

Review Of Problem Structuring Methods And Its Application In Understanding The Housing Needs Of Slum Dwellers In India

Namesh Killemsetty¹

ABSTRACT

This paper provides an extensive review of commonly used Problem Structuring Methods (PSMs) and studies their possible applications for understanding the challenges faced by slum dwellers living in informal settlements across cities in India. The study highlights the role of PSMs as a group of analytical methods for identifying the problems faced by poor and vulnerable populations and looks for possible solutions to increase their efficiency. Subsequently, the paper describes and compares commonly used PSMs such as Soft Systems Methodology, Strategic Options Development and Analysis, Strategic Choice Approach, Robustness Analysis, and Value-Focused Thinking. The paper finally draws attention to the nature of challenges involved in the application of PSMs for slum dwellers which is different from its typical application involving people in managerial positions across organizations who generally are domain experts in their fields

PROBLEM CONTEXT

With over a quarter of India's urban population living in slums and informal settlements, city governance systems in India have been facing large-scale challenges to improve their access to adequate housing, sanitation, essential services, and security. Informal areas like slums become a common sight in cities of developing countries like India where the provision of infrastructure and basic services often lags behind the pace of urbanization. Housing is a critical aspect in the study of slums being both a cause and outcome of poverty as it comprises differential access to resources and control over them (Kumar, 2002). Urban slum

¹ Assistant Professor at the Jindal School of Government and Policy, O.P. Jindal Global University, Sonapat, Haryana. He can be reached at nkillemsetty@jgu.edu.in

dwellers are especially profoundly affected by adverse living conditions, and their health threatened by a range of factors related to their housing (Zanuzdana et al., 2013).

Considering the importance of stable housing in the betterment of the livelihoods of slum dwellers, the Government of India has taken multiple developmental approaches to provide housing and access to basic services for the urban poor. However, these approaches have not achieved the desired results because of primarily being top-down in nature and not addressing the needs of the communities (Tiwari and Rao, 2016). The contemporary policies implemented by the government have been myopic to the lived reality of the slum dwellers because of a lack of understanding of the actual nature of the problems due to their sheer enormity, and/or an unwillingness from the government to deal with the complexities of the lived realities of the slum dwellers. While a community intervention approach would ideally want problems and solutions to be defined by community members, most developmental programs in the country ended up being implemented according to the state agendas (Bháird, 2013). The majority of the approaches do not necessarily happen as a consensual-driven participatory process, but through messy negotiations and the awkward meshing of grassroots processes with formal institutions (Kiefer and Ranganathan, 2018). The inconsistency remains far away from an ideal approach which should maintain a balance between the housing needs of the slum dwellers, and ensure improvement in the quality of shelter and services.

Policies formulated for improving the quality of lives of slum dwellers often ignore the study of slums in their process and consequently, fail to capture the perspectives of the very people for whom they are meant. Slums pose a challenge that could be considered a ‘wicked’ problem. Rittel and Webber (1973) originally classified policy problems that are tough to describe, have numerous causes, involve multiple stakeholders and do not have a right answer, as ‘wicked’ problems that others have referred to as ‘messy’ (Vennix, 1999) or ‘swamp conditions’ (Rosenhead, 1992). The challenges that slum dwellers face have many of these characteristics. First, slums are tough to describe as a policy problem. For example, there is an inconclusive debate about conceptualizing slums as a place vs. as a household’s living condition (Mahabir et al., 2016; Nolan, 2015). The other related misunderstanding is that the concentration of poverty is erroneously equated to a slum. Second, there is no single cause of slum formation and their growth (A. Patel et al., 2014). There are multiple causes cited in literature that include extreme income inequality (Cavalcanti et al., 2019), high housing price-to-income ratio (Lall et al., 2007), rapid urbanization rates (Ooi and Phua, 2007), lagging infrastructure provision (Galiani et al., 2017), and lack of affordable housing supply (Gandhi, 2012) to name a few. Third, there are multiple stakeholders that are directly or indirectly related to this policy challenge, including the local, state, and the national level governments, non-government and community-based organizations (CBOs), slum dwellers, and non-slum residents in the neighborhoods. Finally, a long history of failed policies clearly suggests that there is no right answer to address this challenge so far.

Considering the dynamic characteristics of slums, our understanding has also largely ignored the perspectives of the slum dwellers. Slums have been traditionally studied and analyzed using multiple disciplinary approaches and varied perspectives but rarely are slum dwellers’ voices treated as central to the inquiry. For example, common approaches include slum population estimations and enumerations using demographic surveys and censuses (e.g. Dupont, 2008; Patel et al., 2014); delineating slum boundaries and housing structures using satellite images (e.g. Gruebner et al., 2014; Kohli et al., 2012); and using simulations to test scenarios (e.g. Debnath et al., 2019; Patel, 2012). However, barring ethnographic studies that focus on a particular intervention or community (Doshi,

2013; Walker, 2016), none of these approaches consider slum dwellers' perspectives as central to their inquiry and rarely treat them as the context experts. Moreover, these approaches primarily rely on the aggregation of socio-economic data that fails to capture the complexity of slum dwellers' lives and their multi-tiered and interrelated connections within society and the environment (Mahabir et al., 2016). The need of the hour lies in identifying alternative approaches to identifying challenges in slums and ways to address them from the community's perspective.

Keeping these factors in mind, the purpose of this paper is to provide a review of various problem structuring methods from the field of decision sciences and operations research that could be used to understand the priorities and decision choices of slum dwellers living in Indian cities with respect to their access to housing and basic services such as stable housing, access to sanitation, clean drinking water, drainage, sewerage, solid waste disposal, and street lighting. The challenges associated with making such choices would be multiple – there is no definitive formulation, issues are interlinked cutting across various disciplines, struggle drawing a balance between uniqueness and generalizability – and can be explained in numerous ways. All these factors can be associated as complex problems faced by slum communities concerning issues such as acquiring a stable housing unit and access to basic services. Delivery of such services involves coordinating with multiple departments in the city governments, each of which has its own way of functioning. These factors thus necessitate the use of problem structuring methods as a group of methods that enables participants to clarify their predicaments, converge on potentially actionable problems, and agree on commitments that will at least partially resolve them (Mingers and Rosenhead, 2004).

The following sections provide a literature review on commonly-used problem structuring methods and their possible application to the case scenario of understanding housing needs of slum dwellers in smaller cities of India.

PROBLEM STRUCTURING METHODS

Problem structuring methods (PSMs) are a group of methods used to model or map the nature of a situation or state of affairs that people want to change (Rosenhead, 2013:1162). The methods are a class of qualitative operational research modeling approaches that were first developed 40 years ago for making progress with ill-structured problems. Various definitions of PSMs have been proposed over time, some focusing on the types of problems that PSMs typically address, others on the ways the problems are resolved. In general, they are defined with respect to the problem characteristics, method of analyzing problems, and philosophical dimensions (see Smith and Shaw, 2018 for further details).

PSMs are generally used by individuals in collaboration to create a consensus about, or facilitate negotiation about issues on what needs to change. These methods usually involve an openly outward-looking phase that pulls together readily-available information about a problem and invites individuals to state their opinions and interpretations regarding the situation. Following this phase, a problem statement must be developed – an explanation of what is to be used as input, what the desired outputs, decisions, and the ranges are within which it is necessary to understand the relationships between all these variables (Keisler, 2012). The problematic situations for which PSMs aim to provide analytical assistance are characterized by multiple actors, differing perspectives, partially conflicting interests, important intangibles, and perplexing uncertainties (Rosenhead, 2006; Rosenhead and Mingers, 2001). PSMs explore systemic issues (Midgley et al., 2013), that aim to build a shared understanding and commitment across stakeholders (Ackermann, 2012) through facilitation (Franco and Montibeller,

2010), participation (Rosenhead, 1996) and stimulating dialogue (Mingers and White, 2010) through a structured decomposition of issues. A crucial advantage of using PSMs over traditional OR models is its qualitative form, often being diagrammatic (Ackermann, 2012) and representing differing perspectives. PSM allows the building of models both in the expert and the facilitator forms. In the expert form, the problem situation faced by the client is given to the OR consultant who builds a model to develop an optimal situation. While in the facilitator form, the consultant jointly develops a model through participant interaction, possibly in a group workshop (Franco and Montibeller, 2010). There are many PSMs based on the needs and the scenarios where they can be used. Based on methods that incorporate facilitator modeling, the following sections describe some of the commonly used PSMs – Strategic Options Development and Analysis (SODA), Soft Systems Methodology (SSM), Strategic Choice Approach (SCA), Robustness Analysis (RA), and Value-Focused Thinking (VFT). The following subsections elaborate each PSM and their application in the Indian context.

STRATEGIC OPTIONS DEVELOPMENT AND ANALYSIS (SODA)

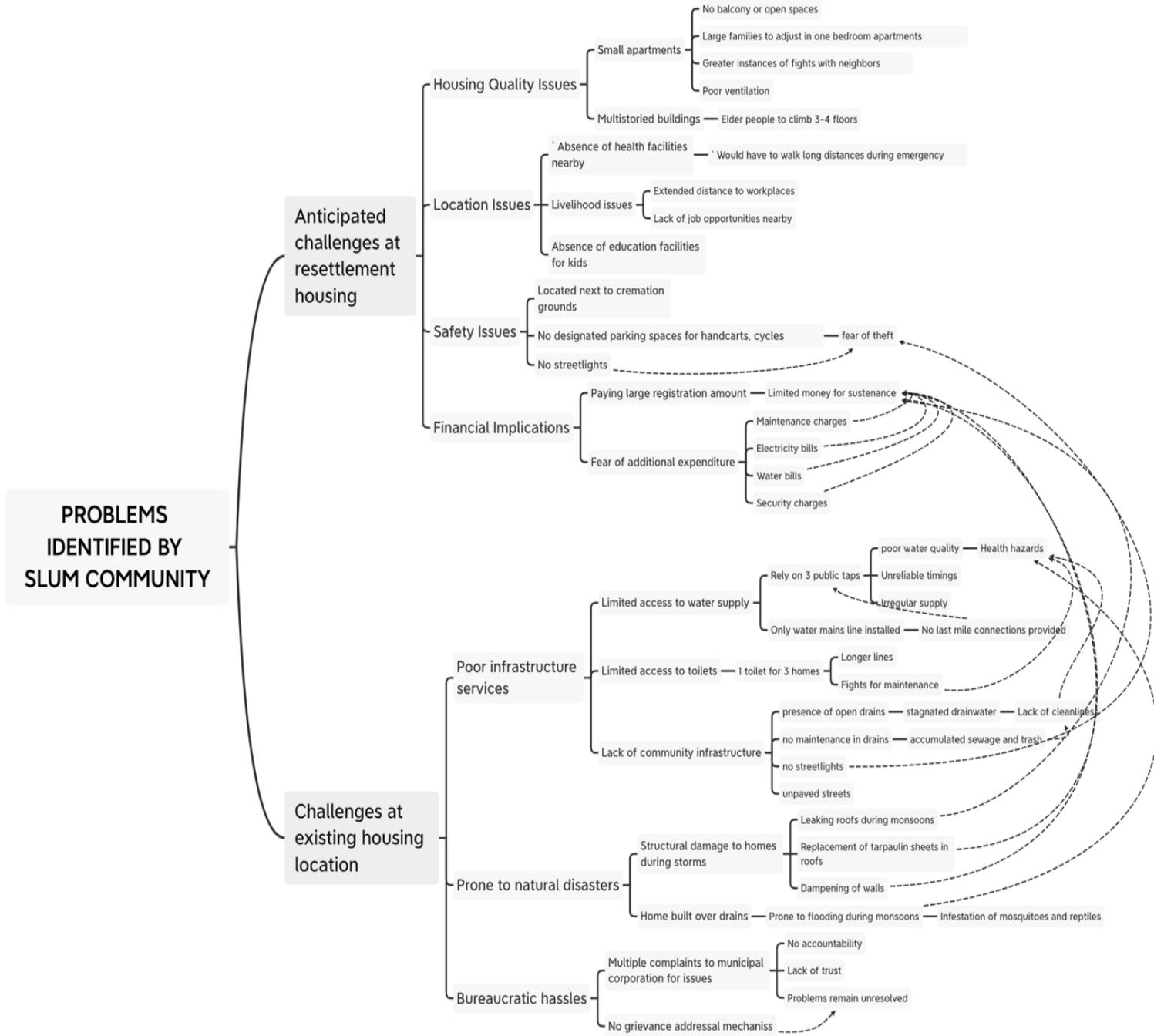
The SODA method is an approach designed to provide consultants with a set of skills, a framework for developing problem-solving interventions and a set of techniques and tools to help their clients work with messy problems (Eden and Ackermann, 2001:21). The basic theories that inform SODA derive from cognitive psychology and social negotiation, where the model acts as a continuously changing representation of the problematic situation – changing as the views of a person or group shift through learning and exploration (Eden and Ackermann, 2006). SODA builds cognitive maps² that are designed to represent the way in which a person defines an issue.

SODA is an approach that allows the skills of a facilitator of the processes involved in helping a problem-solving team to work together efficiently and effectively to reach feasible agreements; provides skills to construct a model of, and appropriately analyze, interconnected issues, problems, strategies and options that members of the team wish to address (Eden and Ackermann, 2001:21). SODA builds models from different subjective views of the situation as expressed through individual interviews which are framed into individual cognitive maps. A composite of individual cognitive maps creates a merged group map that establishes a joint understanding of the problem, and reflects on the emergent issues that consequently arise, to negotiate an agreed strategic direction (Eden and Ackermann, 1998).

The primary advantage of using SODA over other PSMs is its ability to highlight the diverse subjective views of a problem situation. In the context of the case scenario, SODA would be useful in understanding the varied nature of challenges faced by slum dwellers at household and community levels. Cognitive maps can be constructed for the individual problems faced by the households, which can then be combined to create a merged map highlighting the significant challenges faced by the communities for each slum. The maps would highlight the interconnections between the challenges based on what an individual perceives to be his/her problems.

Figure 1 shows the cognitive map created to highlight the challenges associated with housing as identified by residents of a slum community in Brahampur city, India (Killemsetty et al., 2021). The cognitive map highlights the community challenges in two distinct themes – challenges faced by the residents at their proposed resettlement housing where they were due to be forcefully relocated, and

² Cognitive maps are made up of constructs (nodes) linked to form chains (shown by arrows) of action-oriented augmentation (Eden and Ackermann, 1988)



challenges at their existing location which lacked primary infrastructure facilities. The map shows how multiple issues are connected to each other and how this affects their daily lives.

Figure 1 -Cognitive map highlighting challenges as identified by slum community at a case study slum in Odisha, India (Killemsetty et al., 2021)

SOFT SYSTEMS METHODOLOGY (SSM)

Soft Systems Methodology is an approach for tackling problematic and messy situations where users learn their way by finding out about the situation through an action-oriented process (Checkland and Poulter, 2006). The learning emerges via an organized process where the situation is explored using a set of models of purposeful action each built to summarize a single worldview, to inform and structure the discussion about a situation, and discussion on how the models could be improved. SSM is a problem-solving approach developed from systems engineering³ in which a purposeful system is modeled in the systems world from multiple perspectives to elicit the critical feature of subjectivity (Checkland, 1981).

SSM is an organized process of inquiry based on systems models which leads to the choice of purposeful action. The models are used in the problem situation to provide structure to a debate about what to do by comparing the model with real-world perceptions and happenings. The purpose of the debate is to uncover the different constructions people in the situation place upon the happenings and to find some accommodation between different and conflicting constructions (Checkland, 1985: 822).

The core idea of SSM is to build a rich picture of the problem situation through its root definitions, which are the names of relevant systems using the CATWOE principle. The root definitions are built from a thorough understanding of the customers(C), actors(A), transformation process(T), worldview(W), owners(O), and environmental constraints(E).

Table 1 shows the formulation of root definitions for the case scenario on housing issues for slum dwellers in India.

DEFINITION (CATWOE)	CASE SCENARIO
C – customer – who would be the victims/beneficiaries of the purposeful activity?	C – slum dwellers
A – actors – who would perform the activities?	A – government officials

³ Systems engineering focuses on how to design and manage complex systems throughout their life cycles using the systems thinking process. The approach looks at the selection of an appropriate means to achieve an end which is defined as a start and thereafter taken as given (Checkland, 2001)

T – transformation process – what is the purposeful activity expressed as?	T – the need for stable housing with access to essential services – need to be met with corresponding welfare programs
W – weltanschauung – which worldview makes this definition meaningful?	W – rational planning is desirable where the housing requirements of the slum dwellers are met with programs that provide the desired services
O – owner – who would stop the activity?	O – the government
E – environmental constraints – what constraints in its environment does this system take as given?	E – requirements of the slum dwellers to be similar across all slums

Table 1 - Formulation of the rich picture for housing in slums using CATWOE principle(adopted from Checkland, 2001)

The root definitions are thus used to build a rich picture of an affordable housing scheme (see Figure 2). Next, this model is compared with the real-world actions happening on the ground to identify possible changes which are both desirable and feasible. Subsequent actions could thus be taken to improve the problem situation.

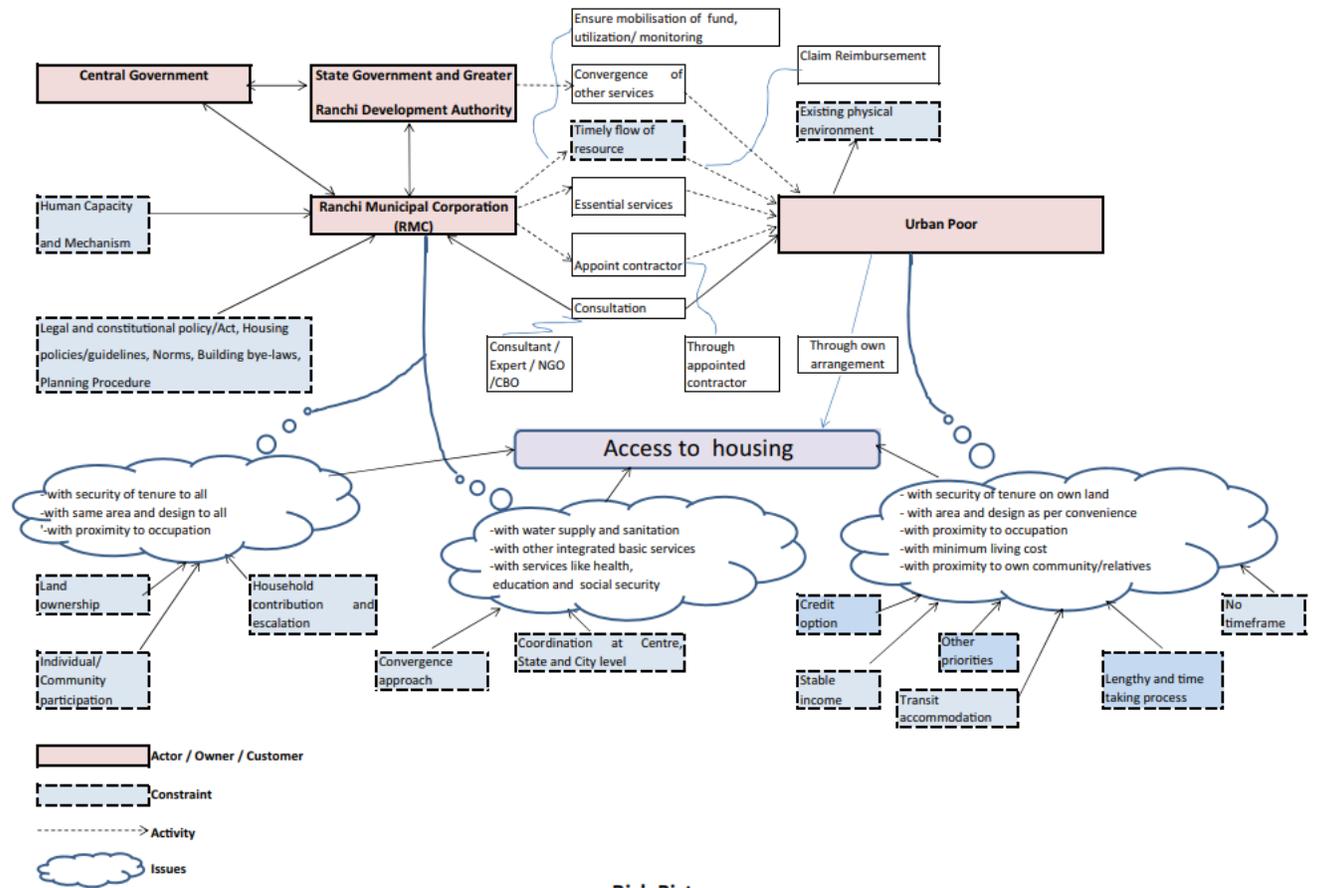


Figure 2 - Rich picture of an affordable housing program (Ghosh, Roy and Sanyal, 2016)

STRATEGIC CHOICE APPROACH

Strategic Choice Approach (SCA) deals with the interconnectedness of issues in an explicit yet selective way by helping people working together to make noticeable progress towards decisions, and focusing their attention on possible ways of managing uncertainty as to what they should do next (Friend, 2001). SCA was developed as a response to a number of operational problems identified as characteristic of any public planning or allocation process, regardless of organizational setting (Ferguson, 1979).

The SCA is a framework tailor-made for complex planning issues involving uncertainty. The most distinctive feature of the approach is the way it helps the users in making incremental progress towards decisions by focusing their attention on alternative ways of managing uncertainty, each calling for a different kind of response (Khakee and Stromberg, 1993). The uncertainties could be:

- Pertaining to the working environment which could be dealt with by responses of a relatively technical nature such as surveys, forecasting exercises, costing estimates, etc.
- Pertaining to guiding values which call for a more political response from say, a higher authority

- Pertaining to related decision fields that call for a response in the form of the exploration of the structural links between the decision in view and others with which it could be linked.
SCA consists of four interconnected stages or modes – the shaping, designing, comparing, and the choosing modes. Opportunities exist to switch freely from any one of the four modes to work for a short period in any of the others. In our case scenario, SCA can be used for sustainable water and sanitation planning in the slums:
 - The Shaping Mode: In the shaping mode, problems are formulated as questions that need to be addressed by the ongoing planning and decision-making process. For a general issue of ‘the water and sanitation system in the slum is not working properly,’ the questions that could be defined are what is not functioning today? What desires do the population and the authorities have at the service level? In what way can water supply be arranged, given the local water shortage and low quality of the water source? How can proper sanitation be implemented?
 - The Designing Mode: In the designing mode, those involved in the planning process identify and explore the different options available to address the various problems using the knowledge of local stakeholders. Table 2 provides examples of some solutions and related different options for questions regarding water and sanitation in slums.

Table 2 - Possible options for water and sanitation problems persisting in slums

PROBLEMS	POSSIBLE SOLUTIONS	OPTIONS
Personal Hygiene	Increased Water Supply	Connection to urban water supply Use of local wells Collection of rainwater
	Behavioural Change	Increased public awareness Education of schoolchildren Advocacy campaigns
Unhealthy Environment	Proper Sanitation	Use of dry latrines and collection services Use of water closets and piped sewers Use of diverting systems and collection services
	Behavioural Change	Use of demonstration facilities Community-led sanitation improvement Prioritize sanitation service delivery
Groundwater Pollution	Greywater Treatment	Connection to the urban sewer system On-site treatment Use of treated effluents for irrigation

- The Comparing Mode: The aim of this mode is to weigh the pros and cons of different decision schemes by defining the criteria for comparing different plans that are formulated by participants during meetings. Examples of evaluation areas to be used for water and sanitation in slums could be health, environment, economy, and socio-cultural aspects
- 4. The Choosing Mode: This mode addresses the management of uncertainty by focusing on the timing of decisions and sorting issues into immediate actions, deferred choices, and

contingency planning. The action schemes, in this case, may include initiation of concrete and immediate measures to implement water and sanitation systems; a commitment to explore further remaining uncertainties, and formulation of contingency plans to deal with future events.

ROBUSTNESS ANALYSIS

Robustness Analysis is an approach used for the evaluation of alternative initial strategic decisions, first proposed by Gupta and Rosenhead (1968). Robustness provides a way of supporting decision-making when there is radical uncertainty about the future, and where decisions can or must be staged sequentially. It resolves the paradox of uncertainty in the future by assessing initial choices in terms of the attractive future options that they keep open (Rosenhead, 2001:181).

Robustness Analysis falls under the heading of a decision-aiding approach rather than a decision-analytic approach, where decision-aiding sidesteps the practical difficulties of identifying individual preferences, aggregating utilities, and estimating probabilities (Wong and Rosenhead, 2000). Decision-aiding throws the burden of forming these judgments and trade-offs back to the decision maker. Robustness analysis can be applied to situations where it is expected that a number of decisions will be made in sequence. Commitment to an initial decision is needed now, and the effect of this initial decision and of the others that may follow is to generate a range of possible future configurations of the system that is being changed by the decisions (Rosenhead, 2001: 189).

Robustness analysis involves the matching of early commitments against differentially beneficial future system configurations under a range of plausible future conditions. As seen in Table 3, robustness analysis can be used in the case scenario in the implementation of a participatory approach where the provision of essential services in slums could be associated with their core requirement on a case-by-case basis.

Table 3 - Stages for providing a participatory housing program in slums using Robustness Analysis

STEPS OF ROBUSTNESS ANALYSIS	APPLICATION IN CASE SCENARIO
1. Choose a future	Provision of basic services on a case-by-case basis for each slum.
2. Identify a configuration which would work well with it	Establishment of a structure which allows demarcation of problems associated with each slum.
3. Identify initial steps towards configuration	Incorporate a participatory approach in each program which allows problem identification from the communities.
4. Check compatibility of each commitment – configuration pair	The problems associated with each slum would be associated with necessary interventions with respect to the available government resources.
5. Check suitability of each configuration in each future	Based on available resources and budget, necessary interventions would be selected for each slum.

VALUE-FOCUSED THINKING

Values are fundamental to every event, making them the driving forces of decision-making. It is these values that are fundamentally important for any decision situation which helps to shape the alternatives. Thus, the iteration between articulating values and creating alternatives forms the basis of the manner of rationale called ‘Value-Focused Thinking’ approach. Value-Focused Thinking (VFT) provides concepts and procedures that allow the articulation and appraisal of fundamental values in a decision situation; use values to create better alternatives for decision problems; and identify decision opportunities that are more appealing than the decision problems (Keeney, 1992). VFT is a critical philosophy that advocates a more fundamental view of values in our decision making in private as well as professional lives. The tools used in VFT provide a systematic approach to structuring complex decisions and subsequent analysis, thus contributing important insights to decision making (Morais et al., 2013).

Value-Focused Thinking primarily consists of deciding what is essential and discovering how to obtain it. VFT can be thought of as a problem structuring method as it lays out all the various concerns of stakeholders and structures them into a smaller, more tractable and measurable set of variables from which it is clear how a formal utility model can be built, assessed, and calculated (Keisler, 2012).

Proponents advocate starting first with the values of the decision makers, and then using the values to create decision opportunities, evaluate alternatives, and finally develop improved alternatives (Parnell et al., 2013). The first step lies in identifying the objectives by engaging in a discussion of a decision situation. The decision context is defined by having an understanding of the nature of the problem and its environment; relevant players; economic, technical and resources factors; and the best-known decisions (Osei-Bryson, 2018). After collecting the list of objectives, this step distinguishes between the fundamental objectives (the ends that decision makers value in a specific context) and means objectives (methods to achieve ends). The next step in the VFT approach is constructing the means-end objective network. The objectives are displayed in terms of the relationship between end objectives and means objectives. The network provides a model of the specific interrelationships among the means objectives and their relation to the fundamental objective, if any. Figure 3 shows an example of a VFT hierarchy network highlighting the list of objectives that elaborate the housing needs and preferences of slum communities, along with their identified solutions listed at the end (Killemsetty et al., 2021).

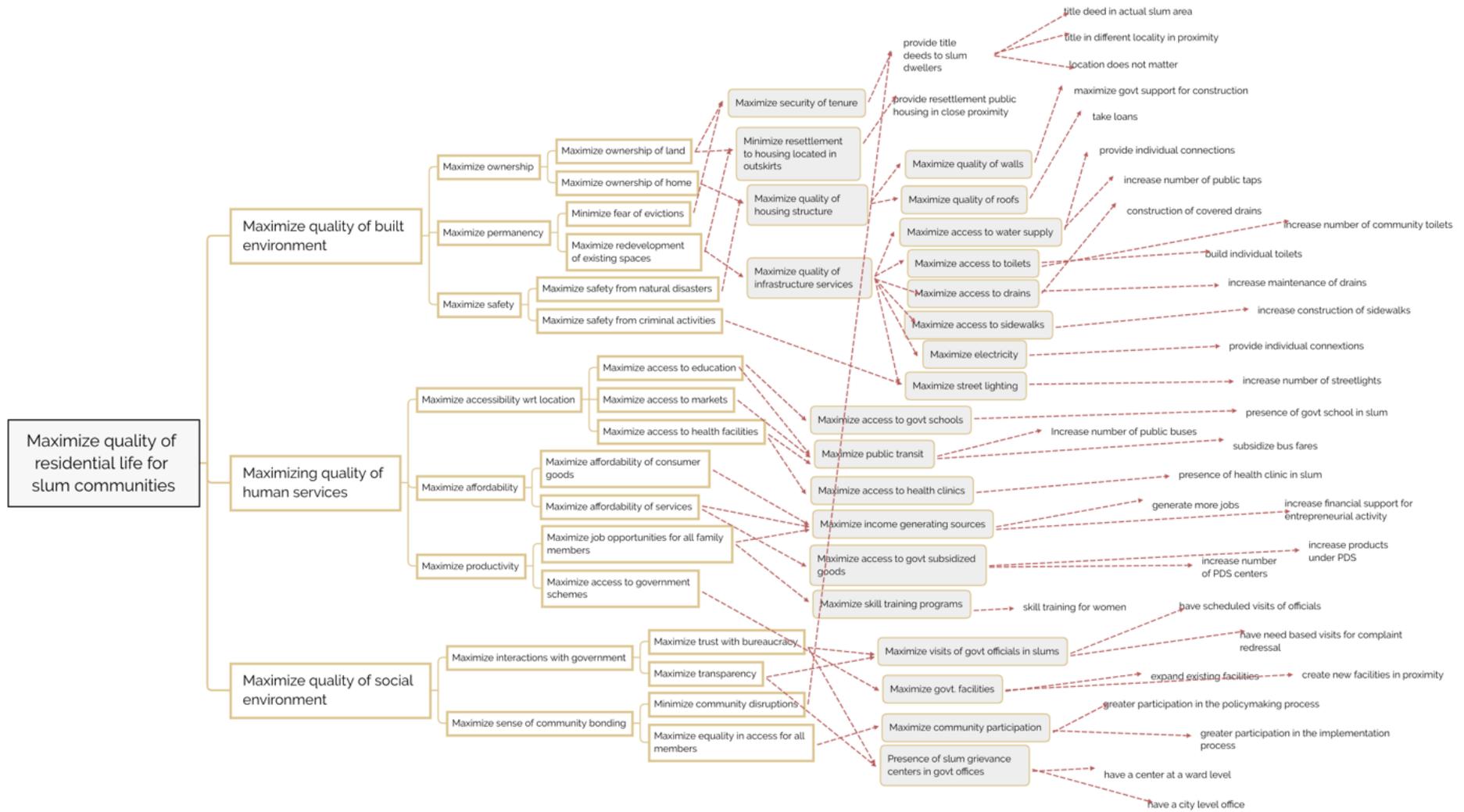


Figure 3 – A VFT objectives network for housing needs of slum dwellers

A clear listing and structuring of the fundamental objectives provide considerable insights into the creations of the alternatives. When the means objectives are identified, the measurement of their achievements provides useful insights which leads to the construction of valuable options (Keeney, 1992; p.99).

Table 4 summarizes the key aspects of all the problem structuring methods discussed in the previous sections highlighting the basic overview, key themes, steps, assumptions, limitations, and their potential applications. While problem structuring methods have a wide range of applications with respect to their sectors of application and the stakeholders involved, a common theme that runs across all methods is the level of expertise required by the participants in their implementation. PSMs have generally been applied to managers, and officials in government offices who have a minimum level of education, have a clear idea of their problems and can express it adequately. The final section of this paper highlights the possible challenges of implementing problem structuring methods in the case scenario of slums in India where the participants primarily would be slum dwellers.

	SOFT SYSTEMS METHODOLOGY	COGNITIVE MAPPING/ SODA	STRATEGIC CHOICE APPROACH	ROBUSTNESS ANALYSIS	VALUE FOCUSED THINKING
OVERVIEW	Takes traditional, hard systems engineering methodologies, and transforms them to be able to deal with the humanness of human beings.	Representation of a person's perceptions about a situation in terms of bipolar constructs, where terms are seen as contrasts with each other.	Recognizes different stakeholders and viewpoints, as well as significant elements of uncertainty and lack of information.	Allows participants and analysts to assess the compatibility of alternative initial commitments with possible future configurations of the system.	Involves decision-makers and other stakeholder groups to identify a broad range of societal values on which policy objectives should be based, and elicit tradeoffs between those objectives.
IMPORTANCE TO	Irrationality, creativity, and values	Problem identification	Uncertainty	Maintaining flexibility under uncertainty	Structuring multiple objectives
FOUNDATIONS	System Redesign	Subjectivism, Personal Construct Theory	Interconnectedness	Flexibility	Multiple-Attribute Utility Theory
ASSUMPTIONS	Different individuals and groups will make different evaluations leading to different actions.	Each individual perceives the world subjectively; the organization is made up by processes and negotiations more than structures.	Decision-makers must learn to make judgments as to how broadly or strictly to focus their attention; and how to strike a balance between current commitment and future flexibility.	Assumption that problems and objectives are well defined. Therefore, robustness analysis is mainly directed towards action and decision-making.	A need for greater depth, clear structure, and a sound conceptual base in developing objectives for strategic decision contexts.

BEST POTENTIAL APPLICATION	Helping managers face day-to-day problem situations.	Used when groups of people, both individually and as a group, may have difficulties in defining and structuring their perception of a problematic situation.	Issues calling for extensive interaction among participants in workshop settings, with skilled guidance from a facilitator if progress towards agreed outputs is to be maintained.	When there is radical uncertainty about the future. Its low-tech accessible character makes it particularly suitable either for a participative workshop environment or it must be staged sequentially.	Useful when there are multiple stakeholders involved in a decision and there is disagreement about the desired direction to achieve improvement.
PRIMARY ADVANTAGE AS COMPARED TO OTHER APPLICATIONS	Provides a set of principles which a user can draw upon to create a specific approach relevant to a particular situation involving particular people with their specific views.	Does not necessarily seek the optimal way forward, but preferably one that the groups are willing to agree and commit to.	Has a greater focus on structuring communications than reinforcing exercise; facilitating decisions than exploring systems; managing uncertainty rather than assembling information.	Addresses the paradox on how one can be rational in making decisions today if the most crucial fact that one knows about future conditions is that they are unknowable.	Develops an objectives hierarchy of the objectives and sub-objectives (attributes) for the decision situation.
LIMITATIONS	Practitioners, honed and chastened by the experience of the complexity of the everyday world are more likely to understand SSM.	Limited emphasis on official power relations.	Draws on extensive experience in observing and subsequently supporting and facilitating decision groups.	Does not offer a general-purpose problem identification methodology.	Identifying and structuring objectives are difficult tasks, and the relationships between different objectives are not specified.

Table 4 - Comparison of commonly-used problem structuring methods

DISCUSSION - CONTEXTUALIZING PSMs IN THE INDIAN CONTEXT

Problem structuring methods have typically been applied in the European and the American contexts in government and private organizations, community development organizations, and nonprofits. The guidelines and the scale of each of these methods have been discussed extensively keeping in mind the previous conditions of their implementation. However, the settings change when PSMs need to be used to understand the problems faced by dwellers living in slums and informal settlements across Indian cities. The nature of challenges and limitations associated with the implementation of these methods would change considering the primary stakeholders. In this case, the primary stakeholders are slum dwellers who, in most cases, would not have received any formal education, and would not be able to read or write. Therefore, it becomes essential to explain the difference in context in the application of PSMs between the developed world and that of an informal setting such as slums.

As mentioned previously, a primary challenge would be the building up of maps and flowcharts of the problems faced by the slum dwellers. Traditionally, the participants of a PSM help the researcher in the creation of cognitive maps and diagrams which go through repetitive iterations after their formulation based on the comments provided by the participants. However, the process would be a problem in this case-scenario where the slum dwellers may not be able to read the issues that the maps mention or understand the relationships between problems as built and shown in the flowcharts. Therefore, it would be useful to have someone, such as volunteers from local NGOs who have local knowledge and are working in the slums, in the data formulation process. Their experience would be relevant in the evaluation of the links between the problems that are identified for further assessment.

Another critical challenge would be the time factor. Usually, PSMs are implemented in organizations with people in managerial positions who are domain experts and are adept in the knowledge of the critical problem they are facing. The entire process can thus be conducted in one or two sessions in a day where the participants have clarity both about the issues and the possible alternative solutions. However, that would not be the case for slum dwellers. The communities might not be very receptive and open to expressing their core values in the very first sitting. Also, slum dwellers would not be able to spend an entire day participating in the study as most households are daily-wage earners. Therefore, it would be essential to spend a considerable amount of time with the communities to establish a rapport before the implementation of any PSM. The study would have to be executed in parts over time by interacting with the communities when they have the time to do so.

Finally, the implementation of PSMs in the context of slums would also have to consider the assumptions that are taken for granted during its deployment in the developing world. The best example of such an assumption would be the role played by organizations in the provision of welfare for poor communities. While it is taken for granted that by and large, local governments and community development organizations are the primary focus for any kind of developmental work in poor communities, it is the local NGOs that often play a vital role in developmental activities across slums. Another critical aspect would be the role of informal approaches in the provision of services for poor communities. Access to provision of services in many cases would be through bribes and taking advantage of the existing corrupt practices in the local government, all of which have to be incorporated while thinking of pathways for possible solutions for the problems identified by slum dwellers.

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