Computerization in physical planning : possibilities of automatization on behalf of the governmental planning autorities in Indonesia

MANAGEMENT VAN DE RUIMTELIJKE ORDENING EN RUIMTELIJKE PLANNING

MANROP-serie: nr.41

George G. van der Meulen

computerization in physical planning; possibilities of automatization on behalf of the governmental planning autorities in Indonesia

Eindhoven, maart 1983

Urbanistiek en Ruimtelijke Organisatie
Afdeling der Bouwkunde
Technische Hogeschool Eindhoven

COMPUTERIZATION IN PHYSICAL PLANNING

possibilities of automatization on behalf of the governmental planning authorities in Indonesia*

George G. van der Meulen**

Eindhoven/St. Hubert, February 1983

---

* this paper is written as a consequence of a lecture held in December 1982 at Cipta Karya, Department of Public Works in Jakarta.

** senior lecturer in Management of Urban and Regional Planning,Dep. of Architecture,Building and Planning, University of Technology Eindhoven, The Netherlands.

C O N T E N T S

SUMMARY

Physical planning is a fast developing discipline which sees itself confronted with much difficult problems from society and from the practice of physical planning itself. In order to tackle some of these problems it is senseful to introduce new kinds of technology. This is especially relevant with regard to computerization.
Developments in the field of the Physical Regulation and the spatial processes in the Netherlands have been reasons to use computers in physical planning. Within the framework of the so-called Management of Urban and Regional Planning (MANROP) some computer models have been created to assist the research in the aforementioned field. Examples of these models are described and some things worth knowing about the computer programs of the MANROP-models are reported.
The usefulness of these models and the included way of working is not limited to the dutch circumstances of physical planning. After a brief look at the problems of physical planning in Indonesia there is given attention to the applicability of the MANROP-models in that context.
Application of computers on behalf of the physical planning does implicate a range of educational aspects, like learning to work with computers, rationalizing of physical planning, systematisizing of methods. In the same context it gives an opportunity for training possibilities on a high level of physical planning in general as well as on an up to date ways of working.
As conclusion some positive and negative elements allied to computerization in physical planning are mentioned.

1. I N T R O D U C T I O N

The lecture I was expected to give at the Directorate General of Housing, Building, Planning and Urban Development of the Department of Public Works of Indonesia in Jakarta in December 1982 originally bore as title 'Computer-automatic spatial translation for structure-planning; the usefullness of the model Plotborough for the physical planning in Indonesia'(van der Meulen,December 1982). In the discussions during some meetings at Cipta Karya preceding that lecture it came to the fore that there was not only interest for the topic of spatial translation by a computer but for computerization in physical planning in general. This was reason enough to extent the lecture in that way. The present paper refers to that lecture.

As a consequence of demographic trends in the Netherlands as well as everywhere physical planning is confronted with difficult and complicated developments in society, the succeeding changes in land use and spatial activities and with developments in the field of Physical Regulation and physical planning itself. The necessity of a to that tuned management will be clear, but the creation of such a management is relatively difficult. This is caused by the fact that it has to start from the point zero and by the fact that it is confronted with a wide and comprehensive field of activity.
At the Department of Architecture, Building and Planning of the University of Technology it has led to the formulation of the so-called 'MANROP-project'(van der Meulen, October 1980) and several activities in education, training and research (van der Meulen 1974).
As a consequence of this project about Management of Urban and Regional Planning there has been given relatively much attention to the possibilities of computerization on behalf of physical planning. One of the reasons for this decision was the conclusion that several parts of the planning process and several activities connected to the decision processes were suitable for automatiza-

tion. At the moment it was clear how such parts and activities could be rationalized a number of computer models has been developed. Those models were tested on fictive data and in some cases in the dutch planning practice. This paper presents few of them (section 5). From the problems and situation of the physical planning in Indonesia some remarks are made about the applicability of these computer models resulting from the MANROP-project (sections 8 and 9). In view of this there is given some attention to the technical aspects of computers and allied apparatus (section 6).

Using computers requires special educational guidance of the practioners of physical planning. At the one hand it is necessary to teach them how to handle this kind of technics; on the other hand the consequence of computerization is partly another way of thinking and an other way of problem solving, especially in terms of research on behalf of physical planning (section 10). Both need extensive attention ; training courses has been developed to reach a stage in which the use of computers on behalf of physical planning is justified (section 11).

The paper is ends with conclusion in which positive and negative elements of the use of computers in the field in question are mentioned (section 12).

2. THE MANROP-FRAMEWORK

Special attention for a management concentrating around the way planning agencies and physical planners **are** occupied with the physical design and Physical Regulation of urban and regional areas is the result of a reaction on the practice of urban and regional planning and the connected decision-making processes.
That practice shows on second thoughts several routine-like affairs executed with relatively little efficiency, little well-considered, little structured, little syte-matic, little methodical, and relatively expensive and time-consuming. This situation was pecular in that sense because the planning practice as well as the spatial developments asked another activity.
That other activity has been realized by stressing the necessity of a management for urban and regional planning.
Management in general is described (van der Meulen, October 1980, p. 516) as the administration of organizations and the way in which this organizations are conducted and the way in which these organizations do execute their tasks, procedurally **as well as** substantially.
Evaluation and research with regard to that situation in the planning practice has led to the formulation of a project for education and research at the Depart-ment of Architecture, Building and Planning at the University of Technology Eindhoven. This project, the so-called MANROP-project, points at:

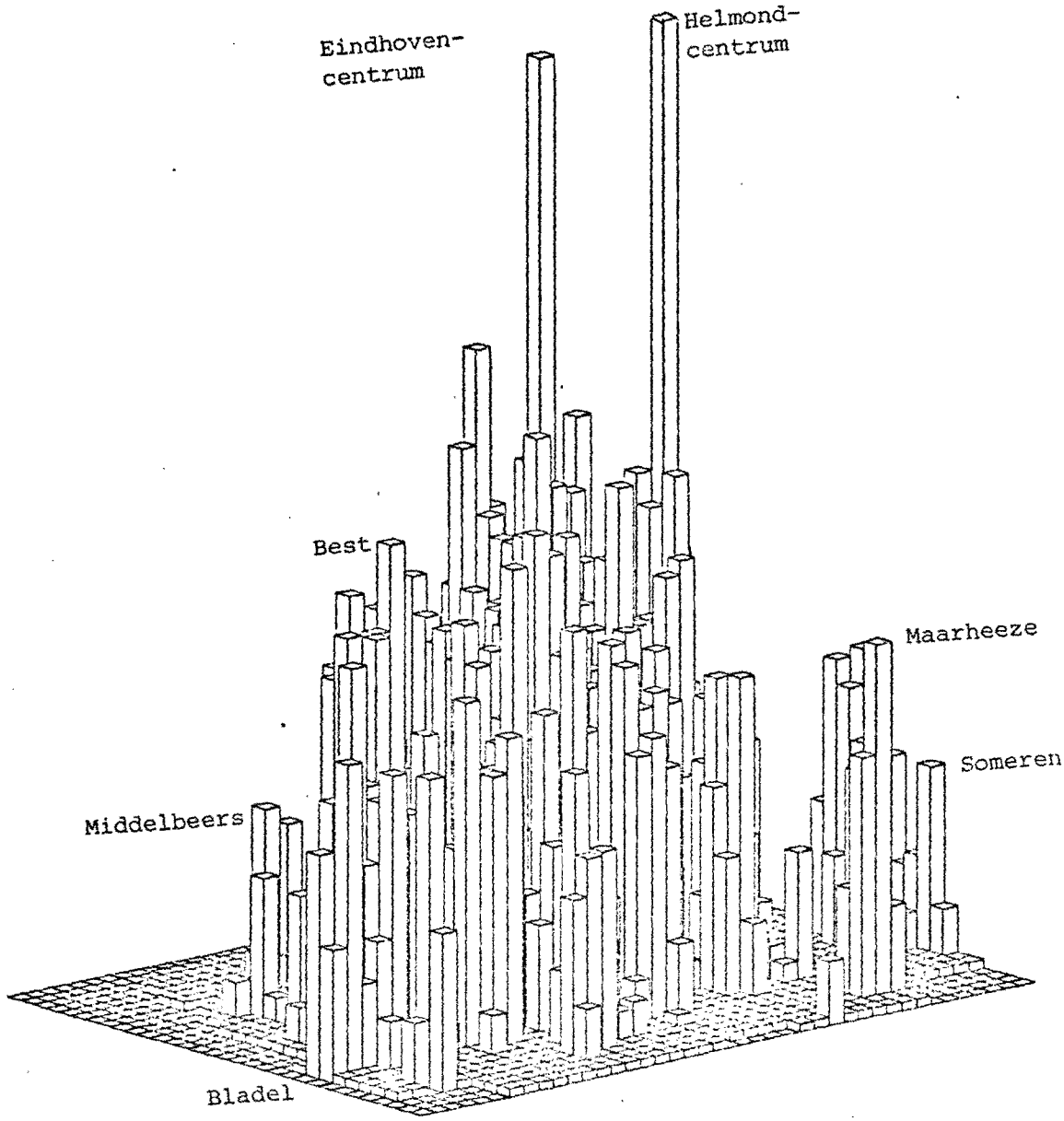
1. activities of governmental planning agencies;
2. rational planning with methodical and systematical ways of working;
3. use of computers and allied apparatus; and,
4. saving of time, efficiency and limitation of cost price (van der Meulen, October 1980, p. 516).

The project mentions seven subunits of interest. Pro subunit of management the description of the project puts to the fore one or more topics to work out. The seven subunits and connected topics are inserted in

the next synopsis.

subunit of	topics
1. data and information	-need, storing and use of data-bases -call in of information -information-systems
2. land	-analysis of land values -analysis of changes in land use -land value maquette (visual information) (see scheme;van der Meulen and van der Kamp, November 1979, p. 547)
3. plan-making	-research methods on behalf of plan-design -executing systematical quantative program -forecasting -spatial translation -automatic cartography
4. cost-benefit	-standard cost-benefit analysis -interest-accounts-systems -cost-benefit analysis as base for designing town-plans -plan-accountancy (municipality level)
5. Physical Regulation	-monitoring system for following the jurisprudention of the Crown (the Ministers)
6. process- and effectivity	-quantitative early warning systems -cartographic/qualitative monitoring and early warning system
7. education	-introductories in primary and secondary schools -evaluation of courses in tertiairy (higher) vocational trainings -methods and technics as a consequence of the MANROP-project

From the chosen topics per subunit of management of urban and regional planning it will be clear that the use of computers and the development of computer-programs is obvious.
In the next section we will explain that even the developments in urban and regional areas and in the Physical Regulation contain pleas for the chosen topics and the programming of computer-models on behalf of this topics.



Scheme1: Computer-generated maquette of land values in the region of Eindhoven, in grids of 1 square km

3. BACKGROUNDS FOR COMPUTERIZATION IN PHYSICAL PLANNING

There is a wide argumentation for the development of methods and technics whereby computers and allied apparatus are used. In short we mention the following reasons:

1. the historical development of the law in relation to the physical regulation (in the Netherlands). In the first place we think of the transformation of the original Housing Act from the year 1901 in a new Housing Act in 1962 and the in 1962 new-born Act on the Physical Regulation. In the second place there was a hausse of physical plans as a consequence of the last mentioned Act since 1965 (see f.i. Van der Meulen, December 1982, pp. 4 and 5).
2. the historical development of the substance, the object of physical planning. In the first place this is related to the afore-mentioned transformation in the law in question. In the second place several unmeant spatial developments had taken place, like regional underdevelopment, suburbanization of housing and of employment and a sprawl of urban settlements. In the third place we mention the so-called Memorandum on the Physical Planning in the Netherlands (Memo's 1960, 1967 and 1974).
3. the need for approaches in which cost-benefit analysis has incorporated; especially this is important in a financial-economically way.
4. the developments that took place in terms of methodology of physical planning. We mention the Sieve Analysis, the Potential Surface Analysis.
5. the developments in the way of planning; this is expressed by changes in the style of planning. Originally it was master or blue print planning; later, planners concentrated around the so-called process-planning in which the uncertainty (Goudappel 1974) and early warning approaches (van der Meu-

len September 1981a) stood central.

6. the technical developments that led to the disposal of computers and allied apparatus.
7. the formulation of the education and research as mentioned in the last section.
8. the recent plea for a 'planning method' in which efficiency, rapidity, low costs etc. get relatively extensive attention (van der Meulen, Sept.1981b,pp.6-7; Van der Heijden and Van der Meulen 1983a).
9. the current endeavors for reformulation and evaluation of the profile of the vocational training on behalf of the researcher in physical planning and town planning (van der Heijden and Van der Meulen 1983b).
10. the fact that more and more physical planners appear who learned to work with such technical means of assistance like a computer.

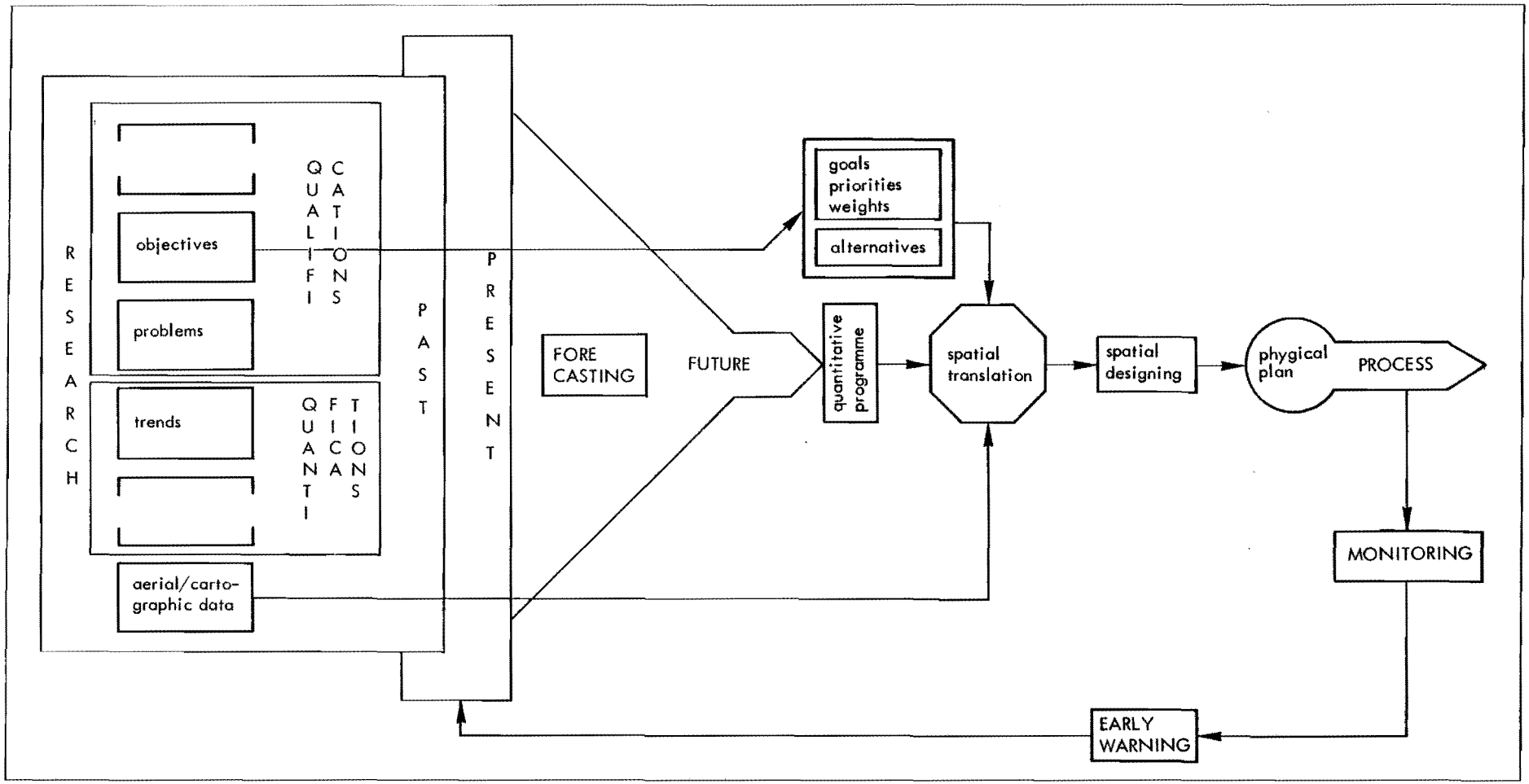
4. PLANNING-PROCESS AND MANAGEMENT

In the total planning-process we distinguish three parts at least. The process contains a plan-making or -designing phase, a decision-making and legalislation phase and a realisation and maintenance phase.
In the following we mainly will point at the plan-making phase, but we must realize that the plan-making process is strongly connected with decision-making. Partly this is caused by the fact that decision-making put forwards norms to be used in the plan-making; for an other part decision-making implies several moments in which feed backs will happen. As a third relatively very important reason our planning style lies in the continuum of blue-print planning up to process planning strongly in the direction of the last mentioned one. We will explain this by describing both planning types. As a consequence of that choice we think that a management is necessary. We will describe and motivate this after we have given an exposition about the planning process; thereby we will stress the moments in this planning process where that management can intervene for instance by using computer models.

Blueprint planning is 'an approach whereby a planning agency operates a programme thought to attain its objectives with certainty. Because of this certainty, a decision-taker committed to the objectives is bound to execute the programme. Also, modification during implementation is not anticipated' (Faludi 1973, p. 131). In the dutch context most of the physical plans up to 1970 are of that kind. Reality forced planners and decision-makers to change the plans and their way of working substantially and procedurally.
This is caused by the fact that during the time of execution (always long periodes) thinking about the way of plan-designing and plan-execution mostly change; a second fact is that at the moment of plan-making the planners by definition only have obsolete figures on

which they have to base their plan substantially. For example, figures about the population are known after a phase of gathering, controlling, putting in statistical acceptable order, putting in readiness for printing, the printing itself and publishing. Then follows still a phase in which the planners have to read, understand and making the figures usable for their ends.
In the procedural meaning the change led to the implementation of monitoring, early warning and reconsidering, structurally as well as continuously.
As a new type of planning this resulted in 'an approach whereby programmes are adapted during their implementation as and when incoming information requires such changes'(Faludi 1973, p. 132). This planning type is named: process planning. 'Process planning requires the spirit of enquiry' (Faludi 1973, p. 133).
From a standpoint of management there is a need for some grip. In the case of a plan this can be for instance that the planners make their plan in a relatively traditional way and that they explicit the way in which they come to that result. In terms of process planning the next step is the formulation of an early warning system and the following of the spatial developments in reality and the confrontation with the plan. If a review or/and a reformulation of that plan is necessary then that feed back can be made. In this way there is a good opportunity to connect process planning with management. As already stipulated, this management has directed to organizational as well as substantial activities.

When we look to the planning process, i.c. the plan-making process now then we can distinguish several series of actions. These series of actions are strongly interrelated and they know several feed backs between the meant series putted in sequential order. Too, the actions inside a serie know such feed backs and the actions are interrelated. The main lines have been placed in the next scheme.



scheme 1: planning process

The scheme shows that (often) with aid of the past and the present forecastings about the future shall be made. The quantitative program for the future and several kinds of qualitative statements in terms of program phases, priorities and weights and interpretable as alternatives are the basis for planning research in the form of spatial translation and spatial designing to make the physical plan having in view.
The plan intervenes in reality. Because of that the reality is monitored. If plan and reality divergate too much an (early) warning is given by the system to restudy and/or review the actual physical plan.
This working tracee contains several moments which need a planning management because process planning only can succeed if these moments do function well on behalf of that process. This is the case if planners as a part of a planning agency, if the planning agency as a part of the decision-making and if the decision-making as a part of political/administrative/governmental institutions are engaged on the right way and on the right moments in which that series of actions are taking place.
For instance: to say something about quantitative developments in the past and in the present an information-system is indispensable. This system needs an organization by which data are gathered; next, authorities have to care for a suitable way people or institutions have to give the data and have to give that information in time.
After that, some methods and technics are needed to handle the data in such a way it expresses the meant developments. The information-system at one hand gathers and organizes and gives all kinds of output of data; data always have to be protected because of privacy considerations or because they are classified. At the other hand, to function well the system needs housing, finances, labour power and apparatus to do all its jobs. Etc. Etc.

Moments in the planning process as shown in the scheme that are suitable for automatization by a computer and allied apparatus are several ones. All those moments which are in fact routine-occasions, principally are available for computerization. That is, calculations for forecasting, data gathering and (statistical) presentation and translation of quantitative programmes and monitoring annex early warning and information-systems contain routine-like elaborations. Compiling those routines for the use of computers is possible because the contents of that routines can be made explicit; even if there is more than one alternative content for each of them.

In the next section we will demonstrate this meaning with several examples of computer models on behalf of physical planning.

5. COMPUTER-PROGRAMMING IN PHYSICAL PLANNING: EXAMPLES

In the next we will give examples of computer models on behalf of physical planning; the examples form a part of the computer models programmed within the framework of the Management of Urban and Regional Planning, MANROP. The chosen examples give a good view at the possibilities of automatization on behalf of the tasks physical planners are confronted with.

1. data-manupilation.

This starts with the input of data. There are several ways for this action,namely: paper tape punching/reading, card punching/reading (both are so-called batch elaboration), terminal reading, magnetic tape reading, digitizing (graphical tablet), microfilm terminal reading and input from satellite computers (the last five ones are used by so-called interactive elaboration).

The second step in the data-manipulation concerns the storage of the data input in computer files, namely on: paper tape, punch cards, magnetic tape or all kinds of discs (including floppy disc).

The last step is the output of information (data) in a wished way. This means at one hand the medium, namely: paper tape puncher, card puncher, lineprinter, magnetic tape unit, discs, terminals like lineprinter or (vector-) display terminal, plotter or satellite computers.

At the other hand a part of the manipulation of the data concerns the organizing and structuring of that data on behalf of the output itself (see below under point 3).

Data-manipulation is not limited to quantities. Also data in the form of qualitative information like texts and cartographic data the(so-called geo-coding) is possible without restrictions in most of the cases.

2. data-updating.

One of the characteristics of a database is obsoletion. After a while there comes new information; partly as an improvement of the data in that database itself, partly as an enlargement of the database (for instance more recent data). In connection to this an easy kind

of updating system must be available.
An example of a database is a set of variables about real estate for each land plot in an area, as follows:

Table 1: Example of a database: real estate variables.

land plot numb.	artefact present	artefact type	year of erection	plot area	ownership	mortgaged	geocode X	geocode Y
1	0	0	0	5000	1	0	300	245
2	1	1	3	200	2	0	310	246
3	1	2	3	1000	2	1	315	245
4	1	3	4	8000	3	1	330	250
.								
.								

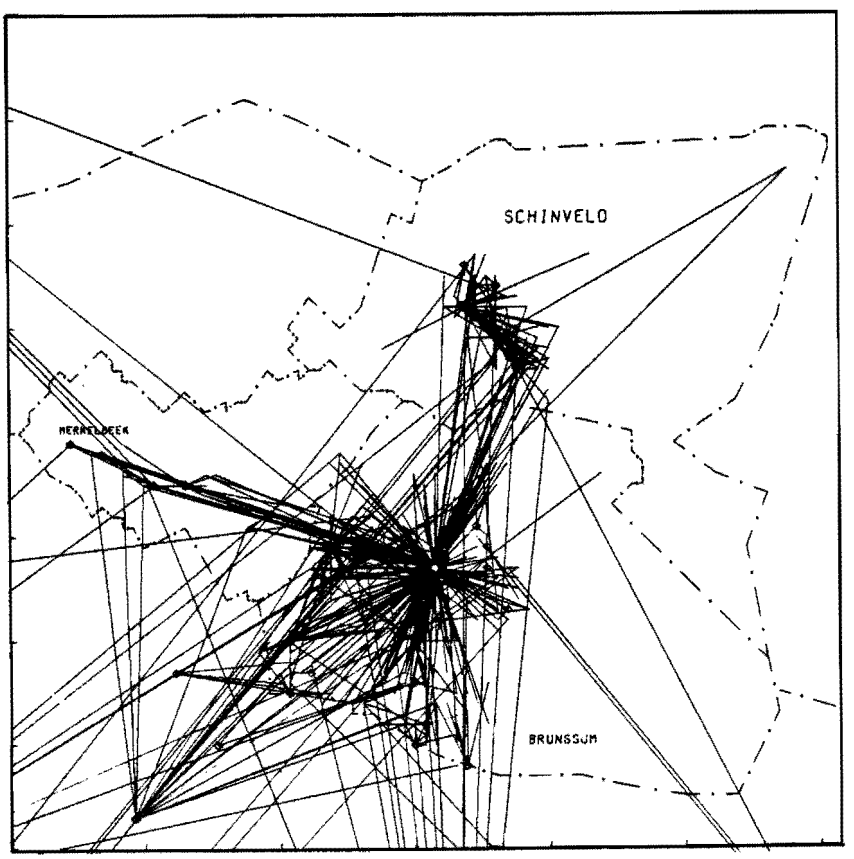
Coding book:

artefact present	no	= 0
	yes	1
artefact type	not applied here	0
	dwelling	1
	office	2
	industrial building	3
	public roads, etc.	4
year of erection	not applied here	0
	pre 1950	1
	1950-1974	2
	1975-1979	3
	1980-	4
plot area	500 m^2	500
	10004.60 m^2	10005
ownership	public	1
	private	2
	leasehold	3
mortgaged	no	0
	yes	1
geocode X	X-coordinate* 40	40
geocode Y	Y-coordinate* 300	300

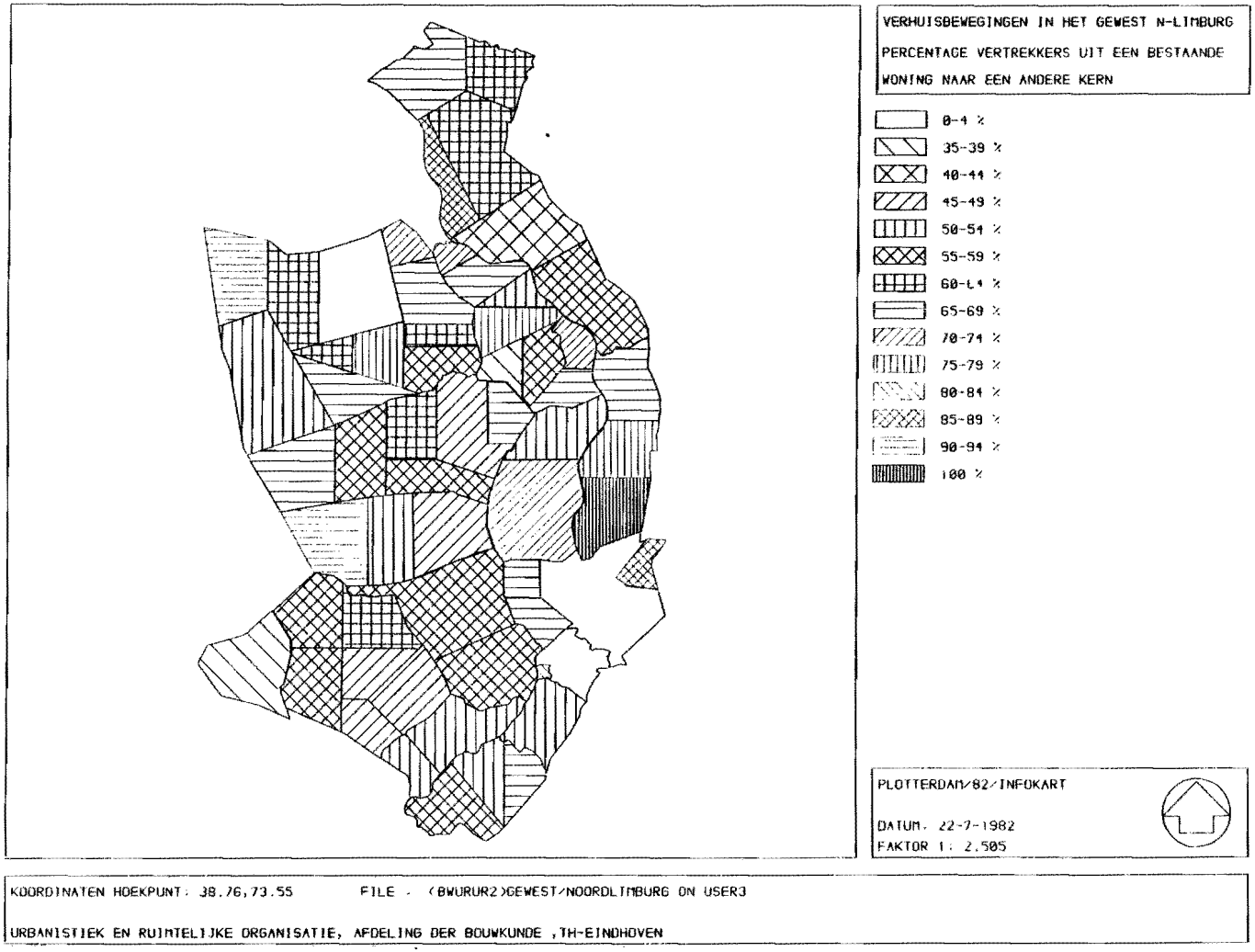
* (f.i.) related to the national geographic coordinate system

3. data-output.

With the aid of computers and especially with the aid of allied apparatus it is possible to generate several kinds of output. This output gets special attention in terms of expression. In tables and statistics we meet figures or digits, a part of them as a result of sometimes very complicated calculations. Cartographic elaborations produce all kinds of maps. This maps can show flows of for instance consumers (see next copy; source Van der Meulen 1980, p. 61) or contain statistical information (choropleth maps) like the working of 'infokart'-procedures (see copy next page; source Goudappel and Van der Meulen 1982, p. 6).



Map 1: Activity pattern of households visiting groceries in a region in the South of the Netherlands.



Map 2: Percentages of households moving to a next settlement in the Northern region of the province of Limburg in the Netherlands.

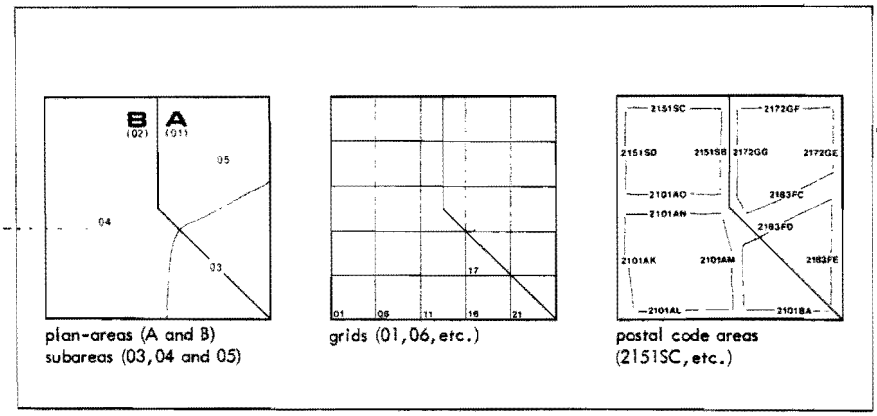
Both maps have been drawn by a (pen-) plotter. The infokart-procedures normally make use of a vector-screen at a grafical terminal.
The easiness of working with this kind of computer-cartographic methods is the relative high speed to express all kinds of data for the same area; it only is a question of changing some input-data!

4. data-analysing.

In short we can point at several kinds of packages for different kinds of sciences, like SPSS (Statistical Package for the Social Sciences) or BMD (Bio-Medical statistical packages). This kind of packages contain statistical analysis like cluster-, factor-, principal component-, regression and bivariate-analysis. For special use and on behalf of connection with other programs these packages are not always suitable. In that cases there are created new for that purpose extended computer-routines (or procedures).

5. information-system.

Input, manipulation, analysing and output of data are parts of the information-system. However, for an adequate information-system we need more than that. We need a management that cares for an organization by which the flows of information are streamlined and the database itself is updated as quick as possible. Only in such a framework an information-system is usable. Part of the streamlining and updating is the way of elaboration; because of the fact that very much of the works within the system are routines the switching on of a computer is obvious.
MANROP knows two information-systems. The one is called INFOAUT; it contains data for different kinds of geographical areas, partly quantitative and partly qualitative like texts. By this system it is possible to relate the different areas for which the database contains information. This is expressed by the copy of the scheme that belongs to it at the next page (source: Van der Meulen and Heskes 1980, p. 152).
The second one is MANROP/DOK for textual information.



plan-areas (A and B)
subareas (03,04 and 05)

grids (01,06,etc.)

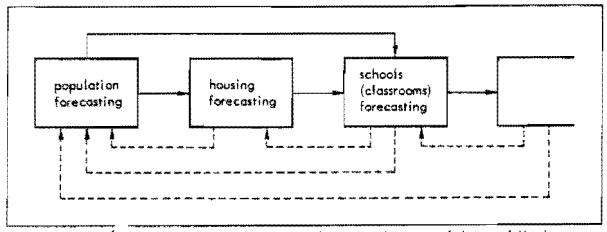
postal code areas
(2151SC,etc.)

Scheme 3: Relatable sub-areas.

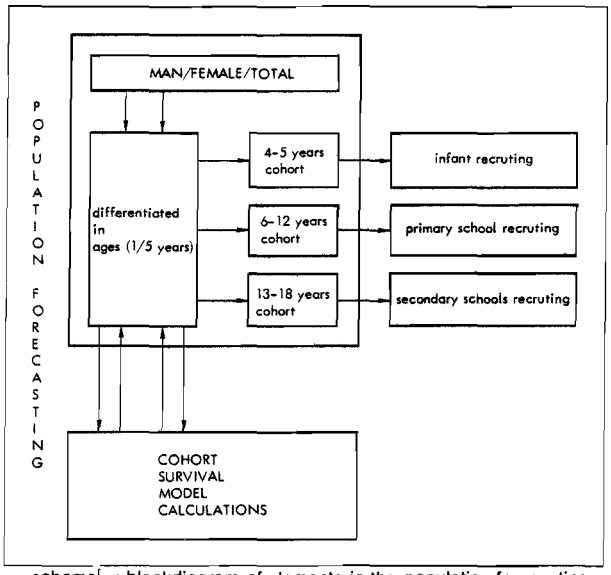
6. Forecasting models.

There are different kinds of forecasting models. As a consequence of the works of the so-called Club of Rome forecasting models are well-known.

In 'normal' urban and regional planning the most attention is given to demographic models, like for instance the cohort survival method. Also, the models for forecasting of the needed amount and quality of housing, schools and other amenities and labour are important within that planning framework. In connection to those models their interrelations are of considerable meaning. The next scheme gives a block diagram of those interrelation, an example. With a block diagram is meant a graphic representation of the logical sequence of procedural steps in the solution of a problem (Sprowls 1968, p. 38); in this case calculations about population, housing and schools (or classrooms). On behalf of the population part there is a more detailed block diagram on the next page.

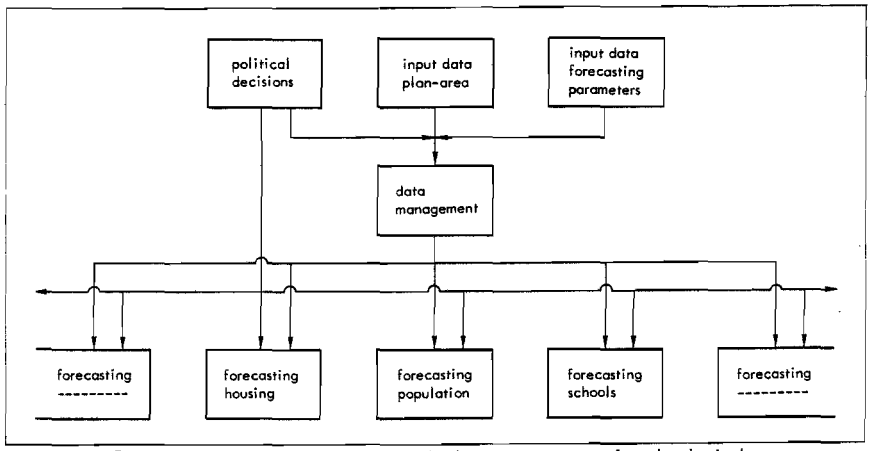


scheme 4: blockdiagram of same forecasting models and their interrelations
— forward relations
--- feedback relations

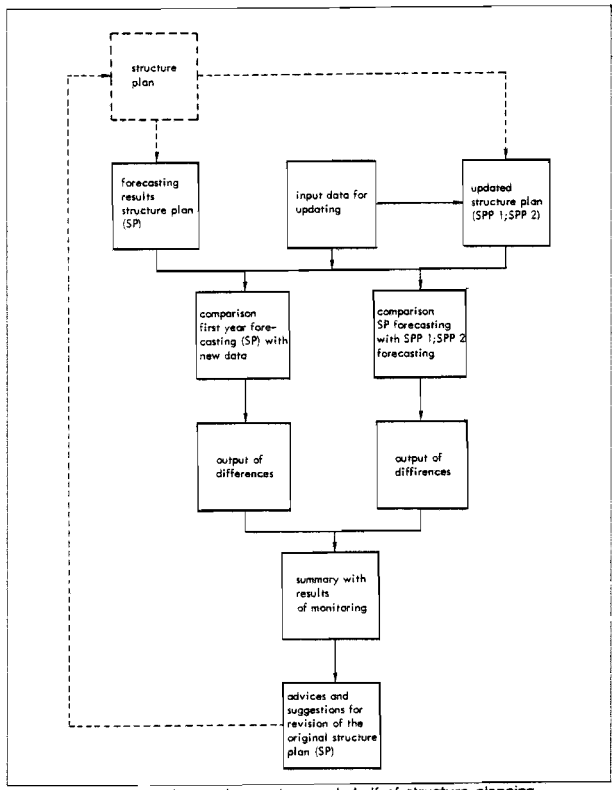


scheme 5 : blockdiagram of elements in the population forecasting part of scheme A related to the schools forecasting part in the same scheme

Such models and their interrelations are very important in the case of early warning systems on behalf of physical plans and their execution. In constructing the quantitative programme for the structure plan of 'Reconstruction Valley' we handled a combination of models in that way as a continuous planning base within the early warning system for that structure plan (Van der Meulen and Overduin 1980, p. 16); see the next copy of the block diagram belonging to the mentioned structure plan.

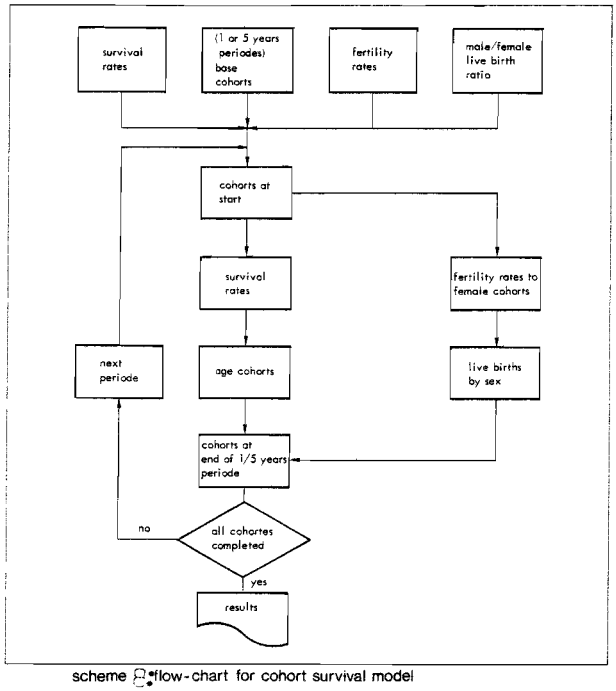


scheme 6: internal structure of the quantitative programme of a physical plan



scheme 7. early warning system on behalf of structure planning

In the next scheme the cohort survival method has been placed in a flow-chart. This is a graphic representation of the procedural steps to be taken to solve a problem and is executed in greater detail than the block diagram (Sprouls 1968, p. 41). In the cohort survival method below migration is not taken into account. The cohorts in the model can take 1 year or can be quinquennia (5 years periodes).



scheme 8. flow-chart for cohort survival model

7. Structuring the plan lay-out.
A plan contains several relative fixed main lines for completion of the substantial content of that plan. In a workshop we introduced working with main lines as a planning method. Background for this is the possibility to use a computer; this is the case at the moment of the plan-making itself but also, at moments we have new information. Then it is possible to produce a total updated plan without relatively much efforts and costs. As a subpart of the early warning system for Reconstruction Valley it got a first application.

8. Early warning system for structure planning.
The scheme on the next page gives the structure of the early warning system as applied for the already mentioned fictive municipality Reconstruction Valley. In contains the following important subparts:

a. the quantitative and qualitative base on behalf of the quantitative program of the structure plan (including goals and chosen forecasting methods);
b. forecasting models to make the quantitative program for the plan;
c. an analyzing subpart in which comparisons take place between the forecasting of the first planned year and the developments in reality and between the forecasting for the whole planned period and a renewed forecasting on the base of that new information about the developments in reality;
d. an updating system for the input of new data and for the storage of these new data in the database;
e. a warning system in which differences analyzed in subpart c. are reported. This happens in the first place as a report of the detected differences. In the second place as a comprehensive summary of the whole activity. Thirdly

there are given advices to the planning authority. In these advices is expressed the amount of differences as well as the degree of difference between plan and reality. On the base of that the planning authority is told by this early warning system what to do with the plan. For instance: total review of the plan in short time; and,

f. as a last step the system makes a new plan-version with the aid of the updated database.

The scheme references to the description of the system (Van der Meulen and Overduin 1980, p. 21). In that description we gave attention to the possibility to base the forecasting on a short (SPP1) and/or on a long (SPP2) periode (of historical data: 5 or 10 years preceding the plan).

8. early warning system for environmental quality.

This early warning system has been developed on request of a provincial planning authority. As planning agency the provincial dicision-making is confronted with the problem that different planning-levels converge there. One of the moments of such a convergence is the approval of detailed plans for the countryside from the municipalities that belongs to that province.

On the provincial level there have been produced inventarizations about the qualities of the landscape; these data have been mapped and for each category of landscape the damage has been determined of all kinds of artefacts and/or activities in case it would be planned for an area with such a landscape.

Now, the provincial as well as the municipal authority can test proposals putted in detailed plans for the environment of the countryside and then they can decide if they will accept some proposals from the viewpoint of the quality of the environment.

The system has been elaborated in a computer model by which it is possible to ask detailed information about geographical subunits in the planning area and about the different planning decisions that already existsfor that subunit. In this sense the model is an analyzing method too. Further this model is relatively

important because it can help to overbridge the pertinent problem of decision-making vertical through the different planning-levels from the national via the provincial up to the municipal level.(Houwen, Van der Meulen, and Niesen 1983).

9. Cost-benefit analysis as basis for plan-design.

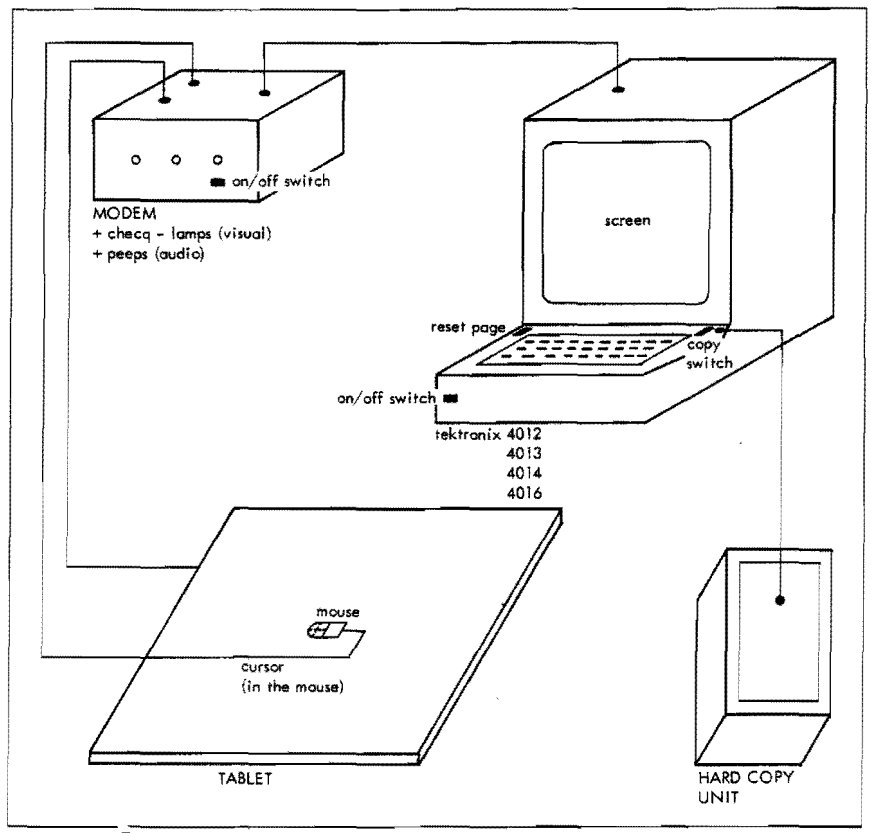
In terms of structure planning and global detail-plans it is possible to handle a computer and e.g. a display terminal to design the plan with continuous calculations of the costs and the benefits. This costs and benefits concern the efforts and money-flows for making the land suitable for building; this includes the so-called technical infrastructure on behalf of the plan-area.

The model works with grids as subdividing of the area and for standardization of all kinds of costs and benefits. The standardization contains labels which refer to designed situations with calculations about the cost-benefit. For instance: housing, one story, two houses under one roof, density of built-up area 30 houses pro hectare, bruto density 20 houses pro hectare, car parking on the parcels, differentiation of housing area, public green area and public roads cum annexes amounts 70:10:20, etc. For this standard-area (grid) all figures are known as already mentioned. Thereby it is possible to automatisize the designing of the plan-area in such a way that every allocation of a labeled land use is followed by calculations by the cost-benefit system. On the next page there is a copy of a scheme of that system (Van der Meulen December 1980, p.8).

10. Digitizing of mapped information.

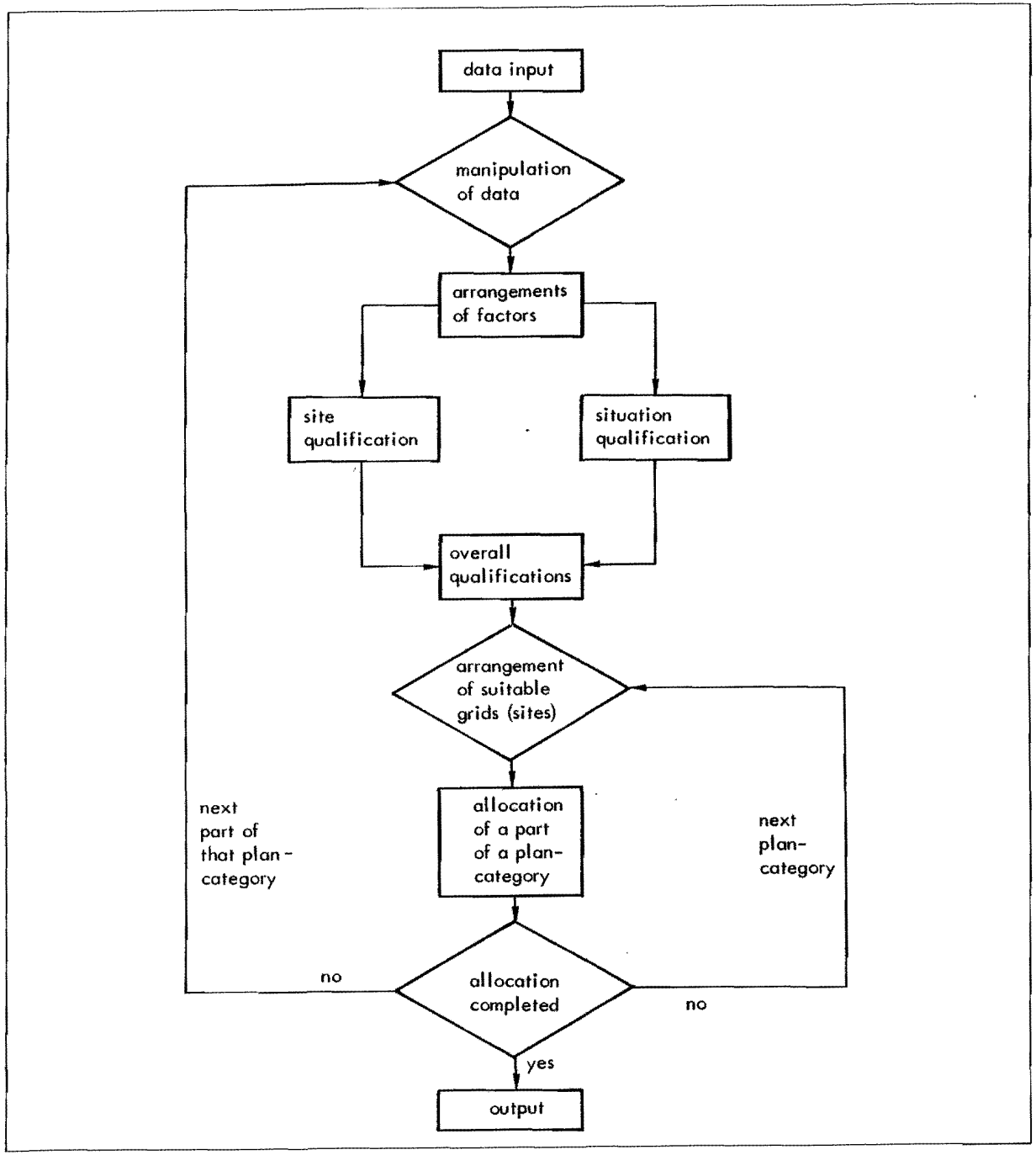
A very interesting way of generating databases about (extensive) areas is the digitizing of maps with all kinds of information. From this carthographic information are made memory files in which the data are ordered by the peripheral coordinates in which that data are present. This digitizing takes place on a so-called graphical tablet connected to the com-

puter. The tablet contains a matrix of wires that can be stimulated by pressing on the button of the mouse; the mouse has connected with a modem, i.e. a kind of translator. The modem has a connection with (a terminal and) the computer. The next scheme gives an impression of that situation (source: Van der Meulen, As and Hagens 1982, p. 2).



scheme 9: digitizing carthographic information

11. Spatial translation for structure planning.
By the model Plotborough it is possible to translate a quantitative programme of an urban or regional plan into spatial allocations. The model points at the qualities of the territoir of the plan. Pro category of land use a special combination of that qualities determines the relatively most adequate locations. In a sequential way the allocations of the planned amounts of categories of land use are elaborated; for each combination of qualities are operative different sets of weights and thresholds and pro category of land use is valid a special set of priorities integrated during the phases of the programme of the plan (Van der Meulen 1979, 1982; van der Meulen en Kesseler 1980; Janssen, Kesseler and van der Meulen 1983).
The model contains a part in which data gathering and data preparing have place and a part in which these data are used for qualification and allocation. The data are red from maps by digitizing with aid of a graphical tablet (see under 10.). This data are manipulated on behalf of mapping and as preparation for the calculations to find the highest quality locations for allocation pro category of land use. This happens on the base of characteristics about the site and about the situation of each location, i.e. a grid of a certain chosable size. After a sequential allocation of all categories of land use over all periodes the plan takes, the result is drawn by a plotter and gives pro phase a map. The last plotted map is the research result comparable with the plan design; this map contains grids with planned categories of land use !
The structure of the model is shown by the scheme on the next page. The model has been practized in real planning situations, for example on behalf of the structure plan for the municipality Ede situated centrally in the Netherlands (Gemeente Ede 1982).



scheme10: flow-chart of the plotborough model

6. COMPUTER AND ALLIED APPARATUS

The computer is well-known. More and more people and institutions have learned to work with resp. integrated computers in their work.
In fact a computer is just a calculator. A computer can be defined as a general-purpose computing device capable of executing a program, whereby a program is a sequence of instructions (Zaks 1980, p. 20).
A computer normally exists of five basic units: a program controller (control unit), an arithmatic unit, storage devices for holding both processing instructions and data, and input and output devices for transferring data to and from the main machine.
It is important to recognize two basically different types of computer: digital and analog. The former performs calculations on numbers held in coded form (such as a binary notation) whilst the latter operates on numbers represented by some physical quantity (such as voltages). There are cases when both types are combined to perform specific tasks and in this case the configuration is known as hybrid. The majority of mainframe computers are of the digital form (Baxter 1976, p. 5).
Computers have different 'sizes'; for a great deal this depends the memory capacity of the central processing unit (CPU). The CPU consists of an arithmatic unit to provide the arithmatic ability to carry out operations such as addition, subtraction, multiplication and division, the logical ability to test equality or inequality of two data items, and a control unit to control the operation of the computer (Sprowls 1968, p. 2).
A known differentiation in sizes is: micro, mini and macro or large system. A microcomputer is a computer in which a central processing unit is implemented with a single-chip microprocessor and with a storage capacity in core memory of maximum 64 K, i.e. of 64,000 memory positions. The large systems

have the disposal of 800 up to 2000 K memory capacity. The mini-computers have capacities between that of the microcomputer and that of the large system. Because of recent innovations in the sector of microprocessing the latter gets more capacity and in fact this makes the term mini-computer somewhat irrealistic; the term is going to disappear.
During the last decennium the large systems have been 'almost' as little as the mini-computers from a decennium ago.
Many fabrics are making computers. In the microcomputer sector we mention f.i.: Apple, Commodore, Pearcom, and Tandy. In the mini and large sector f.i.: IBM, Philips and Burroughs.
As already said, the computer is just a calculator. To make several kinds of products or output we need all kinds of allied apparatus. We mention as peripherals:

- lineprinters to give printed paper output;
- terminals, such as:
  - lineprinterterminals,
  - papertapeterminals,
  - display terminals,
  - graphical display (storage tube) terminals;
- video devices;
- plotters like:
  - drumplotter (penplotter),
  - electrostatic plotter; and,
- cardpunchmachines.

The same is valid for the input of the computer. We point at: the card reader, terminals and all kinds of digitizers (f.i. the graphical tablet).
In many cases it is necessary to store the information. Storage facilities are among others: the punchcard, magnetic tape, disc, magnetic drum (pack) , diskettes and floppy discs.
Also, to the working possibilities of the computer c.a. belong: reading, calculating, writing or printing, punching, and drawing. All this activities only are possible if the computer gets an input of hard ware as well as soft ware programming.
Hardware is the mechanical and electronic components of the computer system. Software concerns the sets

of instructions, i.e. the computer programs.
Especially this last category of programming is important for our expert work. It delivers the connection to our profession (the urban and regional planning, management and research) and the usability of the computer in terms of substantial output products (statistics, texts, maps, storage media).
Programming in this sense normally makes use of so-called computer-languages. We mention as elementary languages hardware coding and Basic; as conservative higher languages: Fortran (from: Formula Translator), Algol (from: algorithm) and Cobol (in aid of administrative elaborations). A recent higher language is Pascal. These languages are bound to compiler-options pro computer.

In the preceding text,it has to be said, only a few aspects on the topic computer and allied apparatus have passed in review. For more extended explanations we have to refer to the literature on that field.

7. THINGS WORTH KNOWING ABOUT MANROP-COMPUTER PROGRAMS

Used computer systems,	
- mini:	- PDP 11T60,PDP 11-23,Burrough 1700
- micro:	- Apple, Euroapple
- large:	- Burroughs 6700, 7700
Used allied peripheral apparatus,	
- plotters:	- Benson drum plotter, type 1332
	- Calcomp electrostatic plotter
- vector graphical terminal:	- Tektronix 4012,4013,4014 and 4016
Used computer languages:	- Algol, Fortran and Pascal with an accent on the first
Used application software:	- statistical packages: BMD, SPSS, BASIS/BASIS
	- drawing/computer aiding design: GINO

8. SHORT LOOK AT THE PHYSICAL PLANNING PROBLEMS IN INDONESIA

Indonesian authorities are confronted with many problems in different fields of human activities; several of them have explicit spatial consequences. It is not the place here, to give attention to those problems in extension. We will mention some problems without explanation (for explanations and treatments in extension we cross-reference to the wide literature about this country).

One of the well-known problems is the relatively rapid accres of the Indonesian population, especially on the island Java. Such an accres gives all kinds of repercussions; we mention:

1. macro-economically: stagnating of the national income pro capita, growing unemployment (including unregistrated or hidden unemployment), and relatively high demographical investments (like education, housing and medical care); and,
2. socio-spatially: unequally regional growth of population, overpressure of population in the agrarian sector of activities and overdensity of some parts of the countryside, an unbalanced growth of settlements, especially the growth of large urban centres partly as a result of migration from the countryside and other islands and the squattering in the peripheries of the large cities.

Another serious problem is found in the sector of agrarian activities, especially in connection with the cultivation of rice (on sawahs). This concerns the enormous pressure on land because of among others a great amount of people trying to find employment there and all kinds of new working methods. As results we probably can see an intensivation of land use and working methods, a growing number of people without land, and an accessing splitting up of parcels of ground; above all this negative results ap-

pear regionally, namely almost at Java. On behalf of an exact view about all these trends connected with land in the first place the need of a good and continuously updated land registry (as a information system) is obviously. In the second place there is a need for periodical research about _tems like land use, employed labour, rental payments, and proprietary relations.

A next problem concerns the geographical relatively one-sided located modern big and middle-sized industries (Java, Jakarta c.a.; Sumatra, Palembang c.a.). The enormous extension of the Indonesian Archipelo in terms of size and in terms of amount of islands gives a less surprising range of problems in the sphere of traffic and transportation; partly these problems have historical backgrounds. Not only connections within the islands are important, but between them too. This is especially important because of a balanced development of the whole country on several fields like traffic and transport, working and economy, housing and urban and regional enlargings. It is important too on behalf of the process of transmigration; not only for the journeys to the new places of settlement, but also to secure the success of the transmigrations on the long term in terms of working, extending of aN integrated village society, export of products to the other islands as well as abroad and of a balanced pattern of settlements in the areas the transmigration points at; in all cases it concerns questions to planners, physical and town planners in particular.

The pattern of settlements consists of a serie of interconnected settlements. Interconnection means communications. Several forms are possible:

1. as over-ground infrastructure: traffic and transport like privat and public cars, ships, airplanes, etc.
2. as under-ground infrastructure: pipelines for gäz, petrol, water,etc.
3. as transfer of messages by telephone, telegraph,

postal services, etc.

In relation to that interconnections the settlements undergo processes of growth and sometimes decline; for another part the developments are generated from within the settlements, but too as a consequence of the being and the developments of the settlements in relation to each other.

To reach a balanced (if wished!) pattern over a whole country it is necessary to make plans: economical, social as well as spatial plans.

Indonesia knows several economical (and social) plans since about its Independence in 1949. We mention:

1. Welfare Program/Economic Urgency Program 1951-1955 (Rentjana Kesedjahteraan Istimewa/Rentjana Urgensi Perekonomian);
2. Five-years Plan 1956-1960 (Rentjana Pembangunan Lima Tahun);
3. Three-years Plan for rice-production 1959-1962 (Rentjana Tiga Produksi Beras; or, Rentjana Swa Sembada Beras, SSB);
4. Basic Acts for Agriculture/Landreform 1960 ();
5. Eight-years Plan or National General Development Plan 1961-1969 (Déwan Perantjang Nasional, DEPARNAS);
6. BIMAS/INMAS rice production program 1964- (Bimbingan Masal/Intensifikasi Masal, resp. massive and intensive accompaning);
7. five-years plans Repelita:
   I. 1969-1974;
   II. 1974-1979;
   III. 1979-1984; and,
   IV. 1984-1989;

Except these plans that are meant for the national level, Indonesia knows a number of plans for the regional and local levels.

Particularly the above mentioned Repelita's (Rentjana Pembangunan Lima Tahun) are important for the present

(and future: till about 1990) planning. Putted in a nutshell these Repelita's try to reach:

I. economic built-up, especially of agriculture, infrastructure and industry; social goals followed with lower priority;

II. development of agriculture and of industries that work up the products of agriculture and minerals almost to semi-manufactured articles; this plan contains more emphasis upon employment, income politics, regional development, transmigration and the built-up of social care like education and public health services;

III. development of agriculture and of industries that work up the products of agriculture and mineral raw materials to semi- and full-manufactured articles, especially in the sphere of consumption; this plan knows a relatively strong emphasis upon regional development and decentralization-efforts;

IV. development of agriculture and of industries that produce capital goods on behalf of the other (basic-) industries.

In the built-up of these plans we see a plain effort to deconcentrate the way of planning. In a report of the Department of Public Works of Indonesia we can read that this is applicable to physical and town planning too (Direktorat Jenderal Cipta Karya 1979). In recent remarks of the Minister of this Department we can hear ideas about the way of extending the existing pattern of settlements. The Minister has preference for a development-model in which the technical (overground) infrastructure is crucial.

A scenario as a way of planning-evaluation in which this proposal has been studied and the research pointed at other model-proposals can give an insight of the meaning of the preference of the Minister of Public Works.

9. APPLICABILITY OF THE MANROP-COMPUTER MODELS FOR THE PHYSICAL PLANNING IN INDONESIA

In chapter 5 has been mentioned several examples of computer programs relevant for physical planning. Those and other models have been developed within the framework of the explained MANROP-project.
When we now look to the physical planning of Indonesia in general and to most of the stipulated planning problems in the preceding chapter then probably a number of models from the MANROP-project are suitable under the conditions of the physical planning of Indonesia; not all of them are suitable in the most detailed sense, of course, but in their structure they will fit well.
In the next we will follow the numbering within chapter five:

1. data-manipulation.

Because of all kinds of data (demographic, economic, geographical, etc.) will be gathered, data-manipulation is necessary. These data have to be transferred for all kinds of information-output; on the national scale as well as decentralized, on the level of the islands and/or regions (etc.). This can be managed effectively by using of computers in general and by using of card punchers, terminals, digitizing media, and so on in particular.

2. data-updating.

In an extensive and developing country data bases are relatively small at the moment, but they are growing very fast. By application of modern technics the speed in which these new data come to the fore, is accellerating. Updating of the databases by the use of computer (terminals) is the most adequate way at this moment. The suitability for all kinds of research and inventarizations on behalf of that research too, especially on behalf of longitudinal and of

transversal kinds of research. Even in relation to the spread of the sources of the data in general (the islands f.i.),updating systems connected as peripherals to a main computer frame have quite relevance.

3. data-output.

All kinds of output (lineprinting, plots, displaying, magnetic tapes, floppies, etc.; figures, schemes, statistics, maps, signals, reports) belong to the 'normal' output of computer applications. In general this means the presence of handy media of expression to describe (analytical results of the content of) the database, in particular during the working process as a consequence of the implementation and use of updating systems.

4, data-analyzing.

The use of several packages of computer programs of statistical methods and technics of (a.o.) the social sciences makes the analysis of databases relatively easy. The complexity of the Indonesian society and the processes therein in fact forces the researchers to use those packages in combination with computers.

5. information-system.

For the management of this extensive country we can imagine the need for updated and relevant information. This implies the need of a well working information system by which it is possible to generate quantitative and qualitative based information in relatively much ways, among which we think of computer-interactive ways. By the use of peripherals (terminals) connected to a main frame it is possible to work on a centralized level as well as on a decentralized level. The computer models on behalf of the information system only have to be implemented in the main computer frame. The peripherals just generate output with aid of instructed commands.

6. forecasting models.

In a qua demographics relatively fast growing country the necessity of continuous and easy applicability of all kinds of forecasting models is obviously. The connected calculations which are in fact routine-

calculations, take relatively much time. By using ready-made computer(-programs) applications these calculations just take seconds; for the generation of several alternatives and the study of the consequences of these alternatives rapid calculations on behalf of forecasting is quite important.

7. structuring the plan-lay out.

If one sees the realization of a (physical) plan as the result of a time taking and time during process then it is senseful to transfer the plan-making from a oncely case to a process in which the plan is regenerated after f.i. updating. This can happen with the main lines of the plans. Because of the chosen way of flexible planning (see f.e. Repelita III in comparison to the preceding Repelita's) this structuring of the plan-lay out in combination to computer-applications can give adequate solutions for reaching the process-character and the wished flexibility in the plan-making.

8. early warning system for environmental quality.

A country whose natural environment has a high quality as that of Indonesia gives much attention to the being of that milieu. Indonesia is well aware of this richness. It is thinkable a computer model as the early warning system for environmental quality can support the planners in plan-designing and zoning or allocating functions over the country and distinguished subareas. The model is important too in further elaboration of decentralization of the execution of the planning proposals and decisions. In that case this warning system gives possibilities to test the proposals and decisions of lower level authorities by the central government in a later stage in the decision-making process.

9. cost-benefit analysis as basis for plan-designing.

This cost-benefit model is based on the dutch circumstances. In the present elaboration it is less suitable in an Indonesian planning context.

The part in which a structuring of the plan-designing has been implemented, can be used quite well, but in

essential we meet this structuring again in the Plotborough model; in particular in the part of allocation of the plan-categories.

11. digitizing of mapped information.

A next model is the digitizing method by a graphical tablet. By this application mapped (cartographic) information can be stored in computer files. This can happen with relatively grove data in the beginning and can be updated by more detailed data in later stadia. Especially the Indonesian planning situation in which many maps contain global information for some areas of the country can make a very adequate use of this application.

11. spatial translation for structure planning.

The suitability of the model Plotborough for spatial translation relates to the relative easyness of the application of this model as well as the possibility to renew the results in case of new data; this takes relatively less time, money and/or trouble.

We think that this spatial translation model can be very helpful on behalf of generating plan-alternatives and scenarios.

10. EDUCATIONAL ASPECTS OF WORKING WITH COMPUTERS ON BEHALF OF PHYSICALPLANNING

The development of computer programs on behalf of physical planning implicate a serie of educational aspects:

1. good notion of the questions of physical planning;
2. good notion of the phylosophy or phylosophies and ways of physical planning;
3. good notion of solving physical planning problems;
4. the chance to learn, to study and to work with process planning on a better way than without this kind of media because of the continuous flow of results with relatively less time, costs and efforts;
5. to work on one side on a higher level and on another side more thoroughly in terms of the discipline of physical planning;
6. the exercise and getting the experience of working with computers and maybe to program and execute this kind of modern media including several kinds of peripherals and allied apparatus.

A very important thing is the fact that automatization by computers makes time free. Freeing time is especially important because of the possibility to thorough the planning activities in substance. Routine activities take lesser time if computerization has formalized and executed them. Using application-packages with computer programs in fact imply users only to give input of data conform instructions. This means at the same moment that it is not necessary to know the content of the method and/or the content of the computer program in very detail; only the main lines of method and model are necessary to know.

Learning to work with computers (with aid of peripherals like the terminal) probably is still more important because we are entering an era of (data-) information. The consequence of this entering is not only the on-going introduction and integration of computers and computer-steered daily processes, but also, a total change of the (national, world) society until a situation that life has based on computerization (and robottering). In relation to this we can refer to scientific discussions about the(large)city of tomorrow, the so-called Information-City as a successor of the Energy-City of today.

11. T R A I N I N G P O S S I B I L I T I E S

To give an acceptable chance to computerization of physical planning skilling and training is necessary.
This skilling and training have to be pointed at:

a. the way of thinking in physical planning and town planning;
b. the methods and technics of physical planning and of town planning research;
c. the computer as calculator and some general technical aspects like architecture of the computer, types of computer and memory capacity;
d. the computer as a medium to elaborate routines, especially in case of routines that are transferrable in sequential orders;
e. the allied apparatus to work with data as:
    1. input medium, among others on behalf of data elaborations;
    2. storage medium, among others in memory files; and,
    3. output medium,

    such as lineprinters, several kinds of plotters, and design display terminals.

The development of possibilities for skilling and training in the above indicated sense do belong to the main objectives of the specialization of Management of Urban and Regional Planning, as concreted in the Project MANROP and as experienced within the Faculty of Architecture, Building and Planning, Vocational Group of Urbanistics, University of Technology Eindhoven.
These possibilities for skilling and training have been described and published in the so-called MANROP-serie. This serie has been started in 1980 and counts about fourty volumes at the moment, partly with instructions to work with

the in section 5 mentioned MANROP-models.
Because of the application of these models within the Faculty of Architecture, Building and Planning in Eindhoven the language used in the MANROP-volumes is dutch; but on behalf of training possibilities the necessary ones can be translated relatively quick; for a part this is possible because of the fact that most of the computers use english in their (hard ware) descriptions and soft ware application packages.
In relation to the Plotborough-model applications we are preparing an instruction video-film on behalf of a workshop to be held in the beginning of 1984.

12. C O N C L U S I O N

"A computer is a thing that does what you tell it to do .... A computer is a decision-making system which can alter its own decision-making program as it proceeds .... However it is made, a computer does precisely what it is told to do: neither more, nor, unless something has broken, less .... It is also a complex logical system which has the remarkable ability to function that way" (Hyman 1973, p. 9).

Seen the possibilities and results of computerization one can say computerization is profitable, significant and needful.

It has positive and negative elements, of course.

To the positive elements belong:

1. rapidity;
2. efficiency;
3. adequate respons on routine-like elaborations;
4. extension and complexity, if explicit, give no problems;
5. relative easy adaptability;
6. ready-made packages are at disposal often;
7. supporting;
8. strong educational bringing up;
9. several application-products will be created during the process of the use of computers;

and so on.

As negative elements we mention:

1. the initiation of computerization takes in the beginning over a short period relatively much money;
2. the first data-gatherings take relatively much labour time;
3. in general it means a loss of labour time;
4. organization problems with all kinds of management problems;
5. in the beginning an anormous need of skilling and training; mostly with the difficulty of

re-training of the generally elder staff labourers;
6. shortage of specialized servants;
7. scale problems; automatization normally starts centrally and with a time lag computers will be introduced in decentral situations; and,
8. the danger that one thinks the computer can everything and will solve any problem you are confronted with.

The MANROP-models offer a variety of application possibilities on behalf of physical planning and town planning in general and for an important part of that models suitable for the Indonesian planning situation too.
Computers (main frame, mini and/or micro) and allied apparatus do not have to be all in one place. Remote connections by telephone wires c.a. and high speed data links make possible to work with one central computer; all kinds of peripherals connect to that central system by which input/output take place in another place than the computer elaborations. This can be very important in case of decentralization of planning agencies and planning tasks.
Concluding we can say the computer is a medium to help. The limiting factor in this context is the skill to use these computers and allied apparatus. In relation to this problem we have indicated possibilities for skilling and training in computer applications on behalf of physical planning and town planning with a reference to the framework of the Management of Urban and Regional Planning.

R E F E R E N C E S

Baxter (1976), R.S.: Computer and statistical techniques for planners, London

Direktorat Jenderal Cipta Karya (1979): The Directorate General of Housing, Building, Planning and Urban Development; Programs Repelita III, Departemen P U, October

Faludi (1973),A.: Planning theory, Oxford, Urban and Regional Planning Series, Volume 7

Gemeente Ede (1982): Plankaarten struktuurschets Ede, Ede/Eindhoven

Goudappel (1974),H.M.: Handelen in onzekerheid, notities over een veronachtzaamd aspect in de ruimtelijke planning, intreerede, THE, Eindhoven

Goudappel (1982),H.M. en G.G.van der Meulen: Onderzoek verhuisbewegingen in het Gewest Noord-Limburg 1974-1980; deelrapport A cijfermateriaal, Eindhoven

Heijden (1983a),R.E.C. M. en G.G.van der Meulen: Aktualisering van de planologisch-stedebouwkundige onderzoeksaanpak; bezinning op de werkwijze bij de totstandkoming van ruimtelijke plannen, in: Planologische Diskussiebijdragen 1983, pp. 341-352

Heijden(1983b),R.E.C. M. en G.G.van der Meulen: Onderzoek en management ten behoeve van de ruimtelijke planning; een antwoord op gewijzigde maatschappelijke en technische omstandigheden in termen van veranderingen in het planologisch-stedebouwkundig onderzoek en in de rol van de planologisch-stedebouwkundig onderzoeker, in: Plan, juli 1983

Houwen (1983), J.Th.M., G.G.van der Meulen en L.C. Niesen: Een beschouwing over de ruimtelijke planning van de landelijke gebieden door de drie bestuurlijke niveau's, in: Planologische Diskussiebijdra-

gen 1983, pp. 367-382

Hyman (1973), A.: The computer in design, London

Janssen (1983),D.G.J., P.J.E.Kesseler en G.G. van der Meulen: Model Plotterdam als katalysator in de planvorming; een bijdrage aan het tot stand komen van het ontwerp-struktuurplan van de gemeente Ede, in: Gemeentewerken, februari 1983, jaarg. 12, no. 2, pp. 27-32

Meulen (1974),G.G. van der: Ruimtelijke Organisatie op stedelijk niveau I en II, kollegedikta-ten THE 7779 en 7791, Eindhoven

Meulen (1979), G.G. van der: Rekenautomaat kan gemeentelijk struktuurplan in ruimte vertalen, in: Bouw, no. 16, 4 aug.,pp.26-27

Meulen (1980),G.G. van der: KONSUBRUNS,ruimtelijk gedrag en leefstijl van voorzieningengebruikers uit een oogpunt van ruimtelijke planning, proefschrift KH. Tilburg

Meulen (October 1980), G.G.van der: Het project MANROP, in: Tijdschrift voor Stedebouw en Volkshuisvesting, pp. 515-522

Meulen (December 1980), G.G.van der: Exploitatie-rekening, hulpmiddel voor het stedebouwkundig plan-ontwerp, Eindhoven

Meulen (September 1981a),G.G.van der: Een bewaakbaar struktuurplanproces, in: PDOB-syllabus: Procesbewaking in de ruimtelijke planning, Delft

Meulen (September 1981b),G.G.van der: Procesbewaking, fundament voor een op uitvoering gerichte ruimtelijke planning, in: PDOB-syllabus: Procesbewaking in de ruimtelijke planning, Delft

Meulen (1982),G.G. van der: Computer-automatic spatial translation for structure-planning; the usefulness of the model Plotborough for the planning in Indonesia, Eindhoven December

Meulen (1982),G.G.van der,M.W.As en T.Hagens: Plotterdam/82/leesin,programmatuur voor het via grafisch tablet (digi-

tizer) inlezen en manipuleren van polygonen (files),Eindhoven

Meulen (1982),G.G.van der en T.Hagens: Plotterdam/infokart,beschrijving van het komputerprogramma,Eindhoven,januari

Meulen (1980),G.G.van der en R.Heskes: Geautomatiseerde opvraag van ruimtelijke relevante informatie. Een voorstel voor een informatie-systeem ten behoeve van de ruimtelijke ordening op gemeentelijk niveau, in: Tijdschrift voor Openbaar Bestuur, jaarg. 6, no. 7, 3 april,pp.150-155

Meulen (1979),G.G.van der en H.van der Kamp: Grondmanagement.Een integrale benadering van het fenomeen grond in het kader van de ruimtelijke ordening, geillustreerd aan de hand van empirisch onderzoek, in: Tijdschrift voor Stedebouw en Volkshuisvesting, november, pp. 541-549

Meulen (1980),G.G.van der en P.J.E.Kesseler: Met computer naar inzichtelijker ontwerpen van struktuurplannen, in: Bouw, no. 19, 13 september,pp.43-47

Meulen (1980),G.G.van der en T.Overduin: Procesplanning en procesbewaking voor struktuurplanning, in: Planning, methodiek en toepassing 13,pp.15-28

Memorandum 1(1960): Nota over de ruimtelijke ordening in Nederland, 's Gravenhage

Memorandum 2(1967): Tweede nota over de ruimtelijke ordening in Nederland, 's Gravenhage

Memorandum 3(1974): Orienteringsnota ruimtelijke ordening. Derde nota over de ruimtelijke ordening in Nederland-Deel 1. Achtergronden, uitgangspunten en beleidsvoornemens van de regering, 's Gravenhage

Sprowls (1968), R.C.: Computers. A programming problem approach, New York

Zaks (1980), R.: Your first computer. A guide to

business and personal computing
(orig.: An introduction to personal
and business computing), Sybex, USA