituality in the fabric of social housing. Nevertheless, a sense of the sacred is inherent in all traditional housing (in some places more, in some places less) independently of their origin. By contrast, military/industrial dormitories are not only rejected by their inhabitants, but are hated because no one can connect with their form and image. A human being cannot truly belong to those buildings, nor can the image of such a building belong emotionally to a human being, and thus people turn to hating them and eventually destroying them. Buildings of this type, built in the 1960s with the very best of intentions, abound around the world. They do not catalyze an emotional attachment to the large scale. Schemes to have "shopping streets" and kindergartens (as a substitute for sacred space) on the fifth floor of high-rise block housing proved ridiculous. Hard concrete plazas tend to be disconnecting and hostile, generating a feeling of anger instead of connectivity.

Christopher Alexander and his collaborators built social housing in Mexicali, Mexico (Alexander *et. al.*, 1985). A prototype house cluster was built around a builder's yard that served the construction needs of the neighborhood. That could have served as the sacred space. Whereas the houses themselves were a tremendous success (and survive with their original owners years afterwards), the builder's yard was not. The government failed to maintain it, yet did not give it over to another community or private use. It was abandoned, and its connections to the individual houses sealed off by the owners. The government never helped it to become a gathering place. No effort was made to endow a sacred value to the builder's yard.

The category of "the sacred" is being defined broadly enough to encompass the normative order of civic spaces, and it is important to include the full spectrum of social relations from the private, to the communal (parochial), to the public (civic). Traditional villages rise to the level of the communal, but NOT to the level of civic culture. Gathering places are important, not simply because they encourage communal cohesion (which tends

to be based on homogeneity), but because the range of different types of gathering places allows for a range of different kinds of social relations. Relations in public have as much to do with defining social distance as with cohesion. Often, the cohesion associated with urbanism is mediated only by the sharing of a common sense of place. Places are, in a sense, an embodiment of what we call "social capital". They ARE social relationships, not just containers or facilitators of social relationships.

There may be a problem with emphasizing the sacred in this discussion. In the third world even more than in places like the USA, the constituencies for social housing are often caught up in some form or another of democratization movement. Particularly in the global cities of the world, we don't wish to make it sound as if we are promoting a return to the condition of a kind of tribalism (which is the way traditional villages can seem). Places do require materialization of the "sacred", but not in the common usage of the word. Gathering places are important, but their structure (and their relationship to the social structure) is more complex than just acting as the containers or opportunities for people to bond. We need to look at the patterns of interaction in traditional cities as well as tribal villages and settlements that are homogeneous by class. Those patterns of interaction are structurally varied and are not simply about communal cohesion.

In conclusion, a settlement must, above all else, establish a sacred structure by some means, so as to connect emotionally with its residents. Sacred structure also helps people to connect to a higher order. This higher order encompasses three functional features: (a) it is *used* as a cohesive means to form community; (b) it is *constructed* upon the cooperation of the discourses of a group of people and is not the unilateral decision of an individual; and (c) it is loaded with a powerful *meaning* for the community. If most or all residents connect with the physical sacred structure, then they connect indirectly with each other. This simple principle establishes a sense of community, which survives the difficult conditions of life. It keeps forces oriented towards maintaining the physical structure of the community, instead of turning them against the physical structure in those cases when it is not valued.

6. Utilizing the Work of Christopher Alexander.

Many times during his long career as architect and urbanist, Christopher Alexander was asked to plan and construct social housing. In every case, and often in opposition to the brief provided by the government agency that hired him, he insisted on user participation. He clearly saw that this was the only way to produce built forms that are "loved" by their occupants (Alexander, 2005; Alexander *et. al.*, 1985). Each of his projects began with the essential framework of involving future users in planning their living space, and shaping the configuration of streets and common areas. In some cases, this led to the support being withdrawn by the sponsoring government, which surmised that such a scheme would severely weaken its control over the geometry of the project.

We believe that Alexander was entirely right in insisting on participation as a basic principle. He correctly predicted that housing built by someone not involved in the world and daily realities of the resident would lack certain essential qualities. As a result, its inhabitants could never love the place. Even if the houses were all built following exactly the same modular typology, participation in the planning or building process guarantees

that the eventual users have a personal stake in the final product. Most people could not care less about a design's formal virtues: they just want something they can truly consider their own.

Alexander's most recent work (Alexander, 2005) establishes a temporal ordering for any construction if it is to be adaptive to human needs. That is, it matters enormously what is designed and built before, and what comes after in the sequence of design/construction. This practice was followed since ancient times in the Near East and was codified in Byzantine and Islamic urbanism, which influenced all regions affected by these civilizations (Hakim, 2003). Its scientific foundation as part of the general processes by which a complex system is evolved is a new contribution, and has been theoretically shown to be crucial to the success of any project. It is now possible to outline the correct order in which components of a housing development can be built to ensure sustainability.

For example, Alexander reveals the steps in designing healthy urban fabric. These of course depend very much on scale. Since one priority is how a settlement connects to the rest of the city, an area of up to 1 km^2 will usually be tangent to one of the main streets, whereas areas larger than that will probably need a major street that goes through them.

1. Major circulation routes are determined as part of the integrative core of the city and the adjacent urban area.

2. Major public spaces are identified to tie in with topography, natural features, and major lines of movement.

3. Secondary street alignments are laid out making 60-150 meter intersections with major streets and spaces.

4. Pedestrian space is defined by the building fronts, and is accessed by, but physically protected from vehicles.

5. Buildings are situated so their front walls define the urban space as coherently as possible — no setbacks, and few gaps.

6. Roads arise as the consequence of linearizing and connecting segments of well-defined urban space. If the living form of the place is to be respected, roads CANNOT be built first, especially if their perceived functional requirements are then allowed to dictate the form, scale, and quality of urban spaces.

Failure to follow this sequence inevitably leads to dead urban fabric. The correct application of this sequence can only come about after convincing the authorities to implement a different construction practice than is usual nowadays. Nevertheless, there are overwhelming theoretical reasons for insisting on this sequence. The steps were followed in countless traditional settlements, forming towns and urban quarters before the era of industrialization. When the main mode of transport is still pedestrian and low-speed traffic (animals, carts, only a few jitney buses and pick-up trucks, etc.) it is easy to give priority to space and buildings. Once the automobile takes over, however, it begins to dictate a new priority, which reverses the above sequence. The planner then sacrifices traditional urban fabric to fast transversal movement, and this ultimately leads to a dysfunctional and unsustainable design.

Alexander has applied these principles in several projects of social housing, including

Santa Rosa de Cabal, Colombia (Alexander, 2005: Book 3, pages 398-408) and Guasare New Town, Venezuela (planned but not built) (Alexander, 2005: Book 3, pages 340-348). Another successful recent example is Poundbury, England, by Léon Krier (1998). Interestingly, the latter is an upper-income development, in which a significant fraction (over 20%) of subsidized residents are included; those are financed by the Guinness Trust, a non-governmental organization. We are going to extract working rules from those examples, and present them in this paper.

7. Iterative Design and the Emergence of Form.

A new community cannot simply be inserted into cleared land (it could, but then it is not adaptive, and does not form a community). We envision step-wise growth rather than building everything all at once. The design must be allowed to evolve, and cannot be decided at the beginning. A master plan — in the sense of deciding exactly where future construction is to be placed, and exactly what form it will take — is too restrictive and thus highly incomplete. Social housing that follows this mindset by being planned on paper, and then constructed according to plan fails to form a living environment. Following Alexander, we advocate a process in which every future step is influenced by what exists at that point.

Careful consideration of the topographic features, the existing vegetation, the entry points, etc. should indicate a loose morphology for the entire settlement at the beginning of the planning process. After getting a very rough idea of the placement of buildings and main access road, then individual lots can be envisioned along the roads, which are themselves still not completely specified. Nothing is yet built, and major decisions take place by using wooden stakes and other markers in the ground. In order to guarantee morphological coherence, what is built is influenced by its environment. This interaction is experimentally determined and cannot be worked out on paper or anticipated, due to the complexity of all the mechanisms involved. In a partially built development, the next house or street segment to be built has to adapt its geometry to what was built previously.

Any decisions made at the beginning of the project must be regarded as recommendations, and not as rigid dictates (unlike those in a master plan). As the project develops in time, decisions made at the beginning for unbuilt areas will now seem incorrect, no longer relevant, so we need the possibility of changing the design continuously as more building takes place. This is exactly what occurred in historical communities built over a time span of centuries. This adaptive procedure (adapting to human sensibilities about the emerging forms and spaces) generated extremely coherent complex geometries in traditional villages and towns, and that coherence cannot mathematically be achieved all at once.

An iterative process goes back and forth between steps, improving each one in turn. That's what we are describing in adaptive planning and design: first form the conceptual idea on the ground, then introduce the position and size of future built elements without yet building them, then go back to refine the urban spaces, and so on. It is only in this way that the interaction of all the components with each other, and with their surroundings, can effectively take place. Once components begin to be built, then they become part of the surroundings, and in turn influence all future built elements.

Healthy urban fabric is an extremely complex system, and it cannot be designed and built in a strictly top-down fashion. Some components could be accomplished top down, by someone who understands the required complexity. The ordering has to be emergent from the process, and not simply an imagined outcome imposed by regulatory fiat. There has to be adaptive capacity that is distributed and pervasive in a process that is inclusive. Cities and neighborhoods are "things that people do together", where a community exercises its territoriality in a positive manner. Any top-down intervention has to be oriented to facilitating that collaboration, not dictating its terms or forcing it into an overly rationalized container.

8. Examples of Patterns and Generative Codes.

Patterns summarize discovered design solutions that make people most comfortable in experiencing and using built form. Their relative merit is that they were decided on a firm (in many cases scientifically valid) basis, rather than being just another opinion. The use of patterns and pattern languages is described in the readily available literature (Alexander *et. al.*, 1977). We now describe some patterns for those who may not have seen them before. Mainstream urbanism has neglected the tremendous potential offered by pattern-based design, chiefly for ideological reasons. Pattern-based design liberates the individual but restrains some of the most profitable (though inhuman) aspects of the building industry.

In building dense urban fabric, one pattern imposes a four-storey height limit for residences (Pattern 21: FOUR-STORY LIMIT). Above that height, a resident feels disconnected from the ground, and from any societal functions, which always take place on the ground. This pattern immediately invalidates high-rise apartment blocks, which are simply a failed social experiment on a vast scale, driven by iconic symbolism. Another pattern requires access to trees (Pattern 171: TREE PLACES). Trees are necessary for a human environment, and their planting has to be carefully thought out to cooperate with nearby buildings and define a coherent urban space (Gehl, 1996; Salingaros, 2005). Alternatively, existing large trees must be saved, and buildings introduced in the same careful and flexible manner (and not according to some arbitrary grid), so that the buildings and trees cooperate to create an urban space. The trees combine with the path geometry and external walls to define a usable urban space, whose dimensions and path structure invite use.

The point we are making (summarized in this particular pattern) is to use trees and buildings together to define a sacred place. This is far removed philosophically from planting trees simply as visual "decoration", which simply reinforces the geometry of power. There is a pragmatic reason for this. Unless a tree is protected by forming part of a sacred place, it will soon be cut down and used as building material, or as fuel for heating and cooking. This idea follows the same principle of protecting cows necessary for plowing by making them sacred animals. Then, the cows are not eaten during a famine, so they can be used for agriculture the following season.

In practice, one chooses several different patterns from Alexander's "A Pattern Language" (Alexander *et. al.*, 1977), and begins to design the settlement. As work progresses, one has to go back and work with more patterns as different design needs arise. Another set of patterns helps to guide the street layout. Alexander originally used patterns

in 1969 to design social housing in Peru (Alexander, 2005: Book 2, page 352). The way that different patterns have to combine together is outlined in (Salingaros, 2005: Chapters 8 & 9). Some architects characterized patterns as an incomplete method, because they could not successfully combine them. Nevertheless, patterns are only one component of a system of design, and their combination has to follow other principles not contained in the patterns themselves. Work by Alexander and others (including the authors) continues to develop the applicability of pattern languages in architecture. Particular insights are being gained from the dramatic success of pattern languages in computer software design.

A far more serious factor that has worked against the adoption of patterns for design is that architecture and urbanism have, for several decades, rested on a philosophical basis of qualitative relativism. This claims that all judgments in architecture are matters of opinion and taste, and architecture is therefore little more than an act of personal expression. Such relativism is in marked contrast to the insights of science, where discovered facts about the structure of reality are found to underlie matters of apparently individual opinion. Architects and urbanists inculcated in the relativist tradition disregard observable structural effects and evolved solutions. They consider patterns as just another opinion, and one that can be safely ignored (especially as patterns directly contradict the military/industrial typology). But patterns are observable clusters of recurrent configurations of response to recurrent design problems, which constitute a discoverable form of "collective intelligence" in human life and civilization. Note that this collective intelligence has to do with the way we operate in the context of the relationship between built form and our values, aspirations, social practices, etc.

In the age of professional specialization, the built environment has been increasingly subjected to a proliferating array of experts who each bring their discipline to particular kinds of problems. This is often at the expense of the ability to see (much less address) the overall challenge of creating living, beautiful, or sustainable places. The notion of a collective intelligence embodied in patterns should not be understood as a claim to have discovered a final truth, but rather as recognition of the importance of a living process. It re-establishes the cultural capacity to engage in place making as a collaborative social process. Success is not measured in abstract terms, but rather by the local experience of continuous improvement in the quality and sustainability of human settlements. The use of patterns in design provides a necessary foundation for a collaborative method that is adaptive and particular to a place (i.e., the constraints of the moment), yet is also capable of responding to human aspirations for something better.

Even when patterns are used for design, the designer must make sure that the project is worked out and built in the correct sequence. This new approach to planning is based on the realization that the emergence of an adaptive form has to follow a specific sequence of steps. Adaptive design requires a "generative process". A living design is never imposed: it is generated by a sequence in which each step depends upon all the previous steps. The patterns themselves tell you nothing about the proper sequence, however. For this, one has to go to Alexander's most recent work (Alexander, 2005). Others support the need for a generative process. Besim Hakim reached this conclusion through the overwhelming evidence available from his research on traditional towns (Hakim, 2003).

9. Construction Strategy.

Both pattern languages and generative processes and codes (either explicit or implicit) have been around for millennia. Pattern languages were codified into practical form thirty years ago. Codes have been used in traditional architecture, and fixed (non-generative) codes widely implemented by one of the authors (Duany & Plater-Zyberk, 2005). Fixed codes are form-based and tell you exactly how to structure the geometry of an urban environment. Generative codes are more recent, and have the additional capability of evolving the form with the project. They tell you the sequence of steps but leave the form of the end product unspecified. They also distinguish between an adaptive and a non-adaptive set of codes (i.e. those that either generate, or prevent living urban fabric).

Even though a particular project will require careful adjustment to local conditions, these two methods acting together will serve for most cases. We can begin their immediate application using published material, with on-site experience leading to further refinements in the process. In very broad terms, here is how one can follow our suggestions:

1. Use pattern languages to plan the transportation network long before any building takes place. This is essential for generating village and neighborhood centers. Rigid grids favored by central government do not create the necessary nodal connectivity of the urban quarter.

2. Use pattern languages (and develop new ones appropriate to the locality) to construct a urban quarter for a complex society consisting of children, adults, seniors; and including housing, stores, retail, schools, informal spaces, transportation hubs, etc.

3. Existing simplistic (and consequently antihuman) monofunctional zoning must be rescinded by central government. Without that step, all planning schemes preclude urban life from the beginning, regardless of what they might look like.

4. Encourage construction systems (controlled from the top down) to work with local future residents (working from the bottom up) so as to generate low-cost, higher-quality dwellings.

5. Use pattern languages to rehabilitate existing low-income owner-occupied houses, and to convert current rental units to owner-occupied. This requires an infusion of money, but it also generates construction work.

6. Use pattern languages and the notion of the city as a network to orient interventions globally. Larger-scale and longer-term processes will insure that in addition to building housing, projects are conceived and implemented to complete a sustainable neighborhood, well connected in a larger urban setting.

The process starts with identifying the right land. A major problem is that much informal housing is pushed to marginal and problematic land, on which it can be impossible to upgrade. It is necessary that the architect/planner in charge of the project be knowledgeable in pattern languages and their application. Since most architect/planners today are not, we recommend that, at least for the next several years, governments rely on someone familiar with this material to oversee construction projects. A number of professionals are available with this knowledge, though not enough to satisfy the demand. Hopefully, enough young architects can be trained in the following decades to direct new projects.

One important point concerns building permissions. Because of the organic variability of different components of the project, it is prohibitive in both resources and time to prepare final drawings and get each one of them approved. Planning permission is nowadays usually given for an explicit documented plan specifying every detail of the design, instead of a general process that can produce similar but individual designs. Alexander solved this problem by getting government permission for a specific building process (a set of building operations, within clearly-defined parameters) that generates similar but distinct results. All products of that process were thus automatically approved without further need for individual permissions (Alexander *et. al.*, 1985). It is important to get approval from the authorities for the PROCESS rather than for a set of final drawings. If this is not possible, then it is best to get approval for a generally suitable structure that can then be modified under this process.

10. Layout Strategy I: Armature of Services.

Following is a rule-based layout strategy that one of us (AMD) has observed working in Santo Domingo, Dominican Republic. It offers a template that planners can work with: a simple but effective armature on which a sanitary and humane settlement may self-organize.

What follows are guidelines for the MINIMUM income favela. There are more rules for the next step up in income, including the accommodation of cars. But anything less than this set of rules tends not to work, so they form a core upon which other rules are added.

1. The government must plat lots and grant ownership with paper and recorded deeds. These can begin with "notional" lots that can be defined later through a "generative" process, and surveyed and recorded afterward.

2. Lots should be within blocks defined by a network of street reservations. Each block must have a pedestrian alley reservation at the rear of all the lots. Lots may vary in size and shape but should not be less that 6 m wide and 20 m deep.

3. The government must grade the land within the block so that it drains to the street. The streets must in turn be graded to drain away from the inhabited area.

4. The government must build concrete sidewalks on both sides of the street reservation (but not necessarily pave the streets). The channel formed between the sidewalks will contain the draining rainwater. The streets also provide firebreaks.

5. At a minimum of one place on the alley, there must be a tall pole with electrical supply from which the residents can connect themselves and freely use the electricity. Do the same with a couple of clean water spigots. There should be one large latrine (with gender separation) per block. One can start taxing collectively for these services once construction is well under way.

6. The lots, as they are built out, should retain a clear passage from alley to street. This encourages rooms with windows and also allows the lot and the block to drain to the street.

7. The residents will construct their buildings themselves, at their own rate; but they must build at the edge of the sidewalk first. The rear comes later. One can require that the frontage wall be concrete block. Their roofs must not drain to a neighboring lot.

8. Corner lots are reserved for shops. All lots can be live/work units.

9. Non-criminal commercial initiatives and private transit operations must not be prohibited (even better to actively encourage them).

10. The various government and resident responsibilities listed above are established by a simple contract: "The government will do this … the resident will do this …"

11. It is possible to ask the residents to pay for the lots, after construction is done, a small quantity at a time.

In addition, there are many social control issues that we are not going to deal with here, but which need to be empirically observed. This is only a physical code, and thus only part of the whole solution that will make the project livable. The establishment of legal boundaries is a government function. But it should not be assumed that we propose to do this first, as a top-down act. Laying out the plots involves preliminary owner participation. The really remarkable thing about the morphology of owner-planned places is the power of their self-organization, which is the process that Alexander's generative codes are trying to exploit.

11. Layout Strategy II: Generative Code.

Alexander (2005: Book 3) has applied more advanced "generative codes" to projects, and we summarize here part of his procedure. This is a more incremental version of the "armature of services" layout methodology described previously.

Alexander observed the self-organizing processes that have created many informal settlements throughout human history, and sought to develop rule-based "generative codes" to exploit these processes. Their natural geometry is so strong that in looking at an aerial view of Querétaro, Mexico, for example (where one of us conducts research), the urban morphology of the informal settlements looks very much like widely admired villages of Provence in France or Tuscany in Italy. They all have subtleties of adaptation to terrain, view, differentiation of commercial functions, and other autopoietic (self-organizing) features.

The challenge is not to build on a *tabula rasa* (i.e., by first wiping everything clean) a structure based on a template in advance, but to get plumbing and other humane elements into these already-complex and sophisticated "medieval cities". We want the organic complexity and adaptive character of "bottom-up" activity, with some of the standards and conditions of social equity that have typically relied on "top-down' interventions. There is a way to lay these out sequentially, iteratively, according to a simple series of rules, as the generative codes propose to do. After that is accomplished, then the result is surveyed and the boundaries are recorded for legal purposes.

A generative layout, including streets, establishes the plots according to topography, existing natural features, and the psychological perception of optimal flow as determined by walking the ground. Then the platting process follows — not the reverse. That would be the Alexandrian approach to "medieval cities with plumbing". Although it could all occur in advance, as part of a "generative code" process by the community, it just has to be stepwise. Layout should not be template-based or designed to look nice from an airplane.

To get the emergent complexity of a living neighborhood, it has to be iterative, and determined on-site. You have to really be sure the organic unfolding can happen, which is not easy in a rigidly codified world. We have the challenge of conjuring good processes out of circumstances that present many constraints and obstacles.

This of course reflects the medieval pattern of laying out streets and lots. It also follows Léon Krier's dictum that the buildings and social spaces come first, then the streets (Krier, 1998). In medieval cities, the process was highly regulated. A grid-based city can also be well ordered: our point is to use the most adaptive grid for the location, which grows from the terrain. The practical implementation of even a radical generative process is not as difficult as one might think. One gets around the legal problems posed by conventional subdivision law by creating rough "plug" lots that are then laid out in detail according to the generative process; then the plat is made final with a series of lot-line adjustments and right-of-way dedications. There is usually some way to override the conventional processes to achieve this kind of thing, but the government must be supportive and not block the process because it departs from established practice.

Getting into more detail about the layout, the main street has to be laid out approximately based on the topography and connection to the outside. Next, decide on the urban spaces, envisioned as pedestrian nodes of activity connected by streets. Next, side streets that feed the main street are decided — even though streets are still only indicated using stakes in the ground. Next, define the house positions (not yet the lot; just the building) using stakes in the ground, so that the front wall reinforces the urban spaces. Each family now decides the total plan of its house so as to enclose a patio and garden in the back. This process is constrained by adjoining streets, alleys, neighbors, and is meant to make the eventual patio and garden spaces as coherent as possible — semi-open spaces that feel comfortable to be in and work in, and not just leftover space. This finally fixes the lot, which is then recorded. Plans are drawn from stakes in the ground.

As lot lines begin to be decided, then the streets can begin to form more definitely in plan (but not yet built). Streets are meant to connect and feed segments of urban space, which themselves are defined by house fronts. (Note that this is the opposite of positioning the houses to follow an existing street). Flexibility in the street design will be retained until houses are actually built. Clearly, you are not going to see many straight streets running across all the development (to the shock of government bureaucrats), because they have not been dawn on the plan at the beginning. Nor do streets need to have a uniform width: they open up to urban spaces. Streets evolve as the whole development evolves. Now begin construction. First build the sidewalks, then the houses, and pave the streets last — if at all.

A more detailed layout sequence in included in the Appendix.

SECTIONS 12-16: PRACTICAL SUGGESTIONS FOR MAKING PROJECTS WORK.

12. The Role of the Architect/Coordinator.

Our experience with construction projects leads us to propose an administrative rule. That is to make a single individual responsible for achieving the "humanity" of an individual project. The government or non-governmental agency funding the project will appoint this person, who will oversee the design and construction, and will coordinate user participation. We suggest that this task not be delegated to an existing employee of the government bureaucracy, or to an employee of a construction company, for the simple reason that such persons don't have the necessary expertise in the design process we are advocating. Ideally, it should be a person who has a professional understanding of these issues, and who has an independent professional sense of responsibility to oversee their proper implementation.

This architect/project manager will be responsible for making the difference between creating a military/industrial appearance, versus a human, living feeling in the final project as built. Again, this is not a matter of aesthetics (which would be immediately dismissed by the funding agency as irrelevant to poor people) but of basic survival. A project perceived by its inhabitants as hostile will eventually be destroyed by them, and in the meantime destroys their own sense of self. As much as we believe in collaboration, it has been shown that people in need of social housing don't always have the organizational capacity to work together to get the project done. Their input is absolutely necessary in the planning stages, but here we are talking about someone on the "outside" who will be responsible to the residents, and who will carry the responsibility of insuring their wellbeing when pressured to cut costs and streamline the construction process.

A crucial part of the role of the project manager has to be defined in terms of multi-layered facilitation of the process. The project manager will often need not only to encourage engagement, but also to teach it to people who are not used to it, and who may lack the habits and skills of effective participatory action. Participants may come to the process with a deep distrust of any method that relies on the efforts of others. Part of the challenge in a new settlement, therefore, will be to create an orderly, reliable, and effective collaborative process that can engage a population — but such people may well be traumatized as the result of prior dislocations and social upheavals. One cannot assume that a pre-existing community will have already established the necessary norms and commitments required for such engagement. The project manager's role will inevitably involve a certain amount of what is commonly called "community building", organizing, and leadership training.

When the project is complete, the architect/project manager should get a fee for his/her job, adjusted to the degree that it is well done. Resident feedback rather than declarations by architectural critics should be used as a basis for judging this success. It is not unlikely that a project will prove to be sustainable and successful for decades to come, but will be condemned by narrow-minded ideologues as looking "old-fashioned", or as resembling a favela too closely for political comfort. Many people in power have fixed visual notions of what a "clean, industrial, modern" city ought to look like — based on outmoded and irrelevant scientific concepts — and refer back to those utopian images when judging a living environment.

We are in fact advocating a bottom-up social approach with a strictly top-down intermediate administrative level. Unless a clear responsibility and autonomous administrative system is laid down, what we wish to see accomplished will never get done.

The impersonal government bureaucracy will never take the trouble to make a place human and livable; it can more easily just follow uncreative rules of modularity and mechanical combination. The construction group is not responsible: it wants to finish its job in the minimum time and make the least number of adjustments. The residents are not politically powerful to guarantee a livable environment. Within the realities of construction, a project requires an advocate with the power to coordinate all of these forces.

13. The Need for Adaptable Materials.

A major though neglected factor behind the choice of materials is their emotional attractiveness to the user. Wealthy people pay a lot for "friendly" materials so that their surroundings give back emotional nourishment. Self-built housing follows the same unconscious principles, using inexpensive and discarded materials in imaginative ways to create an emotionally satisfying environment (arrogantly dismissed as merely "primitive" artistic expression). Contrast this with the hostile surfaces regularly chosen for social housing in an effort to make those structures more durable. Such "hard" materials and surfaces give the impression of dominance and rejection. It is possible to create durable yet friendly surfaces, even though planners have not thought it worthwhile to take the trouble to do that for social housing.

To complicate things further, the issue of desired building materials runs straight into hidden prejudices and images of self-esteem, often culturally specific and perhaps even locally particular. Controlling agencies in some cases ban what they consider to be "low status" building materials, such as Adobe (whose surface is both "friendly" and easily shaped, unlike concrete). But in many cases, it is the owner/builders themselves who shun those adaptable materials in regions where they are used in traditional construction. Hassan Fathy simply could not get poor people to accept living in traditional mud houses (Fathy, 1973). This is a major problem worldwide. It's the image — representing the despised past instead of the promised utopian future.

The ultimate solution to this problem must be cultural. Citizens must rediscover pride in their own heritage and building traditions, and the great value and pleasure they afford. At the same time, the myth of a utopian technological approach must be exposed for what it is — a marketing image meant for the gullible public — while the real benefits of modernity are shown to be entirely compatible with traditional practices (e.g. plumbing, electricity, appliances, etc). In this way, we can regenerate the "collective intelligence" embodied in cultural traditions, and infuse it with the best new adaptations.

As the author Jorge Luis Borges put it: "*between the traditional and the new, or between order and adventure, there is no real opposition; and what we call tradition today is a knitwork of centuries of adventure*".

When a government builds social housing, it wants to solve two problems at once: to house people who lack the means to house themselves, and to use up industrial materials so as to stimulate the economy. There is a very good reason for the latter, as the government is plugged into the largest manufacturers of industrial building materials. It is in the interest of the economy to consume these materials in sponsored projects.

Nevertheless, that may not be the best solution for the housing. There are two reasons for this: one having to do with economics, and the other with emotional connection.

An owner-built favela uses cheap, disposable materials such as wood, cardboard, corrugated metal sheets, rocks, plastic, left-over concrete blocks, etc. While there is an obvious deficiency with the impermanence of such materials (which turns catastrophic during storms or flooding), their tremendous advantage is their adaptability. Owner-builders have an enormous freedom of determining the shape and details of their dwellings. They utilize that design freedom to adapt the built structure to human sensibilities. That is not possible when a government builds house modules out of a much more durable material such as reinforced concrete. People must be able to make changes as a matter of principle. Here we have the opposition between permanence/rigidity and impermanence/freedom, which influences the form of buildings.

Social housing should be made of permanent materials, whereas cheap, fragile buildings are a disservice to people. Favelas built out of sticks and cardboard are unacceptable models to follow. Nevertheless, we wish to preserve as much as possible the DESIGN FREEDOM inherent in using more impermanent materials. That is essential to guarantee the design adjustments that will generate a living geometry. In the best self-built houses, every scrap of material is utilized in a very precise manner so as to create living urban fabric — a sophisticated process that compares with the greatest architectural achievements anywhere. The only solution we see to this conflict is for the government to provide appropriate materials (permanent, but also easy to arrange, cut, and shape) that the users can then employ in constructing or modifying their own homes.

We always come back to the competition between permanence and adaptability. Adaptive changes to form are akin to repair and self-healing in an organism, but are often misinterpreted as a degradation of the project. In fact, the geometry is trying to heal itself (through human action) after the imposition of unnatural, alien forms. This is a natural organic evolution, and should not be discouraged simply because it contradicts an architect's "pure" vision of how people SHOULD live. We most emphatically condemn as inhuman the present practice of forbidding any modifications to social housing by their residents. Tied in to our suggestions for ownership, we uphold the fundamental right for an owner/resident to modify his/her dwelling to any extent without impinging on the rights of neighbors or the public space.

While the original intent of legislation forbidding changes to one's dwelling was sound, it never achieved its goal. Its aim was to legally prevent the destruction of buildings that the government had invested money in. This has never worked, however. Buildings that are hated by their residents (because of their hostile geometry and surfaces) have been systematically vandalized and destroyed, and no legislation has been able to prevent this. The ever-escalating use of hard materials only led to fortress-like housing units, but their residents hate them even more and eventually destroy them. Oppressive surfaces and spaces damage one's sense of wellbeing, thus provoking a hostile reaction. The solution lies in a different direction altogether: make housing units that are loved by their residents, who will then maintain them instead of destroying them.

In his project in Mexicali, Mexico, Alexander introduced an innovative method of creating bricks on site using a hand-operated press and local earth (Alexander *et. al.,*

1985). He emphasized this as a crucial aspect of the project, even though concrete blocks were readily available. One reason was to establish a local supply for all future residents. Concrete blocks are not expensive, but they still set up a financial threshold. Another reason is that they also narrow the design possibilities. Standard concrete blocks lead to standard structural configurations, ruling out some of the adaptive shapes and processes that Alexander wished to introduce.

There are opportunities for the building industry to participate through government directed efforts in these new social housing projects, by providing industrialized elements that can be included with versatility in many cases. One of the authors (EPP) has developed a model for self-construction using cheap and ubiquitously available materials such as rammed earth for the perimeters, together with the introduction of low-cost industrialized sanitary modules that include water storage, toilet, sink and shower along with a filter for gray-water treatment for recycling. The proposed modules may also have structural uses, and include solar cells for electricity and solar panels for water heating and even cooking. These industrialized modules can be massively produced, lowering costs and providing technology, while at the same time allowing the necessary flexibility and freedom of design and evolution of the units.

One of us (AMD) has investigated this concept more recently for a project in Kingston, Jamaica. This "wet appliance" cost-effectively delivers the sanitary and mechanical cores, the most expensive elements of a home, while combining the ability of homeowners to build their own well-adapted dwelling.

We should mention a case where such industrial modules were reduced in complexity so that the building could be initially more adaptive to social needs. Alexander in 1980 worked on building social housing in India, and considered using a prefabricated concrete box containing plumbing for bath, toilet, and kitchen (Alexander, 2005: Book 2, page 320). This solution followed successful earlier projects by Balkrishna V. Doshi. It soon became clear, however, that building a solid plinth (a platform representing a traditional pattern) for each house was actually more important in the building sequence (because it was a priority for the residents) than having the plumbing box. So Alexander decided to spend the limited available money on the terrace, leaving a groove for future plumbing additions. Residents were able to use communal water and toilets until they could build their own facilities. The platform was more vital to the family's life than the plumbing box.

14. Funding Strategy Concentrates on the Small Scale.

Social housing construction cannot be financed entirely by the residents, thus a government or non-governmental entity has to step in and shoulder the costs. In itself, this simple dependence raises issues that affect the shape of the construction. Involving future residents in building their own houses will reduce the initial monetary outlay. The more money invested by an external agency in social housing, however, the more control it will wish to exert over the final product. This natural consequence inevitably leads to the subconscious adoption of a geometry of control, as was outlined in a previous section.

We can offer a few alternatives:

1. Funding sources now determine social housing morphology. Central government,

wanting to build in the most efficient manner, reverts to a highly prescriptive approach, and is willing to sacrifice complexity of form. That attitude cannot generate an urban quarter. We need to develop a flexible, performance-based standard for morphology. We also need to identify alternative sources of funding to break the prescriptive monopoly, and thereby to break out of this antipattern.

2. Raise funds from various sources in order to ensure that homes are affordable to neighborhood residents. A private-public partnership is the most effective way of using the market economy to generate an urban quarter, instead of a monolithic monster favored by government bureaucracy.

3. Involvement with non-governmental organizations will keep a suspicious central government from sabotaging the use of pattern languages in building an urban quarter, or in converting an existing dysfunctional project into an urban quarter.

We are sadly aware of numerous projects of social housing that do not serve the poor, but are simply investment opportunities for the builder or landowner to siphon money from the government. If the government subsidizes rents, then the opportunity does exist for speculative building that will recover initial construction investments (with interest) from rents alone. In such cases, the physical condition of the residents is of little importance. Moreover, the maintenance and future condition of the built fabric is not a part of the profit equation, since there is no expectation of recovering investment from the building structures themselves. It is usually expected that the buildings will decay, thus encouraging non-permanent construction from the very beginning. Clearly, subsidized rents can work against humane social housing, contradicting the intention of the original legislation.

Often, feasible, sustainable, and affordable solutions are rejected for reasons of excessive greed. Good affordable housing has the disadvantage that profit margins are always low (unless the market is manipulated to create an artificial scarcity). If the government or the developers fail to see opportunities to get rich in the process, they may decide to withdraw support from a project, even if they have pledged their support initially. You need a profit to encourage participation, but that has to be balanced with the payback from solving a serious societal problem.

Involvement with non-governmental organizations (NGOs) requires that housing authorities build not only public-private partnerships for redevelopment, but also elaborate networks of local partners. All of these benefit from the allocated money. However, one of the weaknesses here is that, while agencies have been good at getting the local social service providers and city agencies to cooperate, they have not been so good at engaging the support of the tenants. Most social service providers are still operating according to the old model of service provision, rather than the newer emerging models of "community based" solutions to a wide variety of problems. The old social service model engages people in networks based on their particular pathologies (and there is a whole service industry that depends on what people lack). The new model engages people based on their gifts and what they bring to the network (and not what they "need"). This new model, based on the idea of asset-based community development, has had wide application in public health, and more generally in community organizing.

We also face a problem with funding sources that wish to minimize the administrative burden by concentrating on the large scale. It is far easier to give out money in one large

sum than to track the same amount divided and distributed out to many different borrowers. Reducing the number of transactions takes precedence over other systems based upon supply and demand. Nevertheless, it is crucial to have exactly this micro-funding flexibility for the people to be able to build their own houses. Repair of an existing neighborhood requires a vast number of small interventions. Promising work has been done in developing effective management systems to permit such micro-loans (e.g. the Grameen Bank). Again, this is actually a more sophisticated and more advanced financial model, as it is more highly differentiated.

Earlier in this paper, we mentioned the obstacle posed by ingrained geometrical images of control. Those are also tied to a deep prejudice against the small scale. A government project takes a certain overhead to administer, which is independent of the size of the project. Naturally, bureaucrats wish to minimize the total number of projects, which leads them to approve a few very large projects. For example, faced with building a new urban quarter, they wish to build it as large as possible, and all at the same time, so as to economize on the bureaucratic overhead. That approach contradicts our suggestions of building an urban quarter one small piece at a time, and iterating back and forth between the design steps.

15. Working Within the Existing System.

The planning and building system as it exists today creates and perpetuates a dependence that is difficult — and in most cases, impossible — to break. By raising building standards beyond the point that can be reasonably satisfied by self-builders, it shifts the whole housing industry from being local and small-scale, to being large-scale. Building-code standards have evolved in response to real and serious threats to health and safety. Like many such technological systems, however, their unintended consequences are not trivial, and can be disastrous. This is happening today in the rebuilding of the American Gulf region after Hurricane Katrina.

The system in place works to benefit both government bureaucrats and larger contractors, who are often tied by mutual support. But what is seen as a benefit to a commercial/government system can spell disaster for another, major segment of society. One of us (AMD) has argued for a reconstruction of the Katrina devastation, using a strategy that allows the same social processes to flourish as before (Duany, 2007). That strategy faces daunting challenges because of the building, financing, and regulatory system now in place.

Many of the houses destroyed in the hurricane, particularly those in lower-income neighborhoods, were self-built and did not meet current code or financing standards. The urban fabric was the product of a relaxed process of self-building over generations, with the advantage that it was not based on debt. This was a society of debt-free homeowners, whose lives could be structured around activities of their choice (Duany, 2007). Those houses were outside the system, because their non-conforming construction made them impossible to mortgage. The system now requires a contract of debt, since the new building standards cannot be met without commercial intervention. In most cases, this means that the government has to step in and build social housing, solving a problem that it itself has created (Duany, 2007). The cycle of unintended consequences goes on.

To quote from Duany (2007): *"The hurdle of drawings, permitting, contractors, inspections — the professionalism of it all — eliminates self-building. Somehow there must be a process whereupon people can build simple, functional houses for themselves, either by themselves or by barter with professionals. There must be free house designs that can be built in small stages and that do not require an architect, complicated permits, or inspections; there must be common-sense technical standards. Without this there will be the pall of debt for everyone. And debt in the Caribbean doesn't mean just owing money — it is the elimination of the culture that arises from leisure."*

While this may be "leisure" by today's middle-class standards, it represents a hard life for a thriving and vibrant cultural fabric that is simply neglected by (even though it is a direct part of) the conventional economy. Inhabitants of the modern middle-class the world over take a debt-driven system for granted: much of their working life is spent just to pay off the house mortgage. In fact, the system works to preclude other options for putting a roof over one's head. The middle class attains liberation from the financial system only after retirement, when the 30-year mortgage has been finally paid off. Self-built housing erected by cash and barter is an escape from this system, and is viewed by the government and big contractors as a threat to their hegemony. It's a structural problem, not one of malevolent intent. Debt is key, but is just one variable of an interlocking system.

It is not easy to implement such innovations, because most countries and regions already have a well-established system that produces rigidly inhuman social housing (but which it believes, on the contrary, to be an enlightened and progressive solution). Many times in our projects, the first thing that we had to do is to begin studying the existing housing delivery systems so that we can override them. Those systems are created by interlocked bureaucracies, specialists, financial institutions, political entities, etc. You can build on the physical tangibles, but not on the systems. There is much that must be bypassed first — and they will resist their own dismissal.

We (the team of urbanists) cannot get directly involved in these strategies, which are the responsibility of the client and supporting organizations. The local entities have to solve procedural problems and forge alliances that will sustain the project, with us acting as a catalyst for change. One small section, or various independent units within the government could be promoting our project, while facing opposition from the rest of the bureaucracy. Most of the time, the problems with innovative social housing solutions are not technical, social, or even financial: they are almost always political.

You can try to force changes in design approach, and some good might come of it, but that only gets you so far. A project tends to become a power struggle, taking time and effort away from building. Alternatively, we can try to cooperate with the system, bringing stakeholders and facilitators together in unexpected ways. But this requires that we recognize working with an existing system as a different kind of problem — not linear, but multi-variable, and "cultural". It is necessary to be more embedded into the local operating system (a strong existing culture) in order to solve those problems, to have any chance of seeing where the levers are (so we can pull them to affect changes), and to see how decisions are made at various levels.

In most cases, a successful strategy will combine aspects of "working within the system" and reforming the system from the outside. In making an assessment, the first crucial step

is to lay out the critical limitations we find in an existing system of production. Then we should work to negotiate a "workaround" that addresses those limitations from the beginning, before attempting to dismantle the existing system entirely. It may indeed be necessary to radically transform the existing system, but that is a separate problem from the design and building of urban fabric, and we don't want to spend all our energies on fighting the system. On the other hand, if workarounds are not possible, there may be little alternative but to press for systemic reform.

Alexander (2005: Volume 2, page 536) shares his own experience with this struggle. In generating projects over a thirty-year period, he realized that a major shortcoming was that their implementation demanded too much. "*In our early experiments, we often went to almost unbelievable lengths to get some new process to be implemented, and to get it to work. But the amount of effort we had to make to get it to work — the very source of our success — was also the weakness of what we achieved. In too many cases, the magnitude of special effort that had to be made to shore up a new process was massive — too great, to be easily or reasonably copied.*"

Alexander in each case succeeded by replacing an existing system combining procedure, process, attitude, and working rules with an entirely different system. But the effort required to change the entire system, even in cases where it succeeded, was not easily repeatable. He concludes that here, like in a scientific experiment, it is the REPEATABILITY that is important, not the unique occurrence. If the process is not easily repeatable, then ultimately it is not as useful. Therefore, if a production method has too many components that are totally different from the previously working system, then it is not easily accommodated within the old method. It cannot be copied widely in regions where the old methodology still applies.

A genetic analogy, proposed by Alexander, suggests ways of achieving success in the long term. A process presented as a complete, complex system (like the genetic code for a whole organism), requires that its implementation must be either all or none. In that case, the existing system of implementation must change so as to allow the project to be built. If, on the other hand, our process is presented (and understood) as a collection of semi-independent pieces, each of which can be implemented rather easily, then there is a greater chance that one of more of those pieces will catch on. Small groups of practitioners, moreover, could apply each piece of the process, without requiring the support of the system. It is Alexander's hope that easily copied pieces of the methodology will spread independently, and that eventually this diffusion process will lead to an entire new "operating system" over time.

16. Maintenance Strategy Concentrates on the User.

Unless provisions are made at the beginning for the continued maintenance of the built environment, it will turn dysfunctional. Favelas and social housing projects can have very serious problems, but some are clearly less successful in a social sense than others, and their physical deterioration is seen to increase with time. This idea is in keeping with the organic conception of the urban fabric. All living entities require continual upkeep and repair: it is part of being alive. Here we may distinguish the two main components of life itself as separated into genetic and metabolic mechanisms. Genetic processes build the

organism in the first place, whereas metabolic processes keep it running and also repair it continuously.

The same processes, or their close analogues, apply to the urban fabric as an organic entity. Once built, it has to incorporate within itself the mechanisms for its maintenance. Maintenance does not come from a top-down process. We are disappointed at the widespread neglect of the forces responsible for the temporal evolution of urban fabric, and what is required to maintain it in healthy order. Many people somehow have an unrealistic, static conception of urban form. The organic model leads to several recommendations:

1. Encourage and support tenants to maintain their dwellings, by ensuring an emotional connection from the very beginning. The traditional subsidized rental solution has been disastrous. It is unlikely for a tenant to value a faceless material structure owned by someone else. It is possible, however, to establish a sense of collective ownership and responsibility. In a rental situation, it is all the more important to create conditions for effective and meaningful collective control and self-management. Literal ownership isn't always necessary. A stakeholder, in the usual sense, can also be somebody with a sense of ownership in the process.

2. Make it possible to own an affordable home, even if it is the most primitive type of dwelling. Encourage government financial underwriting, seen as a sound future investment that prevents social housing from being destroyed by its tenants.

3. Establish a strict legislated code of responsibility for the residents. The key to the success of such a code is that the residents must have a sense of ownership of the code. It is crucial that they participate in its formulation, and be part of its enforcement. Owners can be held accountable for maintaining their environment, whereas this is more difficult to achieve with renters. Since supply can never meet demand, owners can be made to care for their dwellings.

4. An observed rule of urbanism is that the level of provided services is proportional to the level of regulations and restrictions. Favelas get no services, and also have no regulations. At the other extreme, high-income gated communities get many services, but are also highly regulated.

The ability of tenants to maintain their dwellings cannot be achieved by requiring them to put in work time organized by a central authority (with the ability to evict them for noncompliance). "Maintenance" has to be connected to "governance." In the redevelopment of Columbia Point, Boston, the development company signed an agreement that split the management responsibilities with the residents — 50/50 control. The traditional problem with public housing has been that people would maintain the inside of their dwellings, but there was no collective capacity to take responsibility for the outside. The "defensible space" solution was to privatize or do away with public areas as much as possible — a step expressed in the project's geometry. That, however, led to increasing isolation and a fundamental change towards an introverted society.

The better solution is simply a pattern of well-defined distinctions between public and private realms, PLUS a collective capacity to take responsibility for the public space. Some of that capacity has to do with design that facilitates "eyes on the street" (front porches,

windows, etc.) but the eyes on the street only matter if they are backed up by conditions of trust, reciprocity, and collective efficacy. People often forget that Jane Jacobs' neighborhood worked not only because people could watch the street, but also because people had a sense of obligation as members of a certain kind of community (Jacobs, 1961). She described a characteristic of social environments that is now talked about in terms of "social capital". This is how one creates an effective "code of responsibility". If you try to impose it (as the housing authorities often do), then you get widespread noncompliance in the face of which no enforcement mechanism (no matter how intrusive) will work.

Ownership of homes does seem to be a good thing to encourage, from all the evidence. However, it is not true that renters can't be held accountable for maintaining their environment. Owners can be held accountable in so far as they have equity in their house, which means that they are motivated by concern for the exchange value embodied in their property. Renters can also have a stake in a place, but only if the social relationships involved are not reduced to the cold cash nexus — that is, a certain amount of square footage for a certain monthly fee. It is possible (and often happens) that renters can build up their "investment" in the use value of a place, depending on the extent to which they benefit from the specific networks of social relations that define the neighborhood. (Notice that Jane Jacobs' neighborhood wasn't a neighborhood of owners.)

It is also important to include a mix of rental and home ownership opportunities. Not everybody wants to encumber themselves with the responsibilities of home ownership, and not everybody can afford to maintain a house. One of the things accomplished in "social housing" should be that the everyday costs of housing are socialized, and not just the purchase price. Think about the way the co-housing movement has done the same thing. Some of the ideas from the co-housing movement might be incorporated in helping to insure maintenance.

(For those unfamiliar with this term, co-housing refers to a cluster of houses around shared common land, which usually includes a shared building for meetings and common meals — see Pattern 37: HOUSE CLUSTER in Alexander *et. al.* (1977). In our experience, the pattern works best when middle-class residents are strongly linked by common religious belief, as in Israeli Kibbutzim or some Christian sects. On the other hand, having poverty in common is not by itself a sufficient unifying factor!)

SECTIONS 17-21: SOME OF THE PROBLEMS FACING US.

17. Retrofitting and Sanitizing the Favela: Problems and Solutions.

Although this paper analyzes the process of constructing NEW social settlements, our approach could be adjusted to retrofit the favela. In ecological terms, we embrace and learn from our competition (the "species" in the lowest ecological stratum of urbanism) instead of trying to exterminate it. Governments wish that favelas would simply disappear (refusing even to draw them on city maps), and their residents spontaneously move to the countryside, but powerful global economic forces ensure that this is not going to happen. We, as urbanists concerned with housing the poor, must accept favelas as a social and

urban phenomenon, and try to make the best of an existing situation.

It is not always possible or even desirable to accept an existing favela and make it into a better place to live. First, it is often the case that squatter settlements have grown on polluted or toxic ground, on unstable soil, on steep slopes, or in a flood area. Periodically, their inhabitants are killed by natural disasters, and there is little that can be done to retrofit a settlement on dangerous ground in order to make it safer. Second, squatter settlements invade natural preserves that are necessary for regenerating oxygen needed for the entire city. These are the "lungs" of an urban population, and they must be preserved from encroachment and destruction. Third, squatter settlements produce pollution and human waste that damages the rest of the city. This problem cannot be ignored. Even if the government does not wish to legitimize a particular favela, helping it to treat its waste benefits the whole city.

Let us assume for the moment that social problems (which are particularly rampant in a favela) can be tackled independently of problems arising from urban and architectural form. One can easily go into an existing settlement and try to repair it, with the help of its current residents. John F. C. Turner (1976) did exactly that, setting a precedent for several successful interventions in Latin America, especially in Colombia. The only obstacle — and it is a profound one — is the philosophical conviction that the favela's geometry is out of place in a modern society. Under that mind set, any "repair" turns into annihilation and replacement. We need to truly understand the process of repair and self-healing of urban fabric, uninfluenced by current preconceptions.

Disagreeing with conventional planning beliefs, we accept the geometry of the favela, and point out its main deficiencies: a lack of services, sanitation, and natural features. In most cases the urban fabric is perfectly adapted to the topography and natural features of the landscape (simply because the owner-builders didn't have access to bulldozers and dynamite). What is usually lacking, however, is space for trees and green. The sad truth is that most trees are cut down and used as building materials. Vegetation competes with people for space. The poverty of the favela often includes poverty in plant life: it is a luxury here because of the extreme living conditions. Even so, many residents will try to maintain a little garden if that's at all possible.

Our method is highly flexible, and its principles remain valid even if the situation changes. A series of steps, taken a few at a time (and therefore very economical) can repair the favela's complex urban fabric. More than anything, we advocate a process of REINFORCEMENT, adopting much of the evolved geometry where it appears to work, and intervening to replace pathological structures. Plumbing and sanitary facilities are essential. Sidewalks are most important, and are sorely needed in a favela, which is primarily a pedestrian realm. Having real sidewalks raises the favela to a more permanent, "higher-class" urban typology. The existing building fronts determine exactly where the sidewalks should be built. Streets in a favela are usually of poor quality, if they are even paved, so electricity, sewerage, and water networks could be introduced under the streets. After many buildings are reinforced, one might finally pave the street.

Taking some straightforward sanitary measures can minimize filth and disease. One does not have to bulldoze a favela to get a healthier neighborhood. Doing that will certainly not raise the income level of its residents, nor improve their social condition. Putting the same

people into concrete bunker apartments may look good in a photo, but actually cuts their societal connections, ultimately making their situation worse. We know that when poor people are forcibly moved from a human-scaled neighborhood into high-rise blocks, their social cohesion worsens catastrophically. On the other hand, many social problems are simply not solvable by urban morphology alone.

A favela is usually built of flimsy, impermanent materials. The government can help its residents to gradually rebuild their houses using more permanent materials. We don't imply here replacing the typology of their house, but replacing say, the unstable roof or the walls (taking this opportunity to insert plumbing and electricity). A house made of cardboard and corrugated tin can be reconstructed in a very similar form using bricks, concrete blocks, and more solid panels provided cheaply by the government. Sometimes, the residents are only waiting until they get a legal deed to the land they live on; then they rebuild their homes using more permanent materials and financed by their accumulated savings. Otherwise, they are reluctant to invest anything more than the barest minimum in the structure.

Some readers will object to our accepting the overcrowding that is usual in a slum, and may even be outraged that we suggest maintaining this high density. Here we need to study high-density upper-income settlements in the same society, to decide how much density can be easily tolerated. It's not the high density by itself that is objectionable; it is the difficult living conditions that result from such density. It turns out that portions of high-density urban fabric can be maintained when it is made more sanitary. Unfortunately, such suggestions have been planning anathema up until now.

In some places, accepting the favela and legalizing its plots has come under sharp criticism from social activists who see this as a facile solution for a government to take. The accusation is that by simply legitimizing an unhealthy slum, the government abnegates its responsibility of building more permanent social housing. In our opinion, the magnitude of the social housing problem is so vast as to be near insoluble. The simple economics put a comprehensive solution out of reach. Our approach proceeds with one step at a time, retrofitting those portions of favelas that can be made healthy, while at the same time building new housing following an organic paradigm. If these steps succeed, then they can be repeated indefinitely, progressing towards a long-term amelioration.

Banks, governments, and building companies are captivated by economies of scale, and are less sensitive to economies of place and of differentiation needed to repair a neighborhood. Wielding a blunt and relatively primitive economic instrument, they would prefer to wipe out the neighborhood and build it all over again. It is much less trouble, and less costly in crude monetary terms, to do this. But of course, the unsustainability of this lopsided economic model (and its terrible cost to society) is becoming painfully evident.

Governments are reluctant to bother with small-scale urban interventions, but instead sponsor only large-scale ones since it saves them accounting costs (Salingaros, 2005: Chapter 3). And yet, living urban fabric has to be maintained by an enormous number of small-scale interventions, which is an essential part of the process of organic repair. Institutions such as banks (with an exception noted earlier, micro-financing by the Grameen Bank) are generally unwilling to bother with small loans meant for small-scale building in poor neighborhoods. All banks, however, operate also on a small scale

administering small accounts and loans. They possess the technical ability to service small loans, doing it routinely with credit cards, car loans, and personal lines of credit. Technology has evolved in the direction of differentiation and customization, aided in part by revolutions in software technology. Those innovations have yet to be applied in the realm of social housing, which still tends to follow the inflexible old institutional formats.

On a more positive note, many groups have discovered small-scale solutions of tremendous value. For example, in recent years concepts such as micro-financing, micro energy generation, mother centers, technology centers, urban farming, composting toilets, and other ideas have been successfully implemented. These small-scale processes can eventually make a hugely positive difference to both favelas and social housing. They are all in keeping with our insistence on the small scale as a mechanism for self-help in such communities, and also in establishing a sense of community in a dysfunctional population (Habitatjam, 2006). These small-scale solutions, representing resource independence, offer a healthy alternative to the forces trying to impose central control.

18. Uncomfortable Realities: Soaring Land Prices, Grand Schemes, and National Destabilization.

We would like to foresee some of the problems that could arise in an imperfect system (such as the real estate environment), in order to handle the hard realities of the market. The decision on whether to destroy, help to reinforce, or just ignore a favela is up to the government. We are faced with uncomfortable decisions, which affect the lives of many people already in a desperate situation. There is no simple solution, and no universal method can be applied in all cases. The best we can suggest is a cautious approach, without ideological prejudice, that will benefit the entire population as a whole. So often, anonymous but meaningful settlements have been destroyed in the name of "rational" design, which is nothing more than a tool to preserve the *status quo*.

Squatters require proximity to the city, which is why they move there in the first place. Proximity is essential for them, more so than for the more mobile middle class. Presenting poor people with well-built residences far away from town is not an automatic gift. Transferring the poor to government-built social housing outside the city may plunge them even deeper into destitution, as they then have to spend a greater portion of their earnings for transportation. Our own recommendation of establishing ownership contributes to undo the envisioned solutions, since well-built housing is often re-sold to middle-class residents, while the poor return to squatter settlements (either to their original one, or they build a new one). They prefer to use the profit from selling their new government-sponsored dwelling. In the rental economy, a system of sub-renting substitutes middle-class residents for the very poor.

As soon as a piece of real estate is legally registered, the transferable land title becomes a tradable commodity, and enters the free market (which could be an illegal submarket). Even if a plot is located in the middle of a slum, or in a not-so-desirable social housing project, its price could soar. Opportunities for gain can drive the consolidation of these land parcels into a few hands, not those of the original residents. This has in fact happened in many countries around the world, leading to a corrupt after-market in slum real estate.

Ironically, adding infrastructure to a favela raises its value, which can drive its original settlers out. In anticipation of such a process, speculation can run wild on unbuilt land.

A pervasive system linking corrupt officials with criminal organizations finds ways of profiteering from both slums and social housing. Despite the apparently insoluble socio-legal nature of this problem, we believe that our method actually helps in the long term. Firstly, establishing a tighter ownership of the urban fabric (in both social and emotional terms) reduces the opportunities for exploitation by trading it away. Secondly, much of the exploitation centers on offering services that the government refuses to provide to slum dwellers — it is simply supplying to demand, although at exorbitant prices.

A very different concern comes with our recommendation for engaging Non-Governmental Organizations. While they may be a better choice than an inflexible government bureaucracy, we face a potential problem with grave consequences. The largest NGOs often promote technological "development" in the form of very large projects such as electrification, infrastructure, and building. They see the picture in large-scale terms, and would like to see major construction contracts awarded to foreign companies that have the necessary proven experience in undertaking complex projects of this type. The problem is that many countries cannot afford large-scale interventions.

Despite this reality, a government often gets seduced into entering such a contract, which it ultimately cannot repay. A developing country is counting upon its natural resources to pay the bill for rapid modernization. Nevertheless, economic fluctuations and unexpected events are usually enough to trip the fragile stability of such a deal. The result is that the country gets plunged into debt. By becoming a debtor nation, the nation can only be stabilized by help from the International Monetary Fund and the World Bank. Economic restructuring via Structural Adjustment Programs (SAPs) imposes harsh economic conditions that worsen the lives of the poorer sectors of society. Not only does the country lose part of its sovereignty, but also from that point on, it is in no position to help its poor in any way.

The lesson to be learned from this — a lesson that many nations have unfortunately failed to learn — is the need to work on the small scale. A vast and costly new project is feasible for the wealthy nations, but very risky for the developing nations. (Large-scale projects are most always based on unsustainable processes that waste vast amounts of energy and resources). Social housing should grow from the bottom up, applying local solutions to small-scale projects. If those solutions work, they can be repeated indefinitely. There are many independent NGOs who can help, and foreign experts who offer knowledge and expertise for free. It is better to rely as much as possible on local financial capital, know-how, and resources. A long-term solution, based on the adaptive evolution of housing patterns and construction, is more sustainable than a technological quick fix.

19. Architects Contribute to Make Existing Projects Alienating.

A number of projects built in Latin America have solved the myriad problems of how to deal with government bureaucracy, having come to terms with practical factors and with the existing political structure. Groups have involved private construction companies with non-governmental organizations and local government to construct and finance social

housing. Nevertheless, there is still a distance between techniques for implementation, and how the final product actually feels. As noted before, the scientific evidence suggests this is not a matter of "mere personal taste", but rather there are broad areas of consensus in human assessments, rooted in universal processes of perception and human biology. These areas of consensus can be established through "consensus methodologies", of the sort that we use routinely in our collaborative design processes.

On this point we are less enthusiastic about what has been achieved so far in Latin America. Despite all the best intentions and an enormous amount of work invested, we see many projects having a qualitative character that is, in a widely shared assessment, impersonal and industrial. Of course, they don't all have the "deadly" feeling of totalitarian high-rise housing blocks, but the ambience of the built environment ranges from dreary to neutral. In our judgment, the form and layout fail to connect emotionally to the users. It's interesting to search for the reasons why these solutions were not carried through all the adaptive design steps.

Our explanation is as follows: those projects are directed by architects, who still carry their intellectual baggage of industrial design typologies and relativity of personal tastes, even as they try to help people in a personal way. The architect's language is influenced by his/her design ideology and is not universal. Very few architects have escaped from the modernist aesthetic that formed a pivotal part of their training (a tradition in architecture schools now going on for several decades). It is extremely difficult to rid oneself of those ingrained architectural images — to break out of the fundamentalist typologies of cubes, horizontal windows, modular blocks, etc., and the logic of abstracted functionalism that often serves as the ideological justification for self-aggrandizing aesthetic posturing (Alexander, 2005; Salingaros, 2006). Especially in Latin America, modernist architectural typologies are adopted as part of the national architectural style, popularly though erroneously linked to progressive political beliefs.

Making some of our criticisms explicit helps readers know what we are talking about. We find modest human-scaled buildings (which is good), but they are arranged on a strict rectangular grid that has no other purpose than to express the "clarity of the conception". The plan looks perfectly regular from the air (being planned for such unperceivable symmetry), and expresses modularity instead of variation. The mathematically precise arrangement is arbitrary as far as human circulation and perception of space are concerned, hence it does not contribute to urban coherence. On the scale of individual buildings, we see the usual obsessively flat walls without surface articulation; strict rectangularity; flat roofs; doors and windows without frames; slit windows; houses raised on pilotis; useless building setbacks; no curves in places where they would reinforce the tectonic structure but curved walls put in for aesthetic effect; fractured or oversized urban space; etc.

These are the identifying characteristics of the 1920s' modernist typology. An underlying assumption behind imposing this formal vocabulary on people's homes is that an ordinary person without training is incapable of shaping form and space, and only an architect (acting as the "expert") is capable of doing so. It all goes back to the arrogance openly expressed by modernist architects, who showed their contempt for organic urban fabric. Contrary to the habits of much of modernist design and planning, physical and psychological needs have to be understood not in terms of abstracted quantities, but in terms of a capacity for local, adaptive responses to needs and desires. Living individuals

experience them as part of particular living communities. The alternative process proposed here can be applied generally to arrive at non-standardized and living design solutions — living because they are connected, locally rooted, and inhabited with the spirit as well as the body.

It is very easy to recognize the difference between organic and industrial morphologies, based on their perceived complexity. Here are three criteria that anyone can use: (a) Is the geometry on all scales, from the size of the entire project down to the size of 2 mm details, complex (unique, varied), or simplistic (empty, repetitive)? (b) Are there generally regular transitions from larger to smaller scales, with no abrupt gaps? Or, if there are abrupt transitions, are they terminated with even more complex geometries at the next scale? (c) If the geometry is visually complex, does the form grow out of and adapt to human physical and psychological needs, or is it an arbitrary imposed "high design" complexity? These three criteria distinguish living urban fabric from dead industrial forms (the third criterion is more difficult to apply without some experience).

Paradoxically, the segment of society (i.e., progressive intellectuals and activists promoting social causes) most interested in helping poor people is also that which, for political and ideological reasons, naively assumes that the solutions must conform to the technological "image of modernity". They cannot think outside the seductive images of the 20th century military/industrial paradigm. They sincerely believe the promises of liberation made by modernist ideologues, but fail to see that such forms and geometries are basically inhuman. By contrast, those privileged individuals who can afford to create a warm, responsive living environment (and know how to implement it) do so mainly for themselves, remaining in general unconcerned with the plight of the poor.

20. People's Unreal Image of a Desirable Home.

There is another point that we have yet to discuss, and which can sabotage the best intentions of humane social housing. That is the image a potential resident has of "the most wonderful home in the world". People carry within themselves images of desirability, often the opposite of what they truly require. Advertising works by convincing people to consume what they don't need; to spend their money on frivolous or noxious things instead of healthy food, medicine, and education. In the same way, our culture propagates artificial images of "beautiful" houses in the minds of the urban poor and even the most isolated rural farmers. When an individual migrates to a town, he/she will work to achieve the housing that corresponds to the image in his/her dreams. It is certainly the case that this image will clash with adaptive housing typologies.

As architects and urbanists, we are constantly competing in a universe of images and ideas that are validated by iconic properties rather than any contribution to adaptive living environments (Alexander, 2005; Salingaros, 2006). Human perception of built space is governed by unstated values and subtleties. It is a frustrating battle, because people are distracted from consideration of what is good or healthy. Wonderfully adaptive vernacular architecture is identified with a heritage from which poor people are trying to escape. They are fleeing their past with its misery. People originally from the countryside shun traditional rural building typologies: they are abandoning symbols of the countryside with all its restrictions and fleeing to the "liberating" city. A new house in that style would

trigger a deep disappointment. Providing humane housing therefore conflicts with maintaining the "image of modernity".

A peasant who moves from the countryside into a favela, or someone born there will not wish to see it repaired: he/she desperately wants to move out as soon as possible to a middle-class apartment. The favela doesn't represent the widely accepted "image of modernity", but instead carries a social stigma. Escaping poverty, in the mind of the favela's resident, means escaping from the favela's geometry. That idea is reinforced by the drastic transformation in geometry that one sees in houses for the middle class. Middle class residences tend to be either dreary modernist apartment complexes, or isolated pseudo-traditional houses with a lawn and fence. Those insipid images of modernity dominate the thinking of poor people, who ingest them from television programs and other marketing outlets.

A new project of social housing that is successful in our terms will inevitably resemble traditional local urban and architectural typologies, simply because those have evolved to be the most adaptive to human needs. That resemblance, however, condemns its image as not progressive. Many residents expect to see their new houses built in the "image of modernity", as defined by the homes of the rich and famous the world over. Houses and offices in a high-tech modernist style are constantly shown on films and television together with their rich residents. The poor aspire to this dream. On the other hand, wealthy aristocrats living and working in colonial mansions are no longer embraced as models to emulate, because of their association with the pre-modernist past and a conservative political order. That is a pity, because 19th Century building typologies often contain much of a country's architectural heritage, and offer adaptive solutions that have nothing to do with any social or political class. (People forget that the technocratic style now represents global economic dominance by a powerful elite).

As noted previously, we believe the problem is inescapably cultural in nature. It seems to us that the crux of the issue is valuation — how the community values its options, and then makes decisions accordingly. Or, more properly, it is a question of whether a truly intelligent (i.e. self-correcting and learning) system of collective decision making is in place. So our task is not just to offer choices, but also to offer a framework (or choice of frameworks) in which to make those choices over time.

If residents choose "wealth" as defined in reduced simple terms by monetary markets, then they will logically conclude that the optimal course is to scrape the site flat and put up a single high-rise building with a Big-Box-Mart next door. If they have a longer-term definition of "value" — which includes more subtle but no less vital notions of "quality of life" — then they have a basis for assessing and modifying their built environment in a way that is more complex, more inter-related, and more "organic". This of course is what a traditional culture is and does, by definition.

That simple notion of "wealth" in reduced monetary market terms cannot distinguish between the subtle processes of life. For this reason, it cannot combine the "top-down" resources like bringing "wet appliances" (concrete boxes containing a bathroom and a kitchen counter with sink), or trucks full of building materials appearing at the edge of the site, with "bottom-up" resources like people working on their own houses, small-scale local economies, or following adaptable generative codes.

Combining top-down and bottom-up methods is the crux of the problem, which will require a complex integrative approach, rather than a linear application of resources and single-variable solutions. It is a complex, multi-variable problem of self-organization and of organized complexity, and requires a different set of tools from those people are used to working with.

How then do we take seriously people's aspirations, without necessarily enabling what may be a manipulated desire of theirs, one that encourages the trading away of irreplaceable long-term value for perishable short-term gain? As we have seen, in a modern economic context, traditional cultures are unfortunately very vulnerable to this kind of bad-deal tradeoff. As professional advisers we have a duty to take their aspirations seriously, but also to take seriously their long-term needs, even if they are not really considering them. We should not act in their place — that would be arrogant — but instead have a kind of conversation with them, where we as professionals point out the options before them in a more complete and more connected kind of way.

What is obvious to us isn't necessarily considered positively by the broader population. Such a thing would make sense, and avoids the dangers, if it came out of a collaborative process that was very much in the hands of the locals. It needs to be their vernacular tradition. Otherwise, there is a real danger of such an effort coming across as presumptuous and condescending. There is a very delicate balance in there between respect for the local culture that is very much a culture of poverty — the everyday urbanism, in a sense — and a recognition of the aspirations even within that culture (and in the individuals) for something they imagine to be better.

Often people need to learn to appreciate what they already have (i.e., the capacities, the wealth, and beauty of their particular cultural adaptations to circumstances). This is all the more urgent since we have a global culture that is mostly dedicated to giving people a hunger for goods they don't have. For example, we are well aware of the tendencies for low-income communities to be big backers of Big-Box-Marts. If we try to expose all the serious problems created by Big-Box-Marts as a result of the building form and the business model, people may well accuse us of racism: "*So why don't you want us to have what the rest of you already have?*". It's a very delicate thing when one is working with people in poverty — how does one both give respect where respect is due, and yet recognize where things could be better without being insulting? It requires a process that will engage the creative energy and the self-reliance of the local culture.

21. Is a Changed World Ready to Accept Humane Social Housing?

Projects all over the world were built following the organic paradigm, using owner participation. We observe a cyclic phenomenon: both governments and non-governmental organizations support parts of what we (and others before us) propose, then it falls out of favor and is replaced with inhuman modernist typologies, then it sometimes makes a comeback as elected officials and agency directors change. This temporal fluctuation reflects the model of species competition, where one competing species displaces another (but does not drive it to extinction). When conditions change, that species makes a modest comeback.

The organic urban paradigm has always been only marginally accepted by the powers-that-be, even though it represents the vast majority of currently built urban fabric. In the ecological analogy, unplanned owner-built housing is actually the dominant species, whereas in the minds of most people (in blatant contradiction of fact), it is assumed to be the minority species. The world's urban population explosion has occurred in the poorest strata of society, one minor part housed by top-down mechanisms of social housing, while the other major part had to emerge as favelas (irregular settlements). It is this imbalance — between overwhelming forces generating the world's irregular urban morphology, and ineffective attempts to impose order — that we wish to correct with this paper. We depend upon three hopeful strategies: (a) Readers will see that some of the old prejudices against owner-built housing are outdated, and are economically and socially wasteful. (b) People will recognize the roots of this conflict as ideological, and not as exclusively legal. (c) We finally have very powerful tools for efficient design and repair, which were not available in the past.

The New Urbanism movement (spearheaded by one of the authors (AMD)) has helped to awaken the world to the value of traditional urbanism, and to the need of preserving existing portions of living urban fabric. Our approach tries to channel the natural human need for a nourishing and sustainable living environment, which has been the case during several millennia of human existence. Several extremely successful New Urbanist developments have been built in a traditional character, showing that it can be done today. Planning is no longer biased towards the modernist vision. There exists a new awareness, at least in the most economically developed countries. Whereas in the 1960s healthy middle-class neighborhoods were destroyed with impunity (an act euphemistically labeled "urban renewal" (Jacobs, 1961)), such urban aggression is less likely to succeed today. Still, that does not prevent die-hard modernists from trying to publicly discredit the New Urbanism by labeling it as fit only for the very rich. The present paper is one of many proofs (if any were needed) that the same techniques apply to house the poor of the world.

People have always had an INSTINCTIVE knowledge of how to build, but all that was casually dismissed by modernist typologies falsely claiming an exclusively rational "scientific" validity. With the recent entry of trained scientists into architecture and urbanism, that misunderstanding has finally been dispelled, and we can separate genuine method from image-driven dogma. Our courageous predecessors who built living urban fabric were all stymied by an architectural establishment convinced of the absolute correctness of the early 20th Century industrial design paradigm. Again and again, projects and ideas were marginalized, and had to be re-invented elsewhere and at another time. We believe that our age is finally ready to accept living urban fabric as part of life itself, and that this idea can assume its proper central place in our consciousness.

22. Conclusion.

Twentieth-century practices in constructing social housing may have been well intentioned, but are ultimately misguided. They do not help to connect the residents to their environment. So much urban fabric all over the world could have been made healthy and sustaining for the same cost, but instead exerts a deadening effect on its residents, and ultimately becomes unsustainable. Unfortunately, government planners were determined to

impose an ill-conceived social experiment as part of a utopian program of industrialization. We outline here, on the other hand, practical and sensitive solutions that can be applied immediately to any context, with only minor modifications to fit the local conditions.

The authors make these recommendations based upon considerable experience in practical projects. We will be the first to urge making compromises and needed adaptations in implementing our methodology to any particular project, in the spirit of incremental adaptation. It is far better to compromise and get something built, rather than to insist on following every component of our suggested process but have the project rejected. In this way, we can effect a steady transition to a more robust, more life-supporting, and more sustainable kind of housing for the future.

References:

Christopher Alexander (2005) *The Nature of Order: Books One to Four* (Center for Environmental Structure, Berkeley, California).

Christopher Alexander, Howard Davis, Julio Martinez & Donald Corner (1985) *The Production of Houses* (Oxford University Press, New York).

Christopher Alexander, S. Ishikawa, M. Silverstein, M. Jacobson, I. Fiksdahl-King & S. Angel (1977) *A Pattern Language* (Oxford University Press, New York).

Andrés Duany (2007) "How do we save the Crescent City? Recreate the unique building culture that spawned it", *Metropolis*, February 14, <www.metropolismag.com>

Andrés Duany & Elizabeth Plater-Zyberk (2005) *Smart Code*, Version 6.4 <www.dpz.com>, Miami, Florida.

Andrés Duany, Elizabeth Plater-Zyberk & Jeff Speck (2000) *Suburban Nation* (North Point Press, New York).

Hassan Fathy (1973) *Architecture for the Poor* (University of Chicago Press, Chicago, Illinois).

Jan Gehl (1996) *Life Between Buildings: Using Public Space* (Arkitektens Forlag, Copenhagen, Denmark).

Habitatjam (2006) *World Urban Forum Website* <http://www.habitatjam.com>

N. J. Habraken (1972) *Supports: an Alternative to Mass Housing* (Urban International Press, London & Mumbai).

Besim Hakim (2003) "Byzantine and Islamic Codes from the Mediterranean", in: *CNU Council Report III/IV, Style and Urbanism: New Urban Codes and Design Guidelines* (The Town Paper, Gaithersburg, Maryland, 2003), pages 42-43 & 63. Shorter version available online from <http://tndtownpaper.com/council/Hakim.htm>.

Jane Jacobs (1961) *The Death and Life of Great American Cities* (Vintage Books, New York).

Stephen R. Kellert (2005) *Building for Life: Designing and Understanding the Human-Nature Connection* (Island Press, Washington, DC).

Léon Krier (1998) *Architecture: Choice or Fate* (Andreas Papadakis Publisher, Windsor, England).

Nikos A. Salingaros (2005) *Principles of Urban Structure* (Techne Press, Amsterdam, Holland).

Nikos A. Salingaros (2006) *A Theory of Architecture* (Umbau-Verlag, Solingen, Germany).

John F. C. Turner (1976) *Housing by People* (Marion Boyars, London).

APPENDIX: Generative Code for Social Housing on a Greenfield or Open Brownfield.

The body of this paper really outlines a method of methods, which can be used to format an infinite number of different approaches. All the approaches arising from our recommendations share a common adaptivity to human sensibilities. In this essential quality, however, they differ markedly from other methods currently in use. Evidently, a planner has to make up a new method that best suits local conditions and exigencies. For readers who wish to implement our method with the least delay, we outline here a procedure that can produce housing on vacant land. A slightly different approach is needed to work on a site that has existing buildings, and yet another to reconfigure an existing settlement. Please remember that this represents only ONE of an infinite number of related methods satisfying our criteria, and should not be adopted as a universal set of rules.

We assume that a team of planners will work with some or all of potential future residents in all steps of the layout. This is crucial to get a "reading" of the necessary human factors that must be addressed. Actual building is divided into two components: those that are the funding agency's responsibility, and those that are to be done by the owner/resident. A rough division of labor is for the government to undertake all construction on public space, whereas the owner/resident builds his/her own house; but these responsibilities can overlap either way according to the specific situation. Even if the owners/residents are going to do all the building work on their house, the planning team is prepared to support them and guide them through the process. References below are to individual patterns in *A Pattern Language* (Alexander *et. al.*, 1977).

It is extremely important to make an initial statement that we have here a different type of approach to social housing, and planning in general. The novelty of this approach is evident in three of our procedures. First, we begin with laying out the ground and street network with active user participation, not as a pre-conceived plan drawn somewhere else.

The second unusual element is to allow (in fact, actively encourage) the users to ornament the sidewalk in front of their house, before the house is even built. The third unusual element is to build the urban space before any of the houses have been completed. The urban space is going to define the character of the settlement as a whole — its spatial quality and identity on the large scale — more than any other built object. It is going to play a major role in whether the residents feel they own the place emotionally.

We recommend the following steps, where we have emphasized the unusual aspects of our method, while leaving more obvious construction details up to the local team:

1. Walk the land to diagnose its condition, strengths, weaknesses, exceptional opportunities, areas needing repair, etc. Identify any candidates for a sacred space: e.g., high ground, prominent rocks, large trees, etc. These are going to be protected and later incorporated into urban space.

2. In many cases, the settlement will have an existing boundary that determines street connections. Where this is not so (i.e. in the countryside) the neighborhood's outline must be fixed, as it will have an impact on the overall street pattern (Pattern 15: NEIGHBORHOOD BOUNDARY of Alexander *et. al.* (1977)).

3. Walk the land to determine the main street and the main cross street from the natural pedestrian flow according to the topography and features. These are going to represent the Roman *Cardo* and *Decumanus*, but will be neither necessarily straight, nor orthogonal to each other. Mark them with poles in the ground carrying red flags. Allow room for street plus sidewalks on both sides.

4. Walk the land once more to visualize where the urban spaces ought to lie (decided by the spots that feel the best to stand in; somehow focusing all the region's positive signals). These are going to be bulges in the main streets near the center, and ought to contain any sacred spaces, if possible. Apply the principle of tangential flow around an urban space (i.e., the street goes alongside an urban space, not through its middle). Urban spaces can be as long as necessary, but not much wider than 20 m (Pattern 61: SMALL PUBLIC SQUARES). Mark the boundaries of the urban spaces with red flags.

5. Decide on the footprint of houses to partially surround and reinforce the urban spaces. Front walls, with no setback, are going to define the urban space boundaries.

6. Now some major layout decisions must be taken. One possible typology is to use building blocks of two houses deep, not necessarily straight, each with dimension roughly 40-60 m wide and 110-150 m long. Building blocks begin at the edge of the urban space and main streets. The direction of each building block is determined by the flow of the land. Their boundaries will define the secondary roads, which are marked with red flags. Secondary streets form T-junctions (Pattern 50: T JUNCTIONS) at the intersections, and do not cross a main street. Secondary streets are narrower than the main streets.

7. At the same time, questions of water drainage are settled, because street direction has to accommodate water flow. Decide where runoff water will drain to outside the settlement so as to avoid flooding. Note if any street has to be graded.

8. Shaping the land begins only now, with the government grading the building ground so that it slopes towards the street on each side for drainage. The streets must be graded where necessary to facilitate wastewater flow as decided beforehand.

9. Participating future residents can lay out their house dimensions, using blue flags. Houses have to come up to the sidewalk, and occupy the full frontage. Other than this, there is complete freedom in the house plan. If a courtyard is included, define it by using the house volume to partially surround it (Pattern 115: COURTYARDS WHICH LIVE). Individual variation is essential to guarantee southern exposure; otherwise the courtyard will not be used after it's built (Pattern 105: SOUTH FACING OUTDOORS). First, define the buildings around the main urban spaces and at the main entrances.

10. Once a sufficient number of house outlines have been marked, complete the lot boundaries by using yellow flags. Each plot should be not less than 20 m deep and 6 m wide. Plots are separated by an alley at the back and by a footpath on each side. Plots are recorded and deeds awarded. The remarkable thing is that this is the first time the settlement is drawn on paper (up until now, we have been working only with flags in the ground).

11. The government puts in any infrastructure it is going to provide: electrical utility poles in the alleys, either a water system or a regular distribution of public water spigots, sewerage pipes or a few common gender-separated latrines, etc.

12. The first act of actual building is putting down a concrete sidewalk along the position of all marked house fronts. The government does this along all deeded plots, but not in parts of the settlement that have not yet been planned. It is convenient to complete one housing block at a time. The sidewalk itself should be very wide, and raised from the street (1.5 m wide sidewalks are useless for forming a neighborhood; see Pattern 55: RAISED WALK).

13. The residents prepare designs using colored bits of scrap material not thicker than 1 cm (pebbles, tile fragments, etc.), and push them into the wet concrete as soon as the sidewalk is poured and smoothed. Anything can be used as long as it doesn't compromise the structural integrity of the concrete. Expansion joints are incorporated as part of the design. This act personalizes one's own bit of sidewalk, and establishes the priority of human expression over industrial forms.

14. House building can begin, carried out by the residents themselves, with the front façade going up first at the edge of the sidewalk. In this way, the urban spaces, rather than the houses themselves, are the first spatial elements to be physically constructed (Pattern 106: POSITIVE OUTDOOR SPACE).

15. The entrance (or entrances) to the settlement should be clearly defined by more prominent buildings so they are obvious points of transition (Pattern 53: MAIN GATEWAYS).

16. The government can solidify the urban space by building a large kiosk there — a roofed open room (Pattern 69: PUBLIC OUTDOOR ROOM). Make sure it has steps that are comfortable to sit on (Pattern 125: STAIR SEATS). This element can catalyze the use of the urban space, and enhances sacred elements such as a large tree.

17. Owners complete their individual houses, at their own pace. They have complete freedom in the floor plan within their original markings. If it is appropriate to the culture, build a low sitting wall or ledge integral with the front wall next to the entrance (Pattern 160: BUILDING EDGE and Pattern 242: FRONT DOOR BENCH). This, in turn, might

influence the roof overhang.

18. The description of the building sequence depends on local materials availability, delivery systems, and the most economical alternatives. Decisions such as whether to pour a floor slab at the same time as the concrete sidewalk; if there is plumbing available that needs to go under the slab; whether to fill upright hollow drain pipes with concrete to make a house's corner columns; what material to use for the load-bearing walls; whether to drop in a prefabricated toilet module; the shape of the roof and how it is to be built, are all best taken by the local consultants.

19. The consultants can advise the owner/builders on how to form the house entrance and windows. A main entrance should have drastically thickened edges to represent the transition from outside to inside (Pattern 225: FRAMES AS THICKENED EDGES). Encourage people to build a transition space, however modest (Pattern 112: ENTRANCE TRANSITION). This emphasizes entry as a process, the opposite of a front door designed as an image of a minimal discontinuity in the flat wall.

20. The same principle also applies to windows: help the owner/builders to create windows with deep reveals and a very thick frame (Pattern 223: DEEP REVEALS).

21. Perhaps the single most important rule to creating rooms in a building is that they must have natural light from two sides (Pattern 159: LIGHT ON TWO SIDES OF EVERY ROOM).

22. As the house fronts near completion, the government offers a monetary prize for the most artistic ornamentation, preferably using traditional motifs chosen entirely by the owners, and supplies paints and materials for that purpose (Pattern 249: ORNAMENT). Ornamentation should be more detailed, and more intense, at eye level and at those places where a user can touch the building.

The above proposal may appear interesting, perhaps extraordinary to conventional planners. Some will doubtlessly criticize it, even though it is supported by the most important document of Latin American planning: the "Laws of the Indies". (*Las Leyes de Indias* explicitly direct that a settlement be planned around its central urban space, which has to be established first). We believe our suggestions to be applicable and we ought to try and implement them to any degree possible. It is not necessary for the builders to have access to the full description of each pattern mentioned here; a simple outline and diagram are sufficient. We list the patterns only for reference purposes. The goal of ornamentation is NOT to add something "pretty" so as to distract from the otherwise difficult living conditions. In fact, it serves to connect the residents in a deeper sense to their environment, by giving them intellectual ownership of the physical structure. For this reason, it is absolutely necessary that the residents themselves generate all the ornament and create it with their own hands.

Nikos A. Salingaros

Department of Mathematics

University of Texas at San Antonio

One UTSA Circle

San Antonio, TX 78249 USA

David Brain

Department of Sociology

New College of Florida

5700 N. Tamiami Trail

Sarasota, FL 34243 USA

Andrés M. Duany

Duany Plater-Zyberk & Co.

1023 Southwest 25th Ave

Miami, FL 33135 USA

Michael W. Mehaffy

Structura Naturalis Inc.

900 Cornell Street

Lake Oswego, OR 97034 USA

Ernesto Philibert-Petit

Departamento de Arquitectura y Diseño

Tecnológico de Monterrey, Campus Querétaro

Epigmenio González 500

76130 Santiago de Querétaro, QRO

MÉXICO