

**TRAFFIC FORECASTS FOR SOUTHERN AFRICAN PORTS:
PROJECTIONS, PREDICTIONS OR PLANS?**

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Introduction

This article stems from a comprehensive study related to training programmes for port personnel in the region of Southern Africa. Of the nine states in this region, only Angola, Mozambique and Tanzania are maritime countries. But their main ports also serve as transit ports for the other six countries. The study in question focused on these main ports, namely Luanda and Lobito in Angola, Maputo, Beira and Nacala in Mozambique, and Dar es Salaam Tanzania..

The purpose of the study was to identify which measures should be taken in order to provide the ports with adequately - trained personnel at all levels and for all port functions, bearing in mind the overall objective of making the region self-sufficient regarding training facilities and staff (1).

The scope of the article is that of a methodological case study. I present the case itself, the traffic forecasts for the different ports, and use the case to illustrate some of the many ambiguities of the craft of forecasting.

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The Traffic Forecasts in Context

The various stages in this project, where the traffic forecast is one element, and the connections between them can be illustrated as in Figure 1. This setting may in a sense be viewed as the conceptual framework for the entire project.

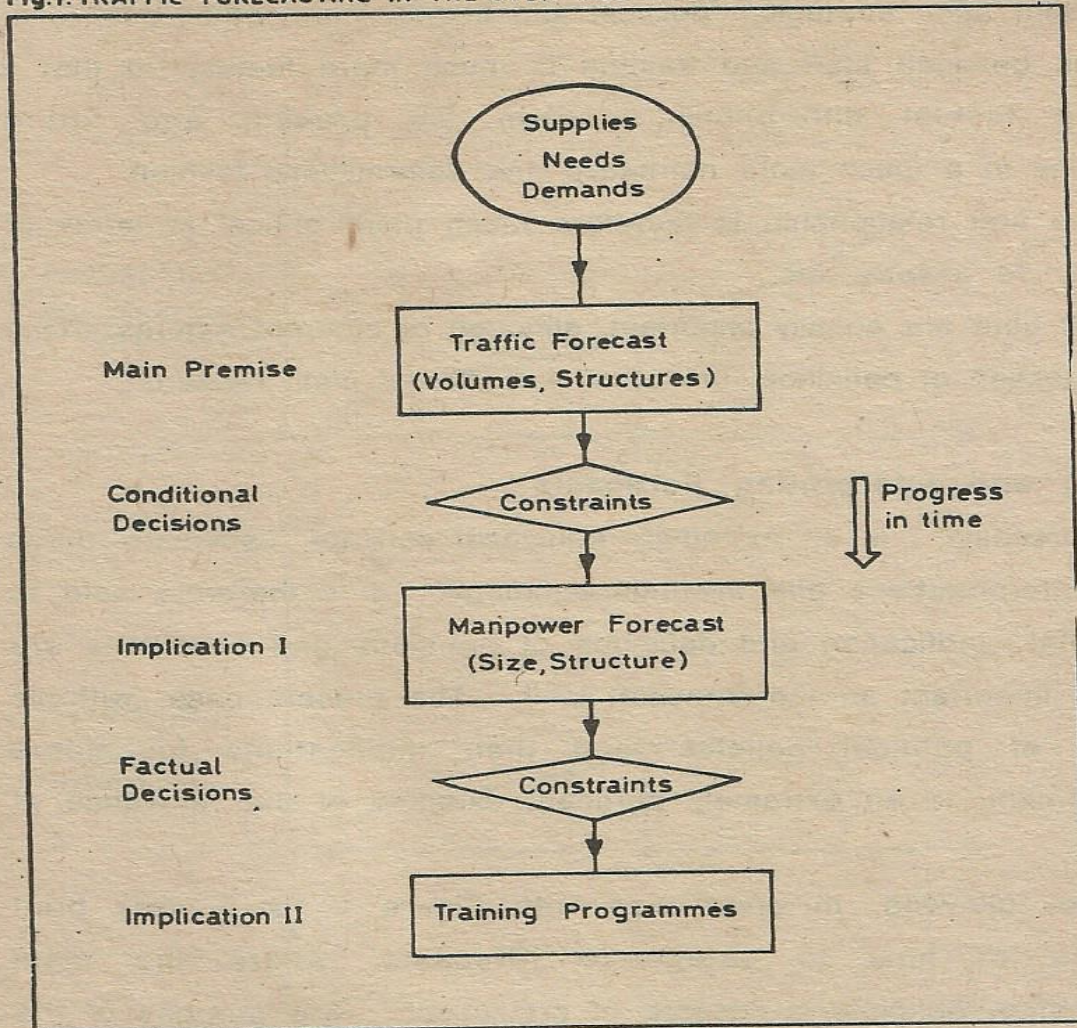
The traffic forecast may be developed in many ways, but is generally speaking always based on some sort of supply and demand analysis. However, it is done, a structured traffic forecast has to be worked out, to form a basis for other considerations and planning strategies.

Towards the objective of developing training programmes, two cause - effect relationships must be examined and "calculated". One is the relationship between a given traffic forecast and port staff size and structure. The second is that between the desired staff size and structure, and the proper training programme.

Regarding the first of these relationships, a given traffic volume and commodity mix may be tackled using different manpower structures, depending for instance upon the technical structure of the port and the technology available. The level of competence of the port staff and their skill at various tasks clearly constitutes a constraint here.

The link between "Staff Needed" and "Training Programme" must then reflect the differences between present and required staff in view of size, structure and competence levels. An analysis of this linkage should then manifest itself in training programme proposals.

Fig.1. TRAFFIC FORECASTING IN THE OVER-ALL CONTEXT.



Contrary to the link between "Traffic" and "Manpower", which is dependent upon strategic, political and financial and other decisions, the link between staff and training is much more factual, in that it reflects factual differences between the present and future situations in a much more normative and deterministic fashion.

The first relationship is therefore much more critical in terms of difficulty to assess, etc.

But both are equally important, although of different natures: One is a question of definition, the other a matter of plain research.

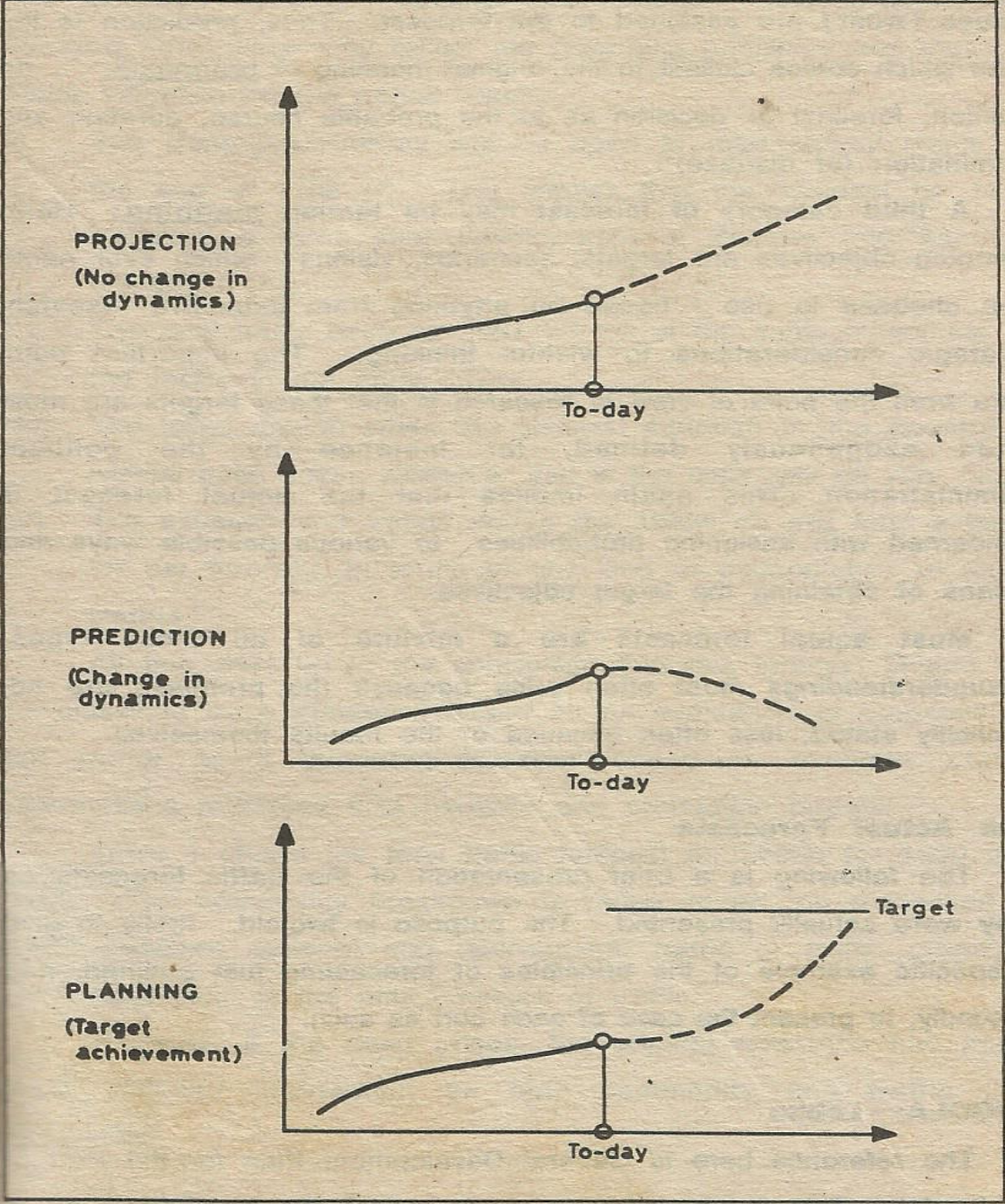
Making and Interpreting Forecasts

"Forecasts" is an extremely equivocal concept, especially prone to misinterpretations and misunderstandings. It is therefore safe to state that clarification and definition of premises and conditions are just as important as the forecast itself. The present case, with its setting of political policies and their implications for future development, is an extremely pertinent example of the relevance of this.

The following, in connection with Figure 2, is a very brief example of how to categorize forecasts, where the main classification principle is "degree of prediction". The purpose of the example is to be a reminder of the necessity of a sober approach in interpreting and applying the actual forecasts for the ports in question:

Projections are defined as extrapolations of time series, more or less simple depending upon the introduction of new constraints. The better-founded and better-defined these constraints are, the more a projection approaches a prediction.

Fig.2. VARIOUS FORECASTING PRINCIPLES.



Prediction implies that probabilities regarding time ('when') and values ('what') are assigned to the forecast. Thus, prediction is the term which comes closest to the original meaning of prognosis: "... an opinion, forecast or decision as to the probable course, duration and termination (of disease)".

A third category of forecast may be termed planning. Here, planning objectives are targets, scenarios, visions - which ever name one chooses to use - based on anything from extensive research, strategic considerations to wishful thinking. The important point here from the point of view of research is that these targets are most often exogenously defined, for instance by the political administration. This again implies that the actual forecast is concerned with assigning probabilities to various possible ways and means of obtaining the target objectives.

Most actual forecasts are a mixture of all these types. Misunderstandings most often arise because the premises are not explicitly stated, less often because of the results themselves.

The Actual Forecasts

The following is a brief presentation of the traffic forecasts as they were actually presented. The purpose is twofold, firstly to give a specific example of the principles of forecasting just outlined, and secondly, to present the case of each port as such.

ANGOLA: Lobito

The reference here is General Development Plan for the Port of Lobito (1). This is an extensive study, where the traffic forecast is very detailed and the underlying assumptions are well described.

The forecast rested on several assumptions. The following are stressed here, since they reflect the governing principles and thus the major influence on the actual results:

- i) The Benguela Railway will be open to international traffic by the end of 1986 (!). This implies that the forecast for 1990 reflected a three year development of Zairean and Zambian transit traffic.
- ii) The total traffic even by 2007 will be of the same magnitude as the traffic in the early 1970s.
- iii) The initial growth when the general situation in the country is normal once again, whenever that is the case, will be very rapid.
- iv) The situation and trends during the 1980s do not form a basis for the forecast, in terms of any kind of extrapolation of these trends.

All this adds up to the conclusion that this forecast should not be classified as a prediction based on an evaluation of probabilities, but rather as a 'planning forecast' based on explicitly stated assumptions regarding time horizons and production targets.

Table 1 shows the total traffic forecast for Lobito for 1990 and 1995. The commodity breakdown is rather rough, no distinction is made between national and international traffic or traffic direction. Total production is the only measure of traffic.

However, if the need arises, the original reference has much more detailed information on both commodity and traffic flow categories.

COMMODITY GROUP	YEAR	
	1990	1995
LOBITO		
General cargo	480	695
Semi-processed metals	270	425
Dry bulk & semi-bulk	365	485
Bulk petroleum products	210	280
SUM total	1325	885
LUANDA		
General cargo		825
Dry bulk & semi-bulk		440
Bulk petroleum products		535
MAPUTO		
General cargo	2 040	2 330
Dry bulk	3 860	9 625
Bulk petroleum products	1 760	1 710
SUM total	7 660	13 665
BEIRA		
General cargo	435	670
Dry bulk	3 375	7 875
Bulk petroleum products	1 040	1 325
SUM total	4 850	9 870
NACALA		
General cargo	530	665
Dry bulk	380	365
Bulk petroleum products	225	270
SUM total	1 135	1 300
DAR ES SALAAM		
General cargo	2 060	2 670
Dry bulk	530	425
Bulk petroleum products	930	1 135
SUM total	3 520	4 230

Table 1: Total traffic (i.e. imports, exports and coastal traffic, and transit traffic) by main commodity group, 1990 and 1995 (1 000 tons), for Lobito, Luanda, Maputo/Matola, Beira, Nacala and Dar es Salaam.

Figure 3 shows the long-term development of Lobito port traffic ca 1970-95. It only confirms that the "normal" situation during the first half of the 1970s is the major guideline for future development and that developments in the last decade do not constitute such as guideline, and in that sense should be overlooked.

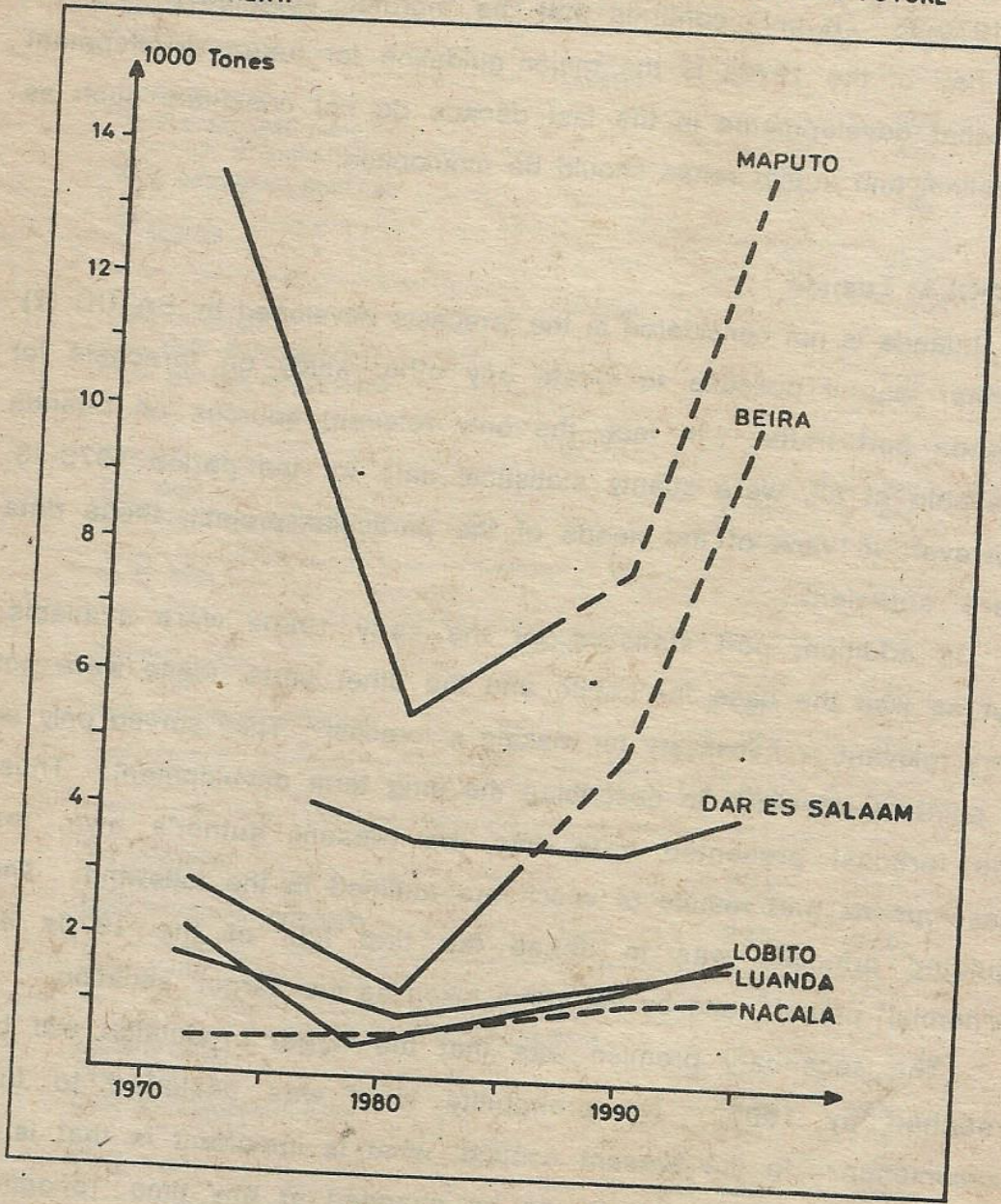
ANGOLA: Luanda

Luanda is not considered in the forecasts developed by SATCC (2). Neither was it possible to locate any other study on forecasts for Luanda port traffic. In fact, the only relevant sources on Luanda available at all, were scanty statistical data for the period 1970-73. However, in view of the needs of the particular project, these data were sufficient.

In addition, port statistics for the early 1980s were available, but as was the case for Lobito and the other ports, these were not very relevant or necessary for making a forecast. They served only as a point of reference in describing the long term development. Thus, the forecast presented here was the present author's own, the assumptions and results of which are outlined in the following: The guiding principle was to define the first half of the 1970s as a "normal" period, and by the same token as the "target" situation.

The secondary premise was that the target production will be reached by 1995. No probability level was assigned to this assumption. In the present context, what is important is that is explicitly stated so that it can be changed at any time, reflecting new thinking.

Fig. 3. TOTAL TRAFFIC FOR PROJECT PORTS, LONG TERM PAST AND FUTURE DEVELOPMENT.



The total production figure was defined as the average production for the four years 1970-73. Here it should be noted that this average resulted from a range spanning from 1.5 mill tons (1971) to 2.3 mill tons (1973). The commodity breakdown was based on the export - import structure for the same period, and was identical to the average structure for exports and imports combined.

Table 1 shows the total traffic forecast for Luanda for 1995. About 80% of the total tonnage is international traffic, (of which some 50% is exports and 50% imports). Hence, about 20 % of Luanda port traffic is Angolan coastal. This last figure was also relatively constant during the early 1980s, while the export - import ratio decreased from 1:1 to approximately 1:3 on average for 1980-82.

Figure 3 shows the long-term development of Luanda port traffic ca 1970-95. It may be noted that the difference between the "normal" and "target" situation is much less for Luanda than for Lobito.

While Lobito in about 1980 had a traffic production of only 25% of peak production, Luanda maintained 50 - 60% of peak production.

MOZAMBIQUE : Maputo , Beira, Nacala

The supporting material here was the forecasts developed by SATCC (3). In addition, statistics for the early 1970s were consulted, to obtain an idea what a "normal" situation was like (6, 7). The forecasts were also compared with statistics for the 1980s to give a further perspective in terms of probability (8).

The forecasts presented here are in essence SATCCs own, as presented in the 1983 study.

The forecasts in Mozambique ports are not quite of the same kind as for Lobito and Luanda, where the targets for 1995 were more or less precisely defined as the previous peak production.

The SATCC study was founded on the following main assumptions:

- Present plans for rehabilitation of ports and railways will generally be implemented before 1990.
- The operational performance will be on par with South African ports and railways by 1995.
- No, or very few, major additions to the regional transport systems.
- Transit traffic by truck is not allowed when railway capacity is available, at least not before 2000.

To what degree these assumptions should be considered predictions, is not explicitly stated in the study. Nor is this important. The point to note here is that they should not be interpreted as predictions, because no level of probability is assigned to them.

· The following is a striking illustration of why it is necessary at all times to make such a careful distinction between predictions and other kinds of forecasts:

The SATCC forecast dated July 1983 forecasts the level of international traffic at Maputo port to ca 5.3 mill tons in 1985. A revised SATCC forecast of February 1985 gives an estimate for the same year of only 2.5 mill tons. It is in this perspective that the forecasts presented here should be viewed.

Here the SATCC forecasts are presented for international traffic only. The forecasting years were 1985, 1990 and 2000. In order to estimate total traffic production, including national coastal traffic, the assumptions that the similar coastal traffic share will be similar to the average observed for 1980-82. (These shares are ca 5 %,

ca 15% and ca 25 % for Maputo/Masola, Beira and Nacala, respectively). To obtain a figure for 1995, simple intrapolations of 1990 - and 2000-figures were made.

Table 1 shows the total traffic forecasts for the Mozambique ports in question for 1990 and 1995.

Again, both traffic and commodity group breakdowns are quite rough. If need be, the very detailed dissaggregation of the SATCC study may be consulted.

As previously stated, the table reflects SATCC study assumptions alone. It is therefore useful to take a brief look at the long-term trend.

Figure 3 shows the development 1970-95 of traffic through Mozambique ports. It confirms that the "normal" situation premises applied to Angolan ports is not valid to the same extent here. They also shows that future development was envisioned quite differently for the three ports.

Maputo/Matola, which had a 1980-82 performance of ca 40 % of its previous peak level, will not reach the peak level again before 1995. This is in sharp contrast to Beira and Nacala.

Beira, which had similar 1980-82 performance in relative terms (45%), was assumed to reach almost twice that level as soon as by 1990, and to double it again by 1995, (and again by 2000).

Nacala's production during the early 1980s was on a par with the early 1970s. The forecast assumed a doubling of this figure by 1990, but after a much more modest increase, contrary to Beira's explosive growth.

TANZANIA: Dar es Salaam

The two main references here were the SATCC study and the Tanzania Harbours Authority (THA) Study (3,9). There are few inconsistencies between the two and both in fact use the same consultancy report as their main basis. As additional reference is the Dar es Salaam container handling study (10).

The forecasts presented here were in essence THA's regarding dry bulk and general cargo, and SATCC's regarding petroleum and petroleum derivatives. The reason was that the THA study was the most recent one, but did not treat petroleum products.

A main premise behind the forecast for non-petroleum transport was the dependency between the production performance of the port of Dar es Salaam and the speed with which not only the Tanzania economy, but also that of Zambia and ZBR will recover.

Two main specific assumptions were that:

- The proportion of Zambian traffic transitting Dar es Salaam will not change much, and that
- traffic in aggregate would recover by 1987 to less than from below the 1977-level, and then grow at less than 3.5 % p.a. until 1992.

On the whole, the assumptions behind the Dar es Salaam forecasts must be characterised as more conservative than those for, say, the ports of Mozambique, especially if one extrapolates the trends towards the year 2000. However, no value judgment regarding predictive power is being made with this comment, since the point of departure situation for the forecasts differs to such an extent.

Both forecasts were presented for international traffic only. The forecasting years for the SATCC study were 1985, 1990 and 2000, for the THA study 1987 and 1992.

With reference to port statistics for the 1980s, the share of national coastal traffic through Dar es Salaam has been estimated at about 2 % of total traffic, on the average. This estimate is reflected in the present forecasts.

Table 1 shows the total traffic forecasts for Dar es Salaam for 1990 and 1995. The only trend to be noted here, is that an absolute decline for dry bulk products, and corresponding increase in general cargo are expected.

Again, both traffic flow and commodity group breakdowns are quite rough. For details, reference is made to the base forecasts, which are very detailed, also in terms of relationship to various handling modes.

Figure 3 shows the long-term development of Dar es Salaam port traffic 1976-1995. It shows less dramatic fluctuations than for the other ports. The obvious similarity is that the present situation was at a low level compared to a peak level in the 1970s, and that this previous peak was not expected to be reached once more until the mid 1990s.

Concluding Remarks

A description of a system may be interesting in itself, but only becomes meaningful if it also improves our understanding of the system. It then also becomes a step on the way to a prognosis, in the sense of a prediction.

Ultimately, the real reason that we attempt to do anything in research and planning is the hope that we shall be able to make statements about the future with as much confidence as possible, on the basis of certain stated premises. The aim of research is to make prognoses. This does not mean that prediction in the usual sense is all that is important: we must understand the system as well, in order to be able to control it. But this of course also implies a form of prediction requirement (11).

The word prognosis, and the concept, may be and are used of many ways of speaking about the future:

- analysis of potentials
- plans
- perspectives
- predictions
- projections
- prophecies
- propaganda
- preferences
- political aims
- professional paradigms, etc

Does this mean that there is complete confusion here? If the confusion is not complete, there is at least no doubt that prognosis is used as a generic term for a number of quite different ideas which need not have anything more in common than that they have something or other to do with the future.

Personally, I would like to try to limit the concept to include only some form or other of conditional assessment of probability, a conditional prediction.

This definition does not in itself exclude any of the other varieties, all of which may satisfy the above mentioned criterion for a prognosis.

In this connection, I would particularly like to emphasize the need to discuss the degree of autocorrelation, i.e. the importance and dynamics of the historical trend:

Next year you will be 48 years old if you are 47 now, despite any governmental interference (of the peaceful kind). The historical trend is all-important. On the other hand, the volume and commodity mix of port traffic next year are quite independent of the figures for last year and the year before. The reason is of course that in this case the government can control and alter the premises for volume and commodity mix. The historical trend is in principle unimportant. The demand for an assessment of autocorrelation should be an invariable rule in making a prognosis, but even so it is often overlooked and not discussed.

So what makes a good prognosis?

The example of autocorrelation embodies an opinion that a prognosis must be based on a genuine understanding of what causes variations in behaviour in today's situation. This understanding must be beyond a description of unstructured general observations.

Without such an understanding, the model for the prognosis is almost bound to be irrelevant. And if it should be relevant, this is a result of luck and is therefore uncontrollable and uninteresting in most ways.

Pushed to its logical conclusion, this means that one prognosis is more successful, as this must be regarded as coincidence. The

prognosis is only good when it is based on an understanding and explanation of cause and effect.

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