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**Article**

## Planning for city safety

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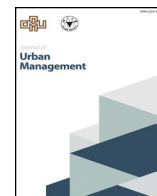


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## Planning for city safety



### 1. Introduction

There may be various answers to the question of what constitutes a safe city. Some might argue that a safe city is an affluent city; some would argue that a safe city is both an efficient and just city; and still others might conceive of a safe city as one that is sustainable. In short, the notion of city safety is somewhat ambiguous, to put it mildly. Viewing the city as a complex and large adaptive system, I would argue that a safe city is a place where the number of problems is kept at a minimum. Of course, problems can take many forms: landslides, flooding, traffic congestion, crimes, slums, poverty, homelessness, overbuilding, terrorism, etc. Moreover, problems of one type, such as landslides, can trigger problems of another type, such as flooding, if not properly addressed. The city is a context in which various decision makers (or agents), solutions, problems, and decision situations interact in unpredictable ways at certain locations. More specifically, these agents, solutions, problems, and locations effectively meet in various decision situations, and given the associated structural constraints, various things may happen as a result. Problems may or may not be solved in these decision situations depending on whether the solutions and agents match the problems under consideration in the decision situations. Relatedly, while it is not practical to aim for a problem-free city, we can strive to anticipate and prevent problems that might occur while also seeking to eliminate those that have already occurred. In that sense, a safe city can reasonably be defined as one in which the number of problems is kept at a minimum.

The capabilities of a city with respect to solving problems are distributed. Relatedly, it is not practical to expect the government of a city to solve all of the city's problems. Cities self-organize themselves, and through this self-organization, the aforementioned agents take adaptive actions to solve various problems. Low-income residents, for example, adaptively seek locations with lower rents that they can afford. However, what a local government can do is effectively set the rules of the game, or the institutions, under which such actions are taken. These rules or institutions constitute, in effect, the relationships among the five elements of the city (Lai, 2006). A decision structure specifies which agent has access to which decision situation. An access structure determines which problem is related to which decision situation. A solution structure depicts which solution can appear in which decision situation. And finally, a spatial structure dictates which decision situation can occur in which location. These structural constraints do not invalidate the random meeting of agents, solutions, problems, decision situations, and locations; rather, they simply provide conditions under which decisions may or may not be made.

The traditional wisdom of city planning can solve certain problems, mainly through the arrangement of the spatial structure of the relationship between decision situations and locations. What is less known is that the other intangible structural constraints, namely, decision structures, access structures, and solution structures, are of more significance in affecting the functioning of a city. In addition, planning investments focused on related decisions may only increase the efficiency of decision making, rather than problem solving. Therefore, in order to eliminate the problems that may or may not occur in a city, that is, in aiming to ensure a safe society, we need more than just planning.

In short, in order to create a safe place to live by reducing the number of problems that may or may not occur, we need to do at least two things in addition to traditional physical planning: institutional design and problem-focused planning. In terms of institutional design, we need to design structural constraints, namely, decision structures, access structures, and solution structures, that will cause the problems under consideration to be attended to by as many agents and aired in as many decision situations as possible so that those problems will have higher probabilities of being solved. In terms of problem-focused planning, we should aim at plans that relate not only to decisions but also to problems. For example, in making plans, we should focus not only on how decisions are related to each other, but also on how the problems associated with these decisions can be solved.

In the sections that follow, we will elaborate on institutional design and problem-focused planning for city management focused on city safety. We will first argue, in Section 2, that institutional design is more effective than physical planning in affecting how cities work and discuss how it can be related to city safety in terms of reducing the number of problems. In Section 3, we will then argue for

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an approach to problem-focused planning that aims at problem solving, rather than decision making, through plan making. In Section 4, issues relating to how institutional design and problem-focused planning can be operationalized in the context of urban development are discussed. Finally, concluding remarks are provided in Section 5.

## 2. Institutional design

In the simplest form, an institution is a set of rules that confine the agents' rights in taking certain actions. For example, an institution can be set up to codify which agent is eligible to participate in which decision situation. This simple institution can be represented by a matrix, as shown below. Consider Matrix 1, in which the rows are agents and the columns are decision situations. A “1” means that the associated agent in the row is eligible to participate in the associated decision situation in the column, whereas a “0” means that the agent is not eligible to participate in that decision situation. Assume that there exist ten decision situations and ten agents and that there is a monitoring cost incurred by preventing a particular agent from participating in a particular decision situation, and call this cost the cost of delineating the right to participate. Following Cohen, March, and Olsen (1972) there are three prototypical structures of the matrix, namely, unsegmented, hierarchical, and specialized structures, where the unsegmented and specialized structures are the two extreme institutional designs and the hierarchical structure is the intermediate design. In the unsegmented structure, all of the agents have access to each decision situation, whereas in the specialized structure, each agent is allowed to participate in one and only one decision situation. It can be easily shown that the specialized structure gives rise to the highest cost of delineating the right to participate because the agents are prevented from participating in most of the decision situations, whereas the unsegmented structure imposes the lowest cost of delineating the right to participate because there is no restriction as to which decision situation the agents can participate in. The cost of delineating the right to participate for the hierarchical structure falls in between the two extremes. The implication is that the more restrictive the institution is, the more delineated the rights are, and the greater the delineation cost is

1111111111	1111111111	1000000000
1111111111	0111111111	0100000000
1111111111	0011111111	0010000000
1111111111	0001111111	0001000000
1111111111	0000111111	0000100000
1111111111	0000011111	0000010000
1111111111	0000001111	0000001000
1111111111	0000000111	0000000100
1111111111	0000000011	0000000010
1111111111	0000000001	0000000001
unsegmented	hierarchical	specialized

In addition, fewer problems would be solved by more restrictive institutions because the probability is smaller that an agent is eligible to participate in a particular decision situation. Thus, we can expect that, in terms of problem solving, the unsegmented structure would allow the largest number of problems to be solved, whereas the specialized structure would lead to the smallest number of problems being solved. The hierarchical structure, meanwhile, would result in an intermediate number of problems being solved. Table 1 summarizes the results of the analysis.

On the face of it, one would argue that the unsegmented structure is more desirable than the other two structures because it results in the lowest delineation cost with the highest number of problems solved. However, that structure also renders the lowest number of delineated rights. As argued by Barzel (1997), when rights are not appropriately delineated, much of the task of delineating rights will be left in the public domain, and the agents will expend resources to acquire rights during transactions, resulting in higher transaction costs. Therefore, the question of which prototypical structure is most effective really depends on the tradeoffs between the various costs and the number of problems solved. Solely focusing on the increase in the number of problems solved would increase transaction costs, which would in turn decrease the performance of the city. Furthermore, it is arguably plausible that institutional design is more significant than spatial structure in affecting how the city works because the former sets the constraints as to whether decisions can be made, and our own previous simulations demonstrated that this is indeed so (Lai, 2006).

**Table 1**  
A summary of effects of different institutional designs.

	Delineation Cost	Rights Delineated	Problems Solved
Unsegmented	Low	Low	High
Hierarchical	Intermediate	Intermediate	Intermediate
Specialized	High	High	Low

### 3. Problem-focused planning

On the one hand, traditional decision analysis develops decision making techniques under the presumptions that problems are fixed and given, and that the decision maker will seek appropriate actions that can solve the problems. On the other hand, traditional planning analysis focuses on the interdependence among decisions in that the selection of the action in a particular decision situation depends on the outcome of the selection of the action in another decision situation, even while also presuming that the problems associated with the decision situations are fixed and given. In real situations, meanwhile, problems are effectively like a fluid that flows between decision situations so that the optimization approach to planning might result in enhancing the efficiency of decision making, rather than problem solving. For example, decisions might be made without regard to associated problems.

One way to counter the bias toward decision making while ignoring the significance of problem solving in planning analysis is to apply weights to any disutilities resulting from problems in decision situations. More specifically, in a decision situation utilities are associated with the agents, solutions, and locations, while disutilities are associated with problems. If the total amount of utilities is greater than the total amount of disutilities with some structural constraints met, then a decision is made. Otherwise, no decision is made. In a problem-focused planning approach, weights are assigned to these disutilities so that the arrangement of decision situations in time, thus plans, will result in the largest number of problems solved, albeit through decision choices. Lai (2003) ran a computer simulation specifically for the purpose of examining the effects of problem-focused planning. The results showed that the greater the weights placed on problem disutilities, the greater the number of problems that are solved, and the more active the problems are in the system evolution. Indeed, we could improve planning by highlighting the significance of problems through the assignment of weights to problem disutilities, so that the behaviors of problem activities are appropriately attended to and a higher proportion of problems are solved.

### 4. Discussion

For concreteness, compare the zoning system and permit system as two contrasting institutions. The zoning system is reminiscent of the specialized, or at least the hierarchical, form of the decision structure, while the permit system is reminiscent of the unsegmented form. They could also correspond, to some extent, to different forms of spatial structure, but for our purposes here, we regard them as institutions consisting of rules, as defined above. Referring to Table 1, we can infer that the zoning system would have a higher right delineation cost regarding land use along with more clearly specified land use rights, while also solving fewer problems emerging from daily activities than the permit system. However, the permit system, by leaving land use rights less clearly delineated, would cause higher transaction costs in the land market. As such, whether the zoning system is superior to the permit system depends on which dimension we are looking at.

On the other hand, in determining the urban growth boundaries for urban development, one might prefer the event-driven approach to the time-driven approach to the land inventory problem (Han & Lai, 2011), because the former in essence makes the urban boundaries plan by considering the interdependence of the expansion decisions in time, while the latter makes these decisions independently. However, if we apply weights to the problem disutilities associated with these decisions or decision situations, such as holding costs, expansion costs, overbuilding, and inflation, the resulting plan would be different if these problems were considered as commensurable to the revenues gained.

### 5. Conclusions

City safety is an issue that cannot be coped with by planning per se. Rather, it should be dealt with by, among other things, institutions and problem-focused planning. Viewing the city as a complex, large system and city safety as determined by the reduction in the number of problems arising in the evolution of the system, we argue that institutional design for urban development is the key in making a city a safe place to live. In addition, we propose a problem-focused approach to planning for city safety that enhances problem solving, rather than decision making, by making plans through the application of weights to the disutilities associated with problems. At the same time, further investigations are needed to determine how these approaches to city safety can be operationalized.

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