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## MONITORING AND EVALUATION: AN URBAN PROJECT CASE STUDY IN KENYA

William M. SENGA, Diana LEE-SMITH, and Davinder LAMBA \*  
*University of Nairobi*

Monitoring and evaluation is a key activity in systematic development planning. This case study of a large urban project in Nairobi, Kenya, looks at ways in which evaluation data and methods can be useful in an on-going process of decision-making. Several management tools, including interpretive structural modelling, delta charts, and an issue format for reporting, were used to organize a complex interdisciplinary research design and follow-up action. Using the principle of monitoring and evaluation by objective, a number of collaborating agencies participated in research and survey design and interpretation of results. Data collection and analysis, organized by objectives, was presented in three reports per year and emerging issues at the level of day-to-day management, project planning, and policy review and formulation, were identified for discussion. Key issues of substance and method are touched upon. The study spanned the years 1976 to 1980.

### 1. Introduction

When the Dandora Urban Project was first formulated by the Kenya Government in consultation with the World Bank, the idea of monitoring and evaluation of such projects was relatively a new one on both sides. For the World Bank, the project was one of several it was funding in different countries, the common characteristic being the use of the site and service approach to urban housing. Each project involved housing several thousand families with low incomes in a major urban centre. Since conventional housing policies and techniques are not affordable by these income groups, the approach involves the project-financed provision of urban services, while the families themselves build their own houses on a self-help basis. Strictly speaking, this is a comprehensive approach to settlement planning, and not merely a technique for providing housing alone. Each of the Bank-funded site and service urban projects entailed the provision of schools, health centres, community centres, and employment opportunities, as well as the basic infrastructure for housing.

Since it was clear that the implementation of a self-help construction project on such a vast scale was not a small management task, and that the lower

\* This paper reflects the views of the authors and not necessarily those of the Kenya Government, the sponsors of the Study.

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income families could not build without some assistance, several other project components were included. Assistance to the families allocated plots was provided within a management structure which encompassed financial, technical, and community development assistance. Furthermore, each project was to be continuously monitored, so that the social and economic status and improvement in conditions of the families could be ascertained, as well as the physical growth of the settlement accurately recorded. Monitoring, and in particular its implications for management science methods, is the subject of the present article. In particular we discuss the process of data collection, information storage and retrieval, group participation and consensus methods, multiple objectives, and procedures for handling thereof. We also indicate how scheduling with emphasis on PERT networks played a role in the monitoring and evaluation process.

From the point of view of the Kenya Government, the Dandora site and service project, located in the capital city, Nairobi, was both a major step towards the implementation of its housing policy, and a test of that policy. In this respect, the idea of an intensive monitoring and evaluation study was welcomed, because it could provide accurate information on whether the policy was workable. Especially since the Government was launching itself into this area of relatively untested performance on a very large scale, this was perceived as a very necessary form of research.

In describing how the monitoring and evaluation study was designed and how it worked in practice, there are various aspects of management that will be touched upon: the management of the project itself, the management of the monitoring study by the government, management science methods as applied to the monitoring research design itself, and finally the management of large volumes of urban social and economic data. It is on the third of these four aspects that attention will be concentrated in this paper, i.e. the use of management science methods and techniques in monitoring research. Inevitably, however, all of these aspects impinge upon each other and will be touched upon to some extent.

## **2. The Dandora Project**

Kenya's commitment to the site and service approach dates from a 1972 UN study of housing needs in the country, when it was identified that conventional approaches to the provision of housing would be inadequate to meet demand as well as being unaffordable by the people in need of housing. Kenya has been identified as one of the most rapidly urbanizing countries in the world [4] in the sense of having a largely rural population, few existing urban centres and services, and a rapidly expanding rural and urban population. It has been estimated that the urban population would expand from only

2 million to 8 million in the last 25 years of this century. In 1974 there was a shortfall of 30,000 urban homes in Nairobi alone, and the annual demand has been variously estimated as between 10,000 and 14,000 per year.

A three-point strategy was outlined by the government to cope with urbanization in general:

(1) to create as many low-cost jobs as possible;

(2) to improve local authority finances; and

(3) to provide affordable urban services. The site and service approach is specifically geared to implementation of affordable urban services, but it can also contribute to the creation of low-cost construction industry jobs, and projects are also designed to create other informal sector employment through the provision of goods and services within the project areas.

The five essential characteristics of the site and service approach as planned for implementation in the Dandora Community Development Project in Nairobi were:

(1) the provision of infrastructure;

(2) people building their own houses;

(3) the provision of credit for building on easy terms;

(4) the provision of technical and community development assistance during the establishment of the community in the project area; and

(5) the provision of sufficient community facilities such as schools, health facilities, and employment opportunities.

Dandora itself consists of 6,000 plots, averaging about 120 square metres in size, each with its own toilet and shower already built, 6 primary schools, 2 health centres, 2 community centres, 40 market stalls, workshops, and a sports centre. The infrastructure for housing consists of sewers, water supply, refuse collection, roads and surface water drainage, street lighting, and open space. Plots were allocated to heads of families who had lived in Nairobi for 2 years, had a monthly income of between 280 and 650 Kenya shillings (US\$ 37-48), and no other residential property in Nairobi. In fact, the plots varied in area from 100 to 160 square metres with some being even larger, and there were two types of basic "wet-core" around which the families are supposed to build their houses. The first type (A) consisted of only the toilet and shower, and was allocated to families in the lower range of the income scale, while type B plots had a store and kitchen ready built as well; this type of plot was allocated to families in the higher range of income group, and they also paid more in plot charges. These provide a ready-made stratification which proved useful in the monitoring and evaluation research study.

The whole project was managed by a special department of the Nairobi City Council established specifically for the purpose. The department consisted of finance, technical, community development, and management sections, with a total staff of about 35 headed by a senior officer of the Nairobi City Council. The whole department was later expanded to manage all low-income housing

projects in the city, being renamed the Housing Development Department, and became the model for similar management structures in the two other major towns in Kenya, namely Mombasa and Kisumu.

The Dandora Project commenced in 1975, and the first 1,000 plots were ready for allocation to the selected families in December 1976. US\$ 14 million was loaned by IDA for the project, and a slightly larger amount came from Kenya Government's own funds.

The evaluation study for Dandora was actually carried out by an independent group of consultants, specifically assembled for the task, both because at that time it was felt that an independent body could best play the role of evaluator, and partly because existing Government organizations did not have the capacity for such a large study with the specific focus required. For the follow-up second urban project, however, monitoring and evaluation is to be executed by the Ministry of Housing itself, under new institutional arrangements whereby its technical resources have been considerably strengthened. At the time of writing, monitoring and evaluation of the Dandora Project is continuing, supervised by the Ministry of Housing and Social Services,<sup>1</sup> while monitoring and evaluation of the second urban project is being planned. This article will describe the experience so far, and its implications for the future.

### **3. The study team**

An independent research study team was set up with a study director, a study manager, and other consultants including office staff. The core of the study team was the group of consultants of different disciplines who were to be responsible for preparing reports on different aspects of project performance, and who included the study director and the study manager. The entire team was responsible for jointly designing the study method. In practice, the same two people have stayed as study director and study manager throughout the period of the study, while most of the other consultants have changed from time to time.

Because of the complexity of the task, the volumes of data involved, and the fact that what was required was virtually an information system as much as a series of research reports, we realized that it was necessary to involve a systems analyst in the team, along with the consultants of several other disciplines. The original team had eight members: two economists, two sociologists, two designer planners, a systems analyst, and an environmental manager. This was the team which worked out the study method during an intensive six-week period of full-time work, using group discussion as the main tool for arriving at

<sup>1</sup> This responsibility was passed on from the Ministry of Finance and Planning to the Ministry of Housing and Social Services in January 1979.

decisions on everything from terminologies to be used to an outline of all the research instruments to be employed.

It was at this stage that the conceptual approach was fully developed and the major tools that were to be employed on the study were decided. The output of this phase was the Monitoring and Evaluation Study Process Statement [5]. Consistent with what was decided upon as basic to our method, this document was then submitted to the various "clients" of monitoring and evaluation, who made their own inputs, in order to arrive at the final revised Study Process Statement which reflected the views and needs of the users of the research as well as the researchers themselves [6]. From the very beginning, the idea of group discussion and consensus formation was central to the study method, and was applied to work within the study team as well as to the way the team worked with the information users.

To complement the study team, a full-time field team of seven was employed throughout the period of the study. Two supervisors, both experienced in social surveys, one skilled in computer work and the other in social work, operated in the field with a team of five interviewers. After trying both university graduates and professional interviewers, it was found more productive from all points of view to train school-leavers from the community itself as interviewers. This gave insights into the community and its needs while the quality of supervisory staff ensured reliability of performance in data collection.

#### **4. What should be monitored?**

It was recognized early on in the design of the monitoring and evaluation study for the Dandora Urban Project that complexity and change would have to be accommodated if the study was to be of any relevance to decision-makers, and that timing was a critical factor in design. In addition, it was realized that data from very different types of sources would have to be mixed and managed, and that information flows to and from decision-makers needed planning for.

Instead of applying a conventional social and economic research methodology, the study team decided to develop a broader method, encompassing not only disciplinary complexity, but also taking account of the public decision-making process. We used several models to guide us in developing this method.

One was the method developed by one of the authors at the Faculty of Environmental Studies at York University, in turn based on Rittel's method for tackling complex problems, and originating from the planning discipline and profession. The second was Etzioni's method for research in socially dynamic situations, originating from the discipline of sociology. The third and most important, was Warfield's method, as well as many of his detailed

techniques for analyzing complex social problems, based in the discipline of systems engineering.

Rittel's method entails the identification of problem related variables as context, design or performance variables.<sup>2</sup> That is, variables that are given and constraining, those which are to be established by the design of the problem solution (whether physical plan, policy or program) and those which are to be aimed at in the performance of that solution. These sub-sets of variables are usually amenable to quantification to varying degree, and on various scales which are often quantitatively discontinuous. Rittel's method for judgement is a societal and qualitative one. It involves a negotiation process of interested parties, backed up by quantitative data of various types.

Amitai Etzioni developed a model for research, analysis and action, focusing on social change rather than interpreting societies, institutions and behaviour as a given pattern [2]. In developing a research method for such a context, Etzioni identifies the "mixed scanning" technique, whereby some instruments are used for gaining a quick overview of a total problem-field, while other, more refined instruments are used for probing specific areas thus identified in greater depth. For longitudinal evaluation it is clear that Etzioni's "wide scan" needs to be maintained over time.

John Warfield's work on systems engineering provided us with further material.<sup>3</sup> These, together with Rittel's and Etzioni's work, provided the basis of our conceptual approach. In addition, they provided us with a number of specific tools which we adapted to our task. This principle of Interpretive Structural Modelling elucidated by Warfield was adopted in the Dandora monitoring and evaluation study and applied in two ways. One was the use of an intent structure to explain the objectives of the project, and the other was the use of graphic models to explain the interactions of many variables affecting an important set of objectives. Both of these were used as guides in planning surveys and in organizing data collection, analysis, and reporting, as will be described later.

The most important question to be answered at the early stage of research design was what to monitor. Out of the enormous field of potential variables it was necessary to define the key ones, their relationship, and how to measure them. This would provide us with our model of the project, which could then be reported upon at certain time intervals. Rather than setting up potentially artificial research questions, such as for example "does income level of the population affect the rate of house construction?", we decided to take objec-

<sup>2</sup> His method, taught as "Design Theory and Methods" at the College of Environmental Design, University of California, Berkeley, is also briefly described in [1].

<sup>3</sup> At first we only had two Batelle Institute monographs available to us, i.e. [8] and [10]. Later, we came across another book by John Warfield [9] which contains all of the earlier material as well as a great deal more.

tives as the research framework, and to determine, through quantitative and qualitative means, whether, and to what extent, they were being met. Implicit in this approach was the inevitable longer term question of whether they were the right objectives, and whether the right project components were chosen to try to achieve them. Thus, management by objectives was adapted to monitoring and evaluation by objectives, providing the starting point for research design. This followed from Warfield's premise of science as a process and of the link between scientific and political enquiry. Warfield also characterizes this enquiry as a collective exploration, and all three of our guiding models encompassed principles and techniques for argument or dialogue between parties involved.

### **5. The institutional context: Whose objectives?**

Having decided on the principle of working from objectives, the next question was therefore to decide on whose objectives we should work with. We discovered that there were quite a few agencies involved in the planning and implementations of the project, and that the interrelationships between them were not always clearly defined. In particular, the information and responsibility links between the monitoring and evaluation study and the various other agencies were not well defined. Two preliminary management tasks therefore had to be performed before our method could be designed in detail. First, we had to identify the various members of our "client group", or potential users of the research data, and how they were interrelated as a management structure for monitoring and evaluation. Secondly, we had to establish, with their collaboration, a working procedure for the gathering and reporting of data.

As consultants we were responsible to the Ministry of Finance and Planning, and were to report to a Government Steering Committee chaired by that Ministry. On the Steering Committee were representatives from two other Ministries as well as from the project committee.<sup>4</sup> The Steering Committee also had representatives from among the technical personnel of the Project Department and from other departments of the City Council. Similarly, the various concerned Government Ministries, as well as other national agencies were represented on the Project Committee of City Council.

These were the basic relationships, but there were others. The World Bank Urban Projects Department had representation on the Government Steering Committee, and they and other agencies, including the UN, as well as other consultants, had information links to the monitoring study.

Having identified the various actors involved in the project, their different

<sup>4</sup> The project itself was managed by the Nairobi City Council, through a project composed of City Councillors, overseeing the work of the specially formed Project Department.

objectives needed to be identified and interrelated so that they could serve as a basis for research. Before describing how this was done, the next section of the paper mentions the tools that were used for interrelating objectives and variables, and in particular describes the one used for relationships between objectives, i.e., the intent structure.

## **6. The intent structure**

Given the large numbers of objectives and variables, it became necessary to model the project to conform to the way it was to be evaluated. Warfield identifies two kinds of models, mathematical and interpretive, whereas Rittel identifies three types: iconic, analogue, and symbolic, which lie along a spectrum from ease of visual interpretation, difficulty of manipulation, and descriptiveness, to difficulty of sensory interpretations, ease of manipulation, and explanatory power. The mathematical or symbolic models obviously lie at the latter end of this spectrum while maps, aerial photographs, and building models lie at the other end. Warfield's interpretive structural models fall into the class of analogue models as described by Rittel. They are those that map one important type of relation into the system being modelled, have significant explanatory capability in terms of human communication, but are not easily adaptable for numerical manipulation (see [7]).

The intent structure or objectives tree used in the Dandora study encompassed the entire range of objectives identified by all project participants. They were grouped in a logical hierarchy which explains how one objective may be the means of implementing another at a higher level, or why another objective at a lower level needed to be framed. Moving down through an intent structure one begins at the top with societal values and moves through programmes and activities by which they may be implemented down to detailed strategies for executing or supplementing project components. Moving across an intent structure takes one through the administrative aspect, to community development, social, health, physical, and economic aspects.

The intent structure as a management and research coordination tool enables overall objectives to be borne in mind throughout the period of project implementation, so that the extent to which objectives are being met can be qualitatively judged, and the outputs of different survey instruments can be set in an overall context. As a tool it can also be backed up or annotated with very simple quantitative data, or with extensive data on individual component elements. In either case the comparison of quantities between objectives must be an evaluative task involving qualitative judgement by people involved in or affected by the project.

The reason for this is that quantities measured on one type of scale cannot automatically be equated with, or computed with, quantities on another type of scale. Rittel identifies four types of scale measure: nominal, ordinal, interval,



and ratio scale.<sup>5</sup> Furthermore, different types of units cannot be computed together. For example, the square footage of area built, the number of primary school places, and the average income cannot be computed together. And yet all of these are important quantities which decision-makers need to know. The virtue of the intent structure is that it can potentially display these incompatible quantities side by side so that a decision-making group can make up its own mind about what has been achieved, as opposed to being given the output of a social cost-benefit analysis which may be based on assumptions the group does not share.

In practice, the Dandora Project intent structure was not annotated as such with quantitative data. Instead, the various objectives identified within it were used to structure and schedule surveys, and as a framework for reporting. The objectives have been used as headings for sections of reports containing detailed quantitative data. They are also referred to in structuring issues arising out of the survey data.

The different boxes in the intent structure, each representing one objective, were used to generate data. They therefore formed the essential framework for the research design. Obviously the amount and type of quantitative data varies greatly with the different objectives. Those at higher levels in the intent structure are more qualitative and those lower down more quantitative in nature. Questions on some objectives could be answered with a yes or no at some stages of the project, for example "has a trade promotion officer been appointed?". Others are simple quantities such as "how many out of the 6000 plots have been constructed?" Others again, such as "residents to consolidate houses", have led to extensive and detailed surveys of the rate of building.

It is in the relationships between objectives, however, that more complex quantification becomes inevitable, in attempting to measure the effects of variables upon each other and thus to explain the dynamics of the project in a more detailed way than the intent structure permits. Here again, another type of interpretive structural model became necessary, as will be described in section 8.

## **7. Identifying objectives**

The step of defining the Dandora Project objectives in order to build the intent structure was undertaken as soon as we had identified the various actors in the project.

<sup>5</sup> A nominal scale merely identifies different qualitative categories e.g. 600 type A houses and 264 type B houses. An ordinal scale establishes rank ordering of categories: e.g. social situation has improved, stayed the same, or deteriorated. An interval scale gives quantitative intervals between categories but does not have an absolute zero making computation and comparison possible: e.g. temperature scales. A ratio scale has equal interval units and an absolute zero, making computation possible.

First, consensus was achieved on the objectives of each individual agency. Using documents available, the study team analyzed their content for statements of objectives. Lists of these were then submitted to their owners for confirmation, and adjustments were made. It is interesting to note that sometimes the agencies involved did not readily recognize their own objectives and queried them, in which case discussions were held over the documents from which they had been obtained.

Secondly, the objectives of the different agencies were grouped as to content in order to identify the overlaps. This integrated list of objectives was also arrived at by consensus, using a gaming exercise where each objective was listed on a card, and separate cards were matched for overlap and ranked in a logical hierarchy. This exercise could have been carried out by decision-makers involved in the project, but in this case, because of time and manpower constraints, it was done by the study team and the results submitted to the various clients for approval.

Cards were prepared for each objective, with the owner of the objective noted on the card. The eight study team members, working in smaller groups, ordered the cards into sets. Cards with overlapping objectives were stacked together for later substantive rewording. Cards with very general objectives were placed at one end of a large table and cards with very specific ones at the other end. Nine levels were established in between, and the different cards were moved around these levels during the decision-making game. Gradually, cards were assembled into larger subsets by discussing the logical relations between them, both vertically and horizontally. These subsets were also moved from time to time.

Consensus formation is a traditional skill among Kenyans. The 100 original objectives were reordered into an intent structure of 59 items, to the satisfaction of the group, in a period of approximately 4 hours. The team worked in small groups of 2-3, negotiating each overlap and linkage. Major rearrangements or changes were negotiated with the small groups meeting together and going over each other's cards. As a traditional consensus formation, although several discussions could be operating simultaneously, each individual covered all the ground. Dissatisfaction on the part of any individual was identified and negotiated until all team members were assured that all sources of dissatisfaction, whether their own or others', had been removed.

## **8. What to measure? Explanatory models**

Although the intent structure provided us with a basic framework for establishing what to monitor, it provided insufficient explanation of the interactions between variables that might affect project performance. Therefore, although the information necessary in order to assess project performance

was outlined, we still needed to decide which specific variables to measure. In order to establish those variables, we had not only to structure the objectives in more detail, but also to explain the ways in which they were likely to interact. In other words, there were still several more steps to be gone through in designing a data structure before the routine exercise of data collection and reporting by objectives could be commenced. The tool chosen to explain the interactions affecting important objectives was again a type of interpretive structural model.

The study team first identified those models which were estimated to be necessary to explain all aspects of the project. They were listed as shown in table 1 in a simplified version of the intent structure, but with the same overall spatial structure, i.e. one axis moving from generality to specificity and the other axis moving through social, physical, and economic sectors.

An example of an explanatory model is given in fig. 1. This is a general form of the model used for different infrastructure components. The general form has two functions:

- (1) to convey visually the assumed relationships between variables being monitored, and
- (2) to show the link between data required and its collection in a suitable form by different instruments.

Each box in the general model represents a variable which can be annotated by one or more indicators. The data for the indicators could be collected from several sources, the ones indicated on the general infrastructure model being questionnaire surveys, observations, and documents. The complete set of models for the study provides a data structure, which can be used for designing not only individual surveys, but the whole range of surveys necessary over the life of the study.

The detailed models for each aspect go into a good deal more description of the actual data to be collected. The detailed model for water supply infrastructure, for example, includes the following indicators:

*Previous availability of service: Access to water supply:*

- % inconvenient
- % indifferent
- % convenient

(Ref. baseline questionnaire, Q. 150)

*Quality of previous service: Water supply*

- % stream/river
- % roof tank
- % borehole/well
- % piped (public)
- % piped (on plot)

Table 1  
List of explanatory models.

<i>Economic improvement:</i>	1.	Economic improvement at community level	6.0	Project employment components:
	2.	Economic improvement at family level	6.1	Industrial area
			6.2	Workshops
			6.3	Markets/informal sector
			6.4	Construction
			6.5	Others
			7.	Tenure, loans and subletting.
<i>Physical improvement:</i>	3.	Health improvement	8.	House construction
			9.	Wet-cores and house types
			10.0	Infrastructure components:
			10.1	Water supply
			10.2	Sewerage
			10.3	Solid waste
			10.4	Energy/street lighting
			10.5	Roads/transport
			10.6	Open space
	<i>Social improvement:</i>	4.	Educational improvement	11.0
			11.0	Secondary schools
			11.2	Primary schools
			11.3	Day-care
			11.4	Adult education
			11.5	Health centres
			11.6	Nutrition centre
			11.7	Training programme
5.		Community participation	12.0	Community organizations:
			12.1	Social centres
			12.2	Churches
			12.3	Organizations
			12.4	Building groups

% buying in cans

(Ref. baseline questionnaire, Q. 149)

In describing the need for interpretive structural models, Warfield states that: "Among the things that humans are poorest at doing rapidly is establishing and portraying visual images of complex sets of interrelationships and modifying these images under the impact of new information or changes of opinion." This was certainly the case with the Dandora study. We therefore found it necessary to translate such detailed information back into a linear report form.

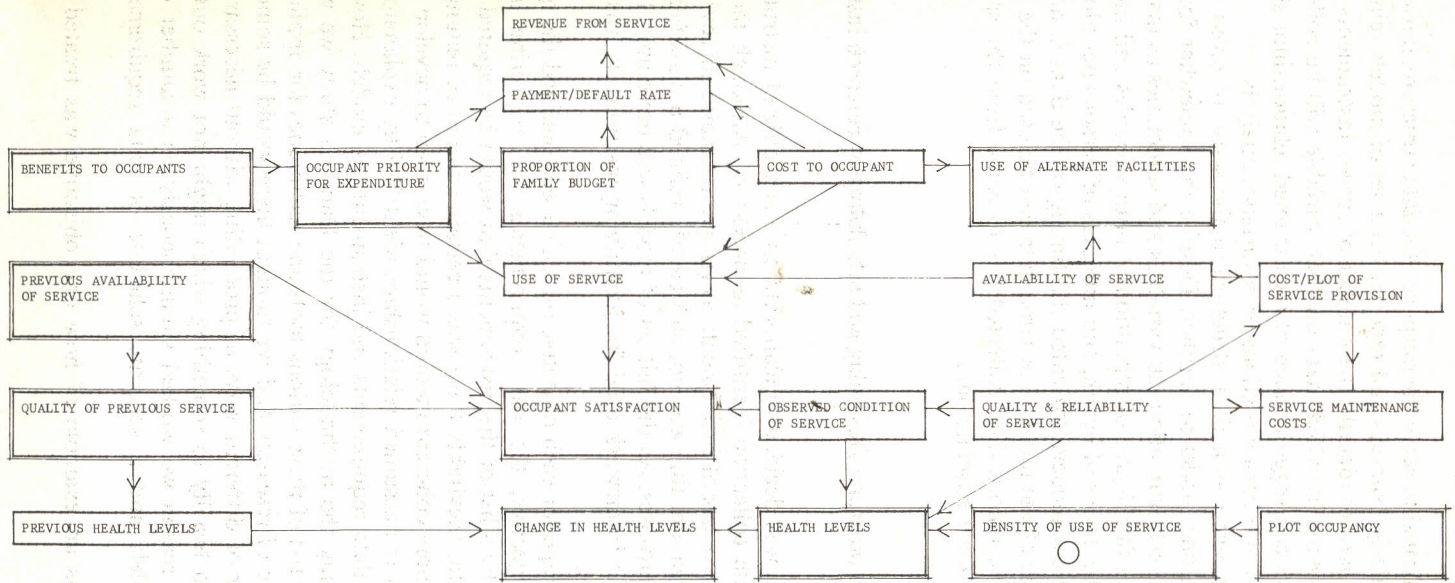


Fig. 1. Typical explanatory model: general model for infrastructure service. Key: ☐ Questionnaire survey; ☐ Observations and documents only.

The models continued to serve the purpose of a data structure, however, and have been used to design surveys and reports. Each set of models relating to a set of objectives is used to identify the number of survey instruments that will be used, and the means by which data on each variable will be collected. In addition, the models can suggest which of the assumed relationships should be examined by means of cross-tabulations or covariance analysis.

The models also serve as a data structure in the sense of cross referring items of data from one model to another. Despite the somewhat formidable number of models, each with about 20 variables and sometimes as many as 50 indicators, there is a fair degree of repetition of both variables and indicators. For example, income, levels of health, and numbers of persons per plot appear repeatedly on different models. Provided the timing of the data is not inconsistent with the logic of the model, the same data can be used on the different models. For any one report, data collected has to come from the same time period, or be pre-project baseline data.

## **9. How and when to measure: Designing and scheduling of research instruments**

From the start it was decided to elaborate on a schedule of instruments to be used for the data collection identified as necessary. Although the models classified data by two sets of instruments as (i) questionnaire surveys and (ii) document or observation, this was not sufficiently refined a classification for detailed planning purposes. As the full set of models was not completed when the study began, the framework used for identifying instruments was initially the set of objectives.

We prepared a page for each objective on which was outlined the questions relevant to the objective, the data requirements for answering all those questions, and finally a list of the instruments that would be required in order to generate that data. Inevitably there was a certain amount of redundancy in this procedure. A more coherent method would have been to develop research questions based on the assumed relationships identified by explanatory models, and to classify data requirements and instruments by models. However, at the time of designing the methodology for the Dandora study we were still exploring the potential of these various tools and techniques for application to an open-ended type of research, and we thought there would be some benefit in trying a number of different ways of proceeding without necessarily tying ourselves down too heavily to something which might not work out well in practice. For that reason we worked simultaneously on a number of tools, including the models and a separate schedule of data requirements and instruments.

The following is an example of how one objective was treated for this

schedule:

*Objective 7.07:* To encourage private initiative and increase output in small-scale construction industry.

*Questions:* What volume of house construction work in Dandora is done by contractors as opposed to being self-help? How much employment is created by the small contractors and the self-help builders? What are the benefits of each type of work to the small-scale construction industry and African contractors? Does labour and management come from Dandora or elsewhere? Are local or imported materials and components used? Are building methods used labour-intensive?

*Data required:* Volume of construction: total, by contractors, by paid labour. Number of small construction businesses operating in Dandora. Profile of small businesses: size, citizenship, length of operation, capital, equipment, turnover, number of employees and whether resident in Dandora, location of business, materials, source of supply, building methods, quality of construction, profit, growth. Number of Dandora residents employed in construction, compared with Nairobi as a whole.

*Instruments:*

*Documents:* Nairobi City Council and national statistical reports. Reports of the National Construction Corporation. Reports of the Dandora Project Department.

*Questionnaire*

*Surveys:* Physical improvement: House construction. Economic improvement: Employment, income, and expenditure.

*Observation*

*surveys:* House construction.

*Case studies* of small contractors.

This gives some idea of the number of data sources that required coordination in order to report on one objective. In the case of documents and some aspects of case studies, coordination was not very difficult, but with questionnaires the timing of different surveys was all-important when it came to comparing data on items such as income and expenditure, or the cost of building. Coordination was also important to avoid redundancy, and to streamline indicators and questions so that they could be used for different purposes.

After a process of rationalization by reducing the variety generated by the models and the schedule of instruments, the study team came up with a regrouping of objectives into six major categories:

- (1) broad policy objectives;
- (2) physical improvement;

- (3) economic improvement;
- (4) social improvement;
- (5) interagency collaboration; and
- (6) special reports.

Only three of these categories—economic, social, and physical—required annual questionnaires. The rest were to be reported upon using a variety of other instruments: in-depth interviews or case studies, document searches, participant observation, “visual observation” surveys, observations of specific community facilities, and a project evaluation seminar.

Questionnaire surveys, although classified as physical, social, and economic, sometimes had to be split again into other categories when being put into the field. This occurred with the physical improvement survey which was divided into house construction and infrastructure surveys, not only because it would have been too long as a single survey, but because the qualifying criteria for completing the house construction questionnaire were different from those for answering questions on infrastructure. Questionnaires were generally administered in 1–1½ hours per interview, by members of a full-time field survey team, the majority of whom were themselves Dandora residents trained by the study team. The baseline questionnaire, which covered indicators on all aspects, was longer and therefore took longer to administer than the other questionnaires.

The sample for the questionnaires was always the same, to allow cross tabulation of data between surveys. Originally, a 50% sample was envisioned, but this had to be cut to 15% because occupation of the site was very slow initially and only genuine allottees were interviewed. Surveying had to begin with the population available. This may appear to have caused some bias on the sample but the study team took care of this problem by continuously monitoring and comparing selected variables from the questionnaire surveys with those from a 100% sample, or a 20% sample selected from all occupants at a later date.

An observation survey of 28 variables relating to house construction and plot occupation was carried out every 4 months during the entire period of the study for every plot. This 100% sample survey provided an accurate and reasonably up-to-date picture of physical progress on site, which was usually presented in the form of a graph of plot occupation, construction starts and finishes as illustrated in fig. 2. The survey usually took about a week to administer and another month or two for data processing, analysis, and presentation in report form along with other current survey results. In the early stages of monitoring this instrument proved invaluable in indicating trends on construction performance. It was used to document an intervention on the issue of whether the Nairobi City Council should demolish temporary shelters built by plot occupants before they constructed a permanent shelter. The data showed that occupied plots were built faster than others, and demolition was halted after the presentation of a special report utilizing these data.



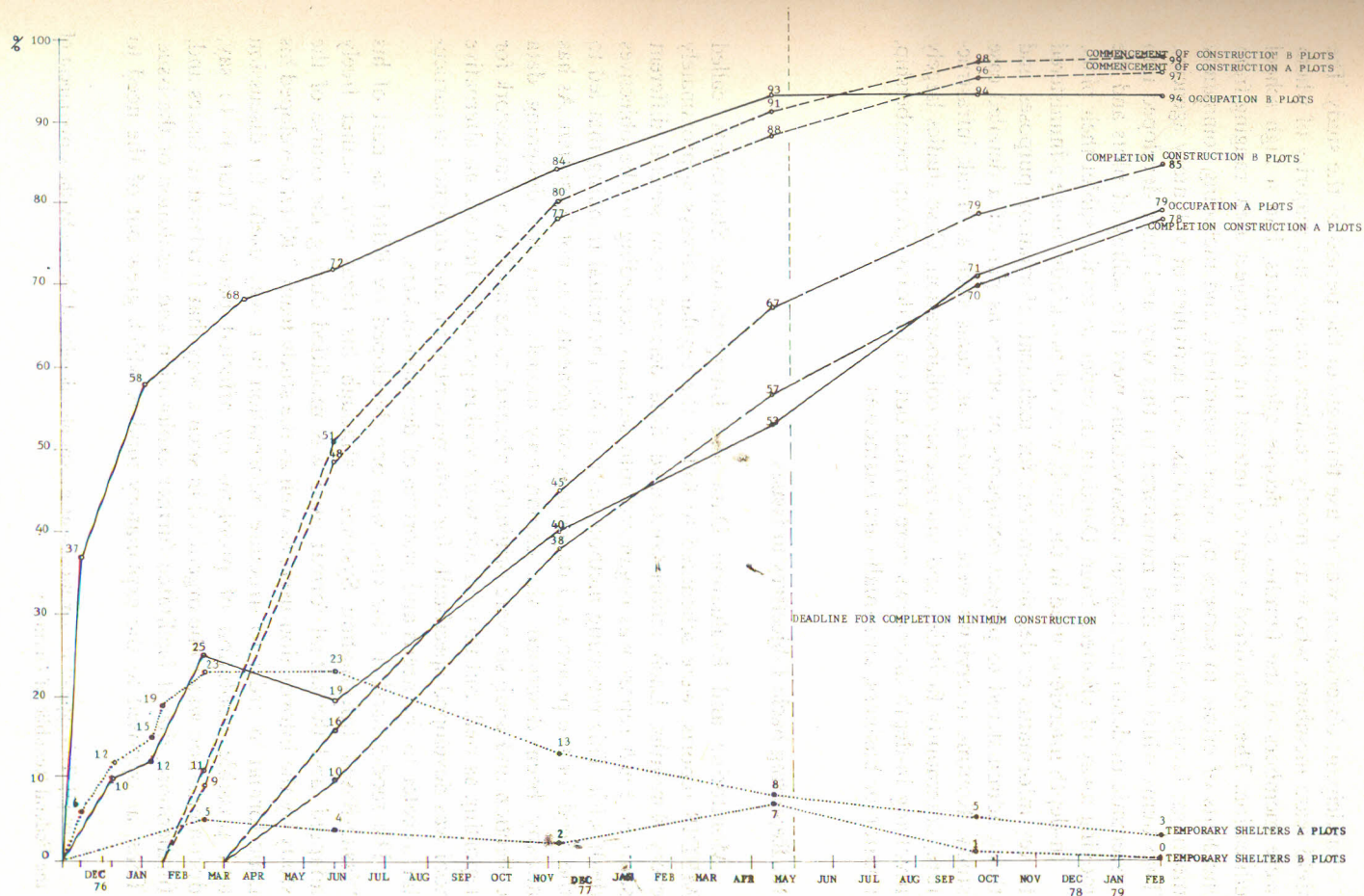


Fig. 2. Graph showing rates of occupation and construction on type A and type B plots. Source: Senga, Ndeti, and Associates, MEDIS Reports no. 5 (1979) p. 42.

Participant observation was in use throughout the period of the study. The field team members, who were mostly resident on site, the majority of whom were members of the families of people allocated plots, had a high school education. They identified events of interest in the project area, ranging from incidents of crime to surveys by other researchers, and including community meetings, family problems and conflicts, and activities of voluntary agencies. Two items which were first monitored in this way and later developed into systematic in-depth participant observations were the selling of plots and the moving away of allottees from Dandora in order to totally sublet their plots.

In-depth interviews used in the study were of two kinds: those administered to key informants or decision-makers for technical information purposes, and those administered to project occupants or others as part of a detailed case study. Routine interviews were conducted on items such as trunk infrastructure, community facilities, and interagency collaboration. Case studies largely involving in-depth interviews were carried out on building group membership, contractor business, and small-case businesses.

#### **10. Reporting back: Objectives to issues**

Monitoring and Evaluation Data and Interpretation Statements, called MEDIS reports, were scheduled to follow the regular surveys approximately every 4 months. Each report contained data derived from several different sources. Each report was organized into sections according to the objectives dealt with. This reporting method ensured that the initial thinking that led to the need for the project and its various components was not forgotten. As has already been described, the explanatory models used for designing data collection and analysis were originally planned to be used as a framework for reporting as well, but this did not work well in practice. Instead, an alternative tool was developed specifically for data presentation, and designed in particular to cater to the needs and priorities of decision-makers.

The model used in this case was one developed by Rittel as part of his "Issue-Based Information Systems", although his ideas were rather freely adapted, and the actual format used was modified during the course of the study by the information-users as well as the study team.<sup>6</sup> Rittel developed his issue format in order to structure information in a way useful for discussion and possible resolution of problems by affected parties. That is to say, documentation was to be organized in such a way that it related to issues and, furthermore, that it facilitated further exploration and resolution of the issue. Thus, as opposed to the explanatory models which grew out of the need to

<sup>6</sup> See [3]. This type of information systems was also developed for use by the Government of the Federal Republic of Germany.

Table 2

Example of issue structured for discussion: Occupancy of Phase I by non-allottees.

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*Relative objectives*

- 6.16 To provide tenure to land at a price residents can afford.  
 2.02 To provide for the physical, social and economic needs of the urban low-income groups.

*Who is affected by the Issue?*

Dandora residents, projects management, future site and service planners.

*Time frame*

Short, medium, and long-term.

*Why is it an issue?*

Occupation surveys show that about half the occupied plots in Phase I of the Dandora Project are occupied by people other than allottees. These people are more often male, wage-earning, somewhat higher income than allottees, and have slightly smaller families. It is possible that allottees sublet their plots for a short time on completion of building to recoup the costs of building. Rents in Dandora are considerably higher than where allottees lived previously. It is also possible that allottees intend to completely sublet their plots permanently because they prefer to live elsewhere. This may be because they are higher or lower income than the target group, but in either case because they prefer to make profits on rents in Dandora than to live there. It is also known that a small proportion of plots have been sold.

*Action already taken*

1. No actions have been taken by NCC on plots which are known to be sold or permanently sublet (or in arrears).

*Possible alternatives*

1. Eviction of all allottees who totally sublet their plots.
2. Eviction of all allottees who totally sublet their plots who are known to be high income earners.
3. Eviction of all allottees who still totally sublet their plots after a specified deadline.
4. No evictions.

*Constraints*

1. If no action is taken, residents will assume project management has no powers and abuses on future site and service projects will increase, to the detriment of the intended beneficiaries, the low-income groups.
  2. Evictions may penalize genuine low-income allottees who are merely trying to pay off debts incurred during construction.
- 

Source: Senga, Ndeti, and Associates, MEDIS Report no. 5 (1979) p. 9.

explain "what is", the issue format grew out of the need to find out "what should be done?" To illustrate, we reproduce (as table 2) the issue of the occupancy of Phase I by non allottees as it was structured for discussion in MEDIS Report no. 5.

Each MEDIS report consists of the following elements:

- (1) data in the form of tables with commentary, organized by objectives;
- (2) a summary of the whole report cross-referenced to the detailed text; and
- (3) the set of issues emerging from the data, each one page of information.

Each issue is structured by identifying the project objectives it affects, the

parties affected by it, and the time frame within which it is important. The longest item on the issue format is the explanation of "why is it an issue?", although this is seldom longer than a paragraph. Other items identified are actions already taken and possible alternatives for ameliorating the effects of the issue. Sometimes constraints involved in doing so are mentioned as well. The set of issues is first identified by the team member preparing the report, or section of the report, and is then reviewed by other members of the study team in the light of the first draft of the report. In many cases amendments are made at this point, or further issues identified for inclusion. Sometimes the exact nature of the issue is not clear, and in several cases an emerging issue has led to additional data collection after the first draft of the report was ready, causing some revisions and delays.

## **11. Issue analysis**

Issues can be broadly classified into three types: policy, planning, and management. Policy issues are those affecting long-term policy on similar projects; planning issues are those affecting the guidance of the project itself, particularly things which may be learned from an early phase that can be improved upon in a later phase; and management issues are those affecting day-to-day action mainly by the executing agency. Some management issues are in fact never raised because effective remedial action can be taken without going through the process of reporting.

Some issues overlap two or more of these categories, having the potential for some immediate remedy as well as longer term, usually more effective solution. Many of the short-term issues which emerged related to the performance of elements of infrastructure, such as water supply malfunction, refuse collection, street lighting and security, and so on. These were dealt with at the level of the executing agency, although they may have some interest for the purposes of planning and policy. Short-term management issues, which also had substantial planning or policy implication, were the illegal scale of plots, the type of technical assistance offered to self-help builders, food growing on plots, plots with poor soil conditions for building, small businesses, house type plans, and plot occupancy. Issues which had only planning or policy implications were by-laws, financial stress during construction, sale of middle income plots for cross-subsidization, demolition, allocation, organization of self-help building groups, and the loan repayment schedule.

Longitudinal analysis of issues in a substantive sense is also revealing. The following example of a major issue is set out exactly as it was recorded in different monitoring reports from March 1977 to August 1978, although, for brevity, only the issue explanation has been included. The selected issue pertains to occupation. It illustrates some of the most pressing problems which

are likely to require policy and planning interventions in this particular type of self-help housing project.

Occupancy of plots was reported on as follows.

*March 1977: The relationship between occupancy, rate of construction, and temporary shelters:* The rate of occupation and consolidation of plots by allottees is extremely divergent for type A and B plots. Type B plot allottees, using the core kitchen built for them, occupy and build faster than type A allottees. Since type A allottees predominate, the overall rate of consolidation reflects their speed. By mid-March 1977, overall occupation was 37% (as compared to 68% for type B plots) and permanent construction had only just commenced (due to delay in approval of house plans.) Type A allottees are building temporary shelters in order to occupy and build. They should not be discouraged from doing so, in order to speed the rate of permanent construction, and any such temporary shelters should be subject to demolition at the end of the 18-month period allowed for permanent construction.

*July 1977: No increase in temporary shelters:* The number of temporary shelters on both A and B plots has remained almost static. This is due to the fact that Nairobi City Council threatened to demolish temporary shelters on 31 March 1977. Although no action was in fact taken, allottees have feared to build more, and have even taken a few down voluntarily. Meanwhile, the Town Clerk's Department of Nairobi City Council has agreed that temporary shelters are permissible.

*March 1978: The relationship between occupancy, rate of construction, and temporary shelters:* Allottees consolidate their houses more slowly when they are not able to occupy their plots. The constraints on occupation:

1. Absence of a kitchen or other sufficiently large space in the wet core provided (this applies to type A cores).
2. Previous Nairobi City Council warnings to residents to demolish temporary shelters, which has influenced them against doing so subsequently.

Type A allottees live elsewhere during construction. The overall rate of consolidation of the project is slowed down, since there are many more A plots than those with kitchens provided. Apart from the financial burden on allottees of rent payments additional to their plot repayments, other effects include extra efforts that project management has to make to find other ways of locating allottees and encouraging them to build.

*August 1978: Occupation of A plots dropping below rate of completion of construction:* Although it is much too early to make predictions from present data, it nevertheless seems worth discussing why the occupation rate on type A

plots should have dropped below the rate of completion of at least one room. It is possible that a large amount of construction was completed just before the present survey was carried out (May 1978), before the households had a chance to move in. It is also possible that A allottees can afford to delay moving in, and that the alternative accommodation they found while building is either satisfactory and affordable, or is preferable. It is also possible that they are waiting to sublet the first room, and are delaying their own move. Another possibility is that many allottees have handed over management of construction (and possibly also the financing and subletting) of their plots to other agents. This is all very hypothetical at the moment however. A quick survey of every 10th plot in Phase 1, just prior to finalization of this report, revealed that the percentage of occupied plots which are actually occupied by allottees is lower for A plots (55%) than for B plots (65%).

The occupancy issue is also well summarized by fig. 2 which shows how A plots lagged behind B plots throughout, although they did not remain tied to the presence of a temporary shelter before managing to start construction. The issue of where site and service plot allottees ought to live during construction remains unresolved in the urban projects in Kenya. Although numerous discussions have been held on the role of temporary shelters, the local authorities remain ambivalent about whether they are to be permitted or not in future projects.

The problem of how plot allottees are supposed to pay for living somewhere else during construction has been partly resolved in the second urban project by reducing plot repayments to a very low level during the first three years after allocation. However, this only partly alleviates the problem because there is still some payment, building must be paid for, and existing rent must continue—the basic ingredients of financial stress. Furthermore, this grace period only applies to certain plots, not all of them. This lack of a full integration of the findings of monitoring and evaluation from the first project to the planning of the second reflects some degree of institutional inertia as well as the lack of streamlining in the design of information routes between monitoring and decision-making.

The occupation of half the plots by people other than those allocated is also a reflection of financial stress. Strictly speaking, those who use their plots for rental purposes only and live elsewhere should be evicted, but this course of action is not being taken in many cases because it has been recognized that the very low-income people need to recover their investment and repay debts. At the moment, regulations stipulate that plot-owners must live on their plots for the first five years, and may then move, but it would be more realistic to reverse this requirement. The second urban project permits some plot-owners to sell after three years and realize their investment. While reducing some potential financial hardship to very low-income people, this measure of selling

is less likely to benefit the self-help builders than if they became landlords over a longer period. However, this again raises questions about the benefits to the low-income tenant population. Ultimately, only a sustained programme of housing construction which raises the stock somewhere nearer the level of demand can help this situation.

## 12. Conclusions

While it is not yet time to draw final conclusions about the full impact of the Dandora Project and the extent of social, physical, and economic improvement achieved in the community, it is possible to draw some preliminary conclusions about the effectiveness of the various tools and methods employed in monitoring and evaluating the project.<sup>7</sup>

In the absence of any clear-cut methodology for monitoring and evaluating a complex urban social and economic project, a number of tools of management science and concepts from planning, social science, and systems engineering were adapted in order to structure data in a form useful to decision-makers. In this process, the raw material being moulded was conventional social science data and its methodology. The characteristics and logic of this type of data and method had to be respected, but at the same time, the purpose to which it was to be put strongly influenced the content of the data to be collected, the nature of the questions it had to answer, the comparison of data from varied sources, and the speed at which it was collected, analyzed, and applied.

Interpretive structural models were used to explain the project and indicate the data requirements necessary to monitor and evaluate it. The intent structure or objectives tree type of model proved extremely useful in identifying the overall purpose of the project and its various components, and served as an agreed basis for coordinating evaluation discussions with a large group of project-related agencies.

Explanatory structural models were also used to develop the potential relationships between project variables and to generate hypotheses that could be tested by the data. Essentially, however, this data structure was open-ended, and new or alternative explanations and variables could be introduced at any time. The explanatory models also served as the framework for data collection, providing the basis for identifying instrument and indicators. This use of structural models as a research framework worked well and could be further developed in other applications, but such models did not make appropriate tools for the display of results.

<sup>7</sup> At the time of writing (mid-1979), the monitoring and evaluation study still has about another year to run. The evaluation seminar to assess the findings of the study over a 5 year period is scheduled to be held in 1980.

Participation by decision-makers in the entire process of research design, survey design, and interpretation of evaluation results was given a high priority in the study, and was considerably helped by the use of two tools: the intent structure and the issue format. Each monitoring report, coming about once every 4 months, was structured into data and interpretations, a summary, and a set of issues requiring discussion and/or action by some of the agencies involved in the project. The issue format was revised repeatedly in collaboration with the decision makers who used the data.

To supplement discussion of issues, the summary of each report provided a useful digest of research findings, according to project objectives, showing how each aspect of the project was performing regardless of whether there was any issue requiring action.

The delta chart, a combination of flow chart and PERT network, proved to be a useful tool in programming. The steps involved for any one reporting sequence involved coordination of different instruments, survey design inputs by data users, fielding of surveys, data analysis, issue identification, additional data searches, coordination with the executing agency, and finally reporting according to a deadline.

Monitoring and evaluation must be closely linked to the processes of project implementation and policy review and formulation. They serve as an essential link in improving performance at all these levels. The institutional framework connecting monitoring and evaluation with decision-making needs to reflect these links. Although some of the institutional links worked well on the Dandora Project, the connection between the local authority Project Committee, to which the executing Department reported, and the General Government Steering Committee, to which the monitoring team reported was weak.

Some institutional aspects have been improved upon in the second urban project, such as the incorporation of a monitoring unit into the Ministry of Housing and Social Services. Coordination in reporting should also be improved upon because there will be a closer working relationship between the Ministry and the local authority Housing Development Departments, as well as some answerability in management terms from one to the other.

On the substantive side, monitoring and evaluation of this one large self-help urban project has so far revealed that some of the key problems remaining to be resolved in detail are as follows:

- (1) the flows of cash at the household level during the expensive construction period;
- (2) the physical and financial arrangements of where families live during this construction period;
- (3) the policies and plans relating to spontaneous economic activity and employment generation in new self-help settlements; and
- (4) the type of by-laws and standards applying to site and service self-help construction.



Apart from these, which require substantive policy and planning inputs to resolve, the types of issues raised by monitoring and evaluation can be dealt with on a routine basis at the level of day-to-day management, project planning, or policy planning, or policy formulation and review. Many management issues have to do with aspects of infrastructure function, such as water supply and sewerage, while the issues involving the adaptability of housing designs to the low-income families are typical of the planning level.

## References

- [1] Center for Planning and Development Research, *Some Principles for the Design of an Educational System for Design*, Reprint Series no. 54 (Institute of Urban and Regional Development, Berkeley, 1966).
- [2] Etzioni, A., *The Active Society* (The Free Press/Macmillan Co., New York, 1968).
- [3] Kunz, W. and Rittel, H., *Issues as Elements of Information Systems*, Working Paper no. 131 (Institute of Urban and Regional Development, Berkeley, 1970).
- [4] Mabogunje, A.L., Hardoy, J.E., and Misra, R., *Shelter Provision in Developing Countries* (SCOPE/John Wiley and Sons, New York, 1978).
- [5] Senga, Ndeti, and Associates, *Monitoring and Evaluation Study Process Statement* (July 1976).
- [6] Senga, Ndeti, and Associates, *Monitoring and Evaluation Study Process Statement (Revised)* (Oct. 1976).
- [7] Vester, F., *Urban Systems in Crisis*, Federal German Government, Research Project no. 10401004 (1976).
- [8] Warfield, J., *An Assault on Complexity* (Batelle Institute, 1973).
- [9] Warfield, J., *Societal Systems: Planning, Policy and Complexity* (Wiley/Interscience, 1976).
- [10] Warfield, J. and Hill, J.D., *A Unified Systems Engineering Concept* (Batelle Institute, 1972).