
Recreation Values of Forests and Parks [and Discussion]

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Recreation values of forests and parks

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Economic and social changes in the western world increase the need for multiple land use. Recreation in forested areas is therefore an important issue, as well from the point of forestry policy as of forestry planning. This is illustrated with some examples from the Netherlands.

Recreation planning is surveyed in three successive steps (determination of the location, of the capacity and of the layout) with the aid of some schemes and examples.

With regard to the economic evaluation of future recreation values mention is made of the use of the consumer-surplus method.

Finally some pointers are given on forestry policy in connexion with physical planning and, in this context, the obtaining of data for recreation research.

1. INTRODUCTION

In the course of history, parks in the neighbourhood of large towns have been integrated into and form a dominant feature of the leisure behaviour of the town population, whereas forests remained more or less a *terra incognita*. As a result of changing economic and social circumstances – the demand created by the happy few now being created by all social groups, the addition of day and weekend recreation to that in vacations, the greater mobility of recreationists and the awakening of the urban population to the fact that the abundance in natural resources is dwindling – forests are becoming an increasingly important feature in outdoor recreation. In practice this has resulted in a situation that, although one can distinguish between forests and parks (the primary objective of forests being timber production and of parks the production of recreation days), all kinds of transitions occur. It even might be that in Western Europe as a result of future shifts in demand for timber and recreation, the differences would gradually cease to exist and a forest might be termed a park with trees and a park a forest with recreationists. Some day a forester may wonder at what to raise, manage and maintain: trees, or human beings enjoying their leisure? Certainly at that time the foresters' contemplation of visitors as lawful recreationists instead of recreants from their occupation and as interfering with natural forest life will be a foregone conclusion.

Anyhow, it is undeniable that in past decades the interest in forests and parks has been increasing rapidly. The economic and social impulses are well known: more prosperity – more leisure – more diversity in leisure behaviour – more mobility – more recreation in forests and parks. Aside from this general development another movement is important with regard to the attitude towards forests. Under influence of the reports of M.I.T. and the Group of Rome, the environmental aspects of human life came to the fore with a boom in publications on this issue. This movement was speeded up by a short-wave fluctuation in food production and a tendency to regional overproduction in Western Europe. This rosy-coloured situation of food production

resulted among other things in the 'plan Mansholt' of 1970, which foresaw a large shift from unproductive and even productive agricultural land to parks and forests. By 1980 7% or 5×10^6 ha in Western Europe should have gone out of agricultural production. None of this has yet been realized. On the contrary, the discussions turn to a world food crisis with a grain reserve of only six weeks. However the outcome may be, the long term increase in leisure time in Western Europe has resulted in a change in approach to forest policy or at least it should result in such a change. The added use of forests must lead to important adaptations in the strategy of cutting, restocking, planting and general management.

The historical orientation to timber production shifts with the adding of other aims: the social benefits to be gained from camping sites, second-home sites, horse riding, walking and driving for pleasure, day-outings, nature areas, etc. It is, however, to be expected that this reorientation will take a long time as professional and administrative stability is built into any organization. Forestry as a middle and long-time business will be no exception to this rule.

2. FORESTRY AND TOWN AND COUNTRY PLANNING

It would be a wonder if existing forests were all situated in the right place to meet the new requirements and, on top of that, that they would have a sufficient capacity, layout and accessibility. In this respect there is a large resemblance between the situation in Great Britain and in the Netherlands. The Netherlands is beaten by Great Britain as far as the smallest percentage of forest covered area in European countries is concerned. Another joint characteristic was mentioned not long ago in a t.v. quiz for high schools. A question was: name an island country of some 233 000 km² where all cities are situated at a distance less than 100 km from the sea. The answer, which the pupils couldn't give, was of course Great Britain. In the Netherlands as in Great Britain the large towns and urban centres are situated along the coasts, whereas the forests can only be found inward in the more remote areas. Great Britain being so much larger than the Netherlands, there is a significant difference in scale, however, which makes it difficult to transpose actual Dutch situations to England.

In the Netherlands the change in attitude regarding forests promoted by an increased population and therefore a stronger recreation pressure gave rise in 1966 to the 'Second Report on Physical Planning' mentioning the desirability of making extensive parks in the neighbourhood of large towns such as Amsterdam, Rotterdam and The Hague. These would have to function as day-recreation sites and as buffer zones. As a result, some large regional parks are being created in that area.

For the project 'Midden-Delfland' (figure 1), between the agglomerations Rotterdam and The Hague, a special act is now in preparation. Furthermore, in the newly reclaimed polders an increased area percentage is destined to become forest (figure 2). To improve landscape and environment in a cut-over peat area of 1.2×10^6 ha in the northeastern part of the country, afforestation is an important subject of study in the reconstruction.

All the above mentioned cases concern highly productive agricultural land. It may therefore be concluded that in the Netherlands an active participation of central and regional authorities in the planning of new forests and parks prevails.

As regards future large-size park areas, recently a discussion started whether or not the idea of the National Board on Physical Planning creating a small number of large-scale parks from 2000 to 4000 ha can be maintained (A.N.W.B. 1971). This discussion turns towards the high

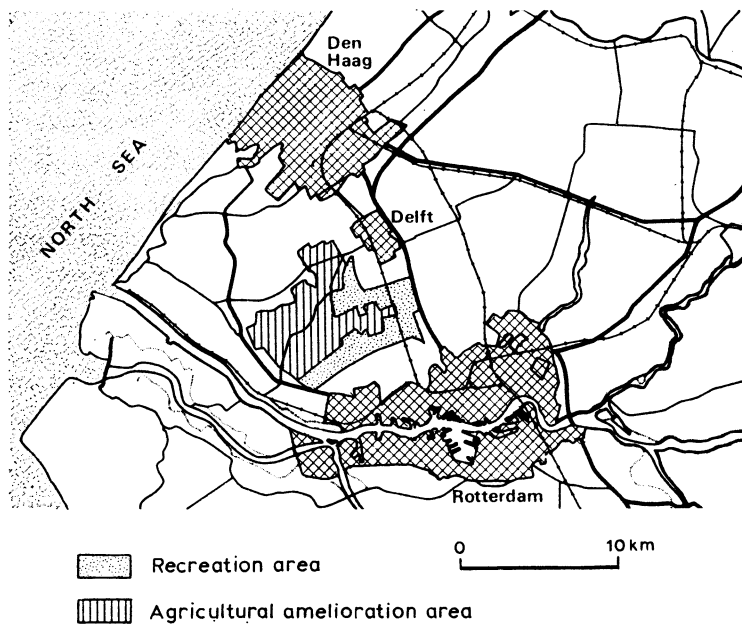


FIGURE 1. Situation recreation Project Midden-Delfland.

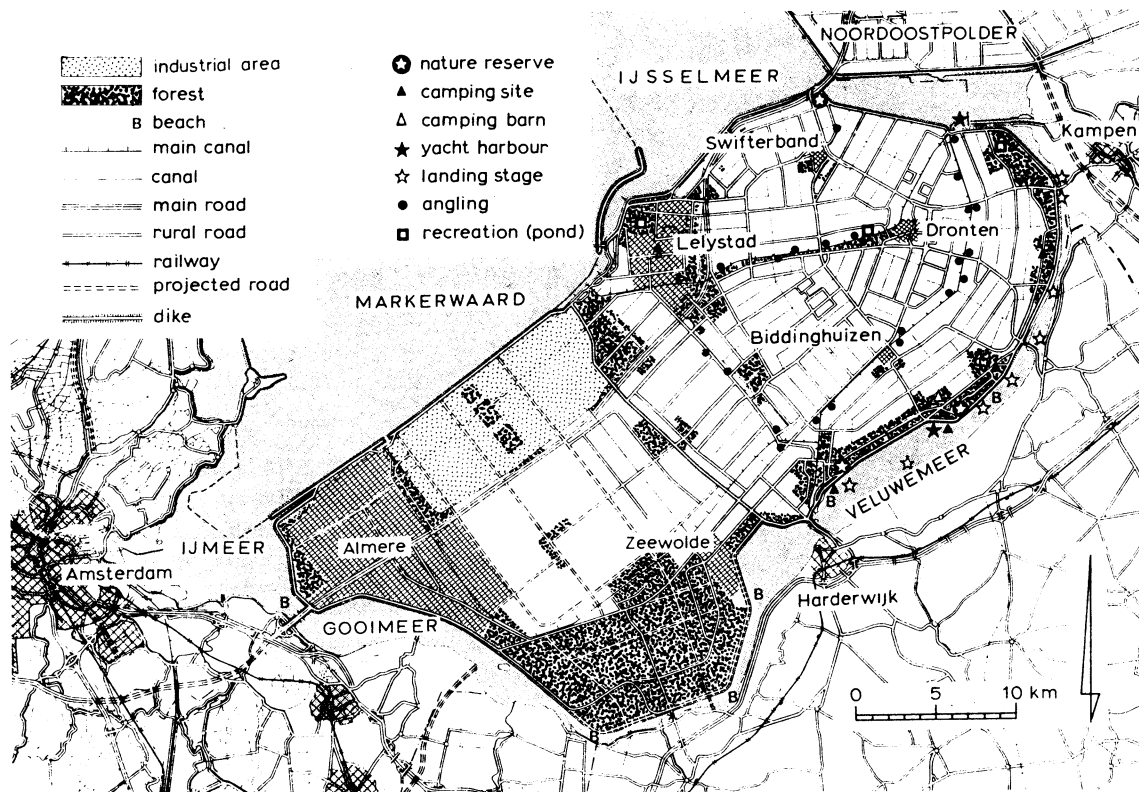


FIGURE 2. Structure plan Flevoland (realized in part) (after R.I.J.P. 1973).

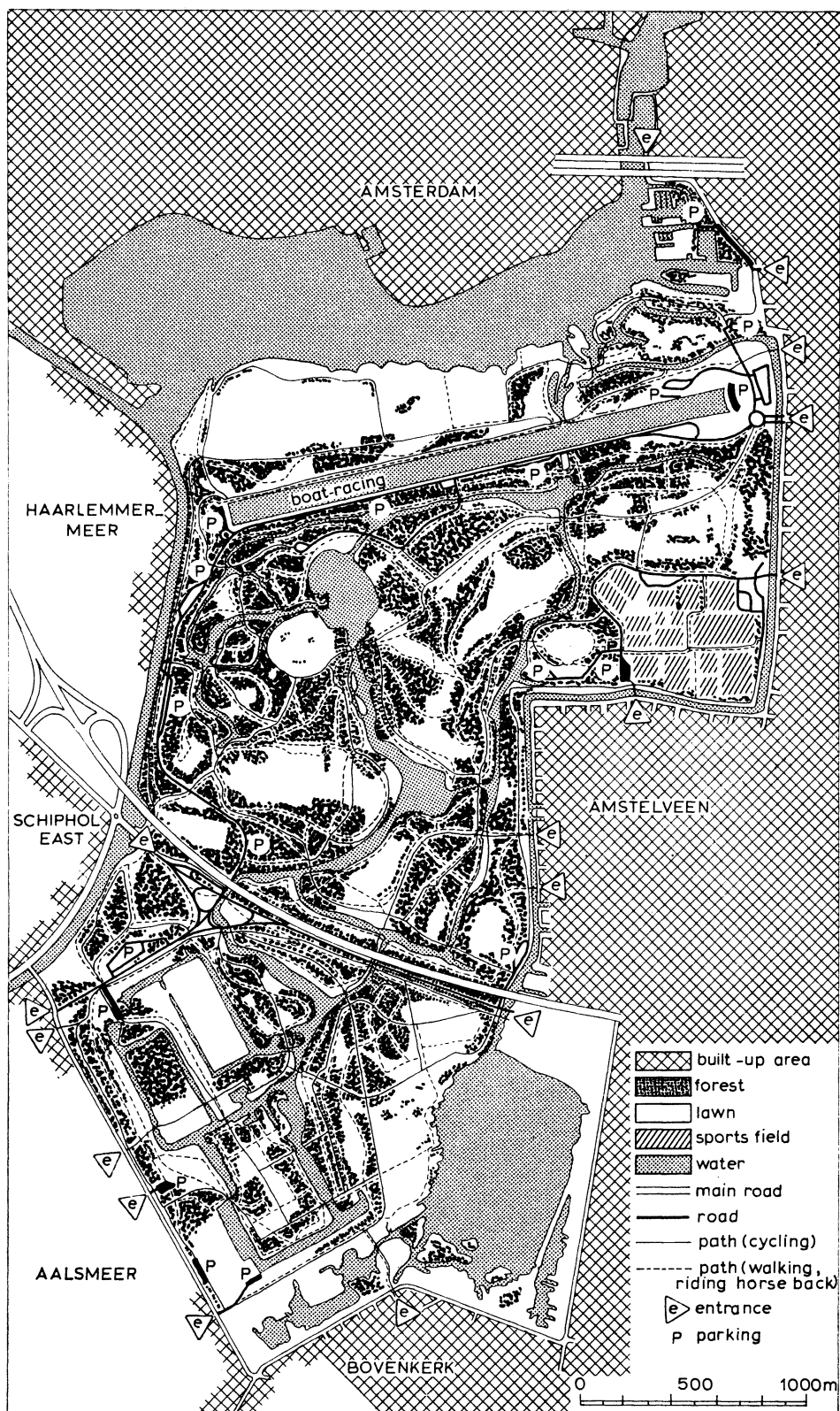


FIGURE 3. Layout of the Amsterdamse Bos (after municipal maps).

investment, but even more to the uncertainty about their function. The question is whether it is not preferable to create a larger number of smaller parks more scattered over the countryside.

In this discussion such items as the traffic involved, congestion on Sunday afternoons, road dimensions, travel distance, freedom of choice for the recreationists, origin exclusivity as against destination exclusivity are major points (Klaassen 1973).

When a large part (say 70%) of the recreationists on one site come from one town, the recreation site has origin-exclusivity. When the majority of all recreationists in a certain town goes to one site, then that site has destination-exclusivity. For example, the 'Amsterdamse Bos' (figure 3) has origin-exclusivity, as have town parks in general, but not destination-exclusivity. When no other outdoor recreation facilities would exist around Amsterdam it might also have destination-exclusivity. It is rather essential when planning new parks and forests to know this beforehand, because it makes a large difference in their layout. Parks and forests with destination-exclusivity will, for example, generally require more diversity and a more complex furniture than those with origin-exclusivity. In the latter case, the layout might be more directed towards types of outdoor recreation that are in the minimum for that specific town.

The advantage of large recreational areas is the possibility to create a large visitor capacity per area as well as a large diversity and a good accessibility. The drawbacks are problems in the field of environmental and public health, the necessity to carry out large infrastructural works and the possible occurrence of traffic congestions (Verkoren 1973).

A first evaluation of the pros and cons has led to the conclusion that to create a large number of small areas might be an advantage (Klaassen 1973). In the layout of the large parks now being constructed there is a tendency to apply this principle by creating a number of small size concentration points. So a development from mononucleate recreation parks to polynucleate parks has occurred. The same tendency is found in town planning in the new IJssellake polders, where polynucleation seems to be a leading principle. This can offer an additional opportunity for town and park planners to combine their efforts.

The problems of site, number and size of parks lead to another basic issue in land use planning.

The rising prosperity and mobility results in a change in scatter of recreationists, away from urbanized centres. The first point to be mentioned in this respect is the future distribution of leisure time. This distribution is a decisive factor in the planning and zoning of outdoor recreation facilities. Many speculations about the future distribution exist. Are we moving towards less working hours per day, less working days per week, less working weeks per year or less working years in a life-time? It does seem reasonable to assume that to some degree an increase of all kinds of leisure time will be the case. However, the effects of their relative increase are extremely important, not only with regard to the spending of leisure time and therefore for planning and zoning of facilities, but also in relation with settlement and urbanization.

The four-and-a-half-day working week seems to have a good chance of realization. There are already enterprises with variable working hours having to face it that part of the workers leave their job at one or two o'clock on Friday afternoon. This phenomenon may have fundamental effects on the whole approach to town and country planning.

Up to now in comprehensive allocation, models for urbanization (such as Lowry models) are used as a causal sequence: basic employment–service employment–dwelling–recreation. It is to be doubted if this can be maintained and whether in the future this everywhere applied

sequence of activities should not be changed into an entirely reverse approach: leisure–dwelling–service employment–basic employment.

For the present we see in practice that the degrees of freedom in planning are restricted by a sort of perpetuum mobile of present-day town planning, not to be stopped without tremendous effort. The existing pattern of compact towns, suburbanization and recreation areas outside the towns prescribes a more or less 'segregational model' for the allocation of the main human

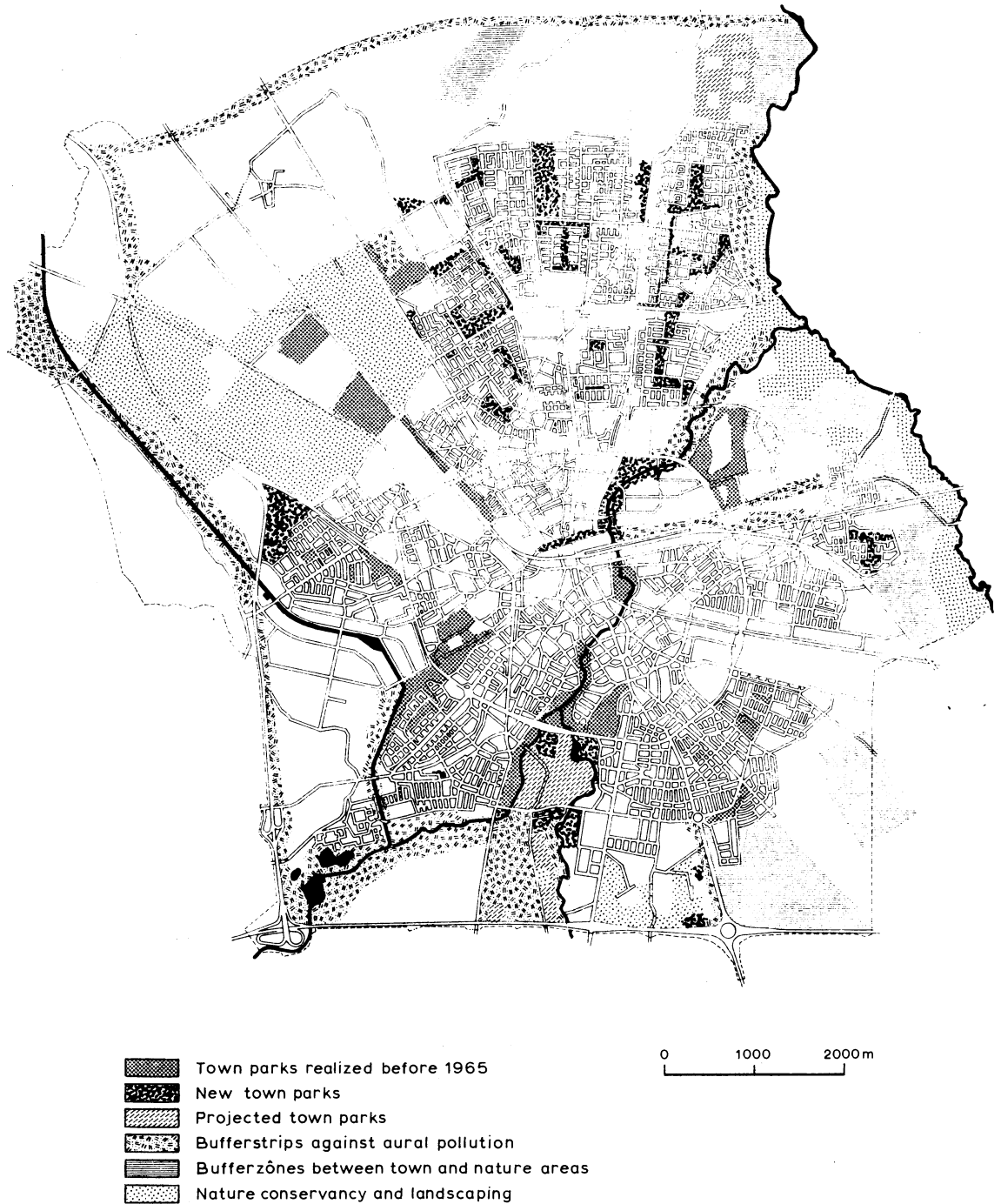


FIGURE 4. Town planning of Eindhoven (after municipal maps).

activities (Verkoren 1973). It should be an important point of discussion whether the historical way of comprehensive town planning must be changed to one that includes a first phase of afforestation, to improve environmental and recreational conditions, in areas of possible future town expansion. A kind of conditional medium and long term planning, while in the mean time the newly planted areas could be used as recreation grounds for the already existing parts of the towns. There are some hesitatingly made exercises in this direction (figure 4). It is a good thing at least that foresters and landscape architects are becoming more and more involved in town and regional planning in the Netherlands.

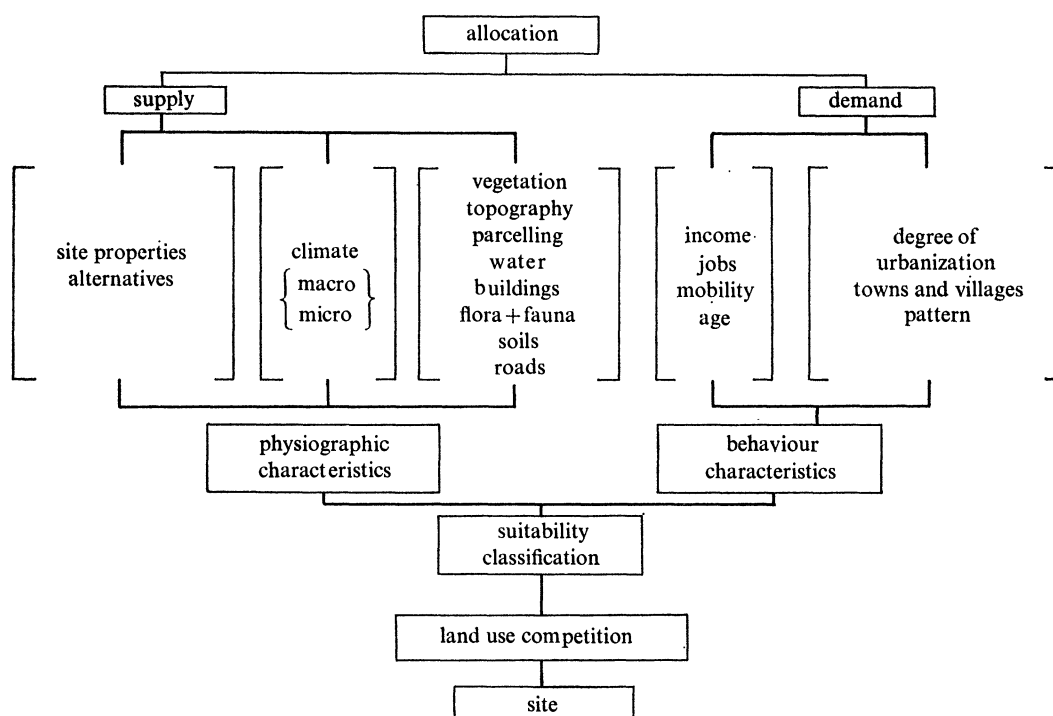


FIGURE 5. Scheme of allocation determination in recreation planning (after Van Lier, Bakker & Bergman 1971).

3. PLANNING FOR RECREATION IN FORESTS AND PARKS

There is a widespread general knowledge of recreation values of forests and parks. If, however, we try to apply this knowledge in an operational sense to plan new facilities there is a lack of quantitative knowledge. Only specific research can fill this gap. In this context it is astonishing that in all developed countries information on outdoor recreation behaviour and outdoor recreation facilities is lacking in the census. For adequate planning of the important social phenomenon of recreation, good statistics on participation rate, distribution over types and distance, frequency and time of occurrence is vital.

For design purposes several types of approach can be distinguished, but when having to create new facilities – for example, recreation opportunities in forests – the sequence allocation – capacity–layout may in itself be an approach to solve the problems. Although there is a close relation between these components of recreation planning, such a sequence-based approach may meet the first requirements.

3.1. Allocation of facilities

Figure 5 gives a survey of the problem fields involved. As stated in many papers, actual recreation is a result of the interaction between the supply of recreation opportunities and the demand to spend leisure time. Recreation is in fact the result of a complex of physiographic characteristics on the one hand and behaviour characteristics on the other. This simple statement once more emphasizes the multidisciplinary character of recreation phenomena. One consequence for research on, as well as planning and management of forests might be that a larger part of material and personnel costs should be allocated to sciences as sociopsychology and sociology than nowadays is the case. Also, when taking decisions regarding cutting, restocking and afforestation, a heavier weight should be given to viewpoints based on disciplines as landscaping and physical geography. In a matter of a landscape analysis, for example, is to be given new impulses in this respect. In the matter of a general analysis of landscape features a quantitative method was recently developed (Menzinga-Waayenberg 1971; Visser 1972) by using a 'Quantimet'. The Quantimet apparatus is normally used in metallurgy for structure analysis and has within the past decade been applied extensively and systematically in micro-pedology (Jongerijs *et al.* 1972). With the new method it is possible to establish a size

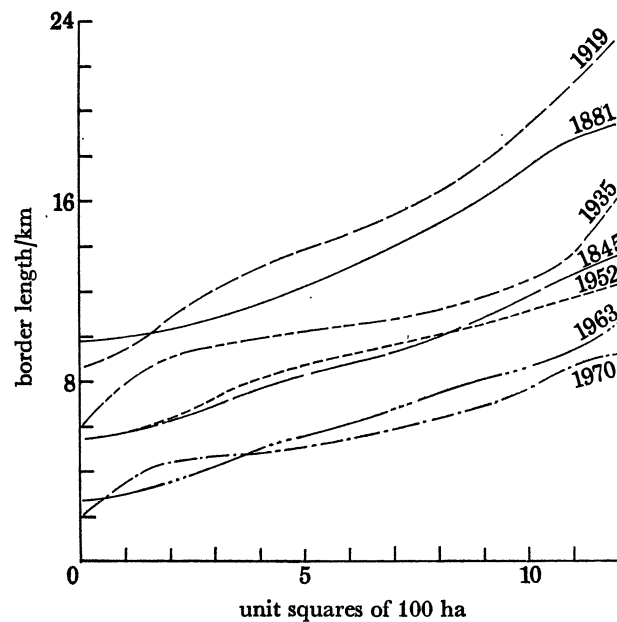


FIGURE 6. Border length of hedges per square of 100 ha with increasing border length near Haaksbergen in various years (after Visser 1972).

classification, and to determine the shape and border length of forests, open spaces, etc., as also to give the development in time of some aspects of landscapes (figure 6). Also the transparency of a landscape as seen from a certain point can be given by turning the circular images over 180° in the apparatus (figures 7, 8).

With respect to afforestation, including the making of recreation facilities, a classification of forest types in connexion with recreation and settlement (first and second homesteads) values might be extremely helpful. A classification of forests based on composition (softwoods, hardwoods, mixed cover) as well as on layout, accessibility, form and number of open spaces and on

distance to towns might give a first idea of the supply aspect for the various types (figure 9) of outdoor recreation. As far as my information goes, such a description of forests and parks on a regional or national basis is missing. There must be wide opportunity to apply the knowledge of foresters, landscape architects and townplanners in this context.

In the siting of recreation facilities woods have always played an important role. A survey of the location of camping-sites in the Netherlands shows that forests and the seacoast were dominant factors when creating camping sites for vacation purposes (figure 10).

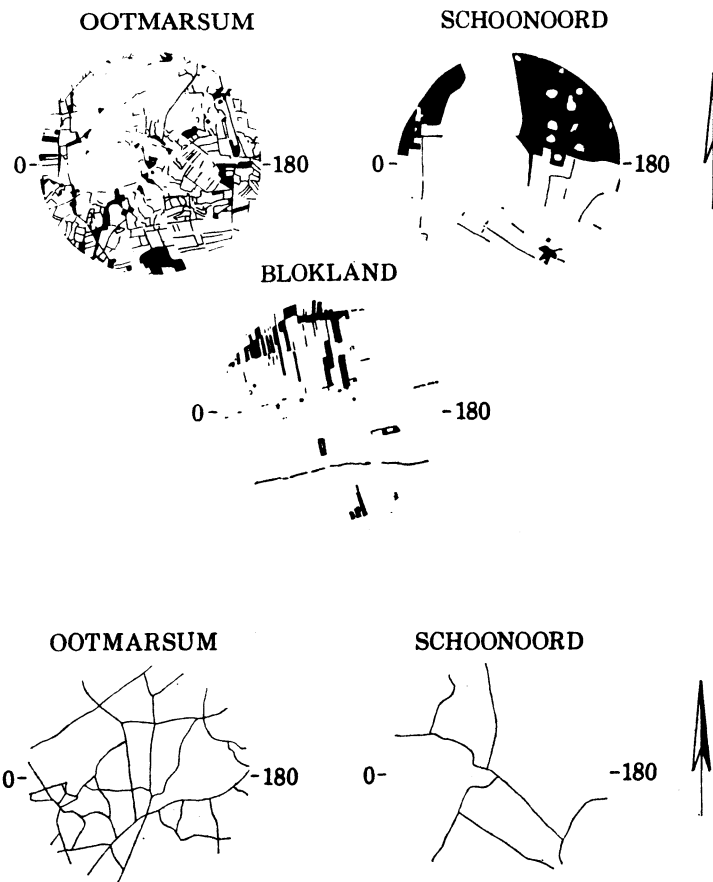


FIGURE 7. Hedges and forests in three areas of 900 ha (Quantimet images, after Menzinga-Waayenberg 1971).

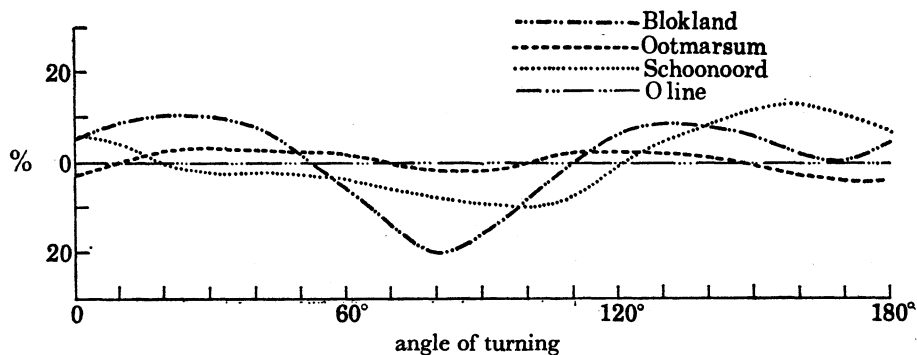


FIGURE 8. Procentual difference of the horizontal transparency of the projection value, when turning the images around their centre. (Quantimet data, after Menzinga-Waayenberg 1971).

Now a transformation of dwellings for the summer holidays into weekend houses occurs so the distance from urban centres is going to receive a heavier weight as a result of the higher use-frequency. It is to be expected that this weekend leisure behaviour will rapidly increase (the income elasticity for this type of residential recreation is rising to a level of about 2.0). It is a point of discussion whether present forest policies take account of this social phenomenon in the right manner. To create a beautiful environment for second homesteads afforestation adapted to this purpose is considered to be one of the best ways to anticipate such future land use.

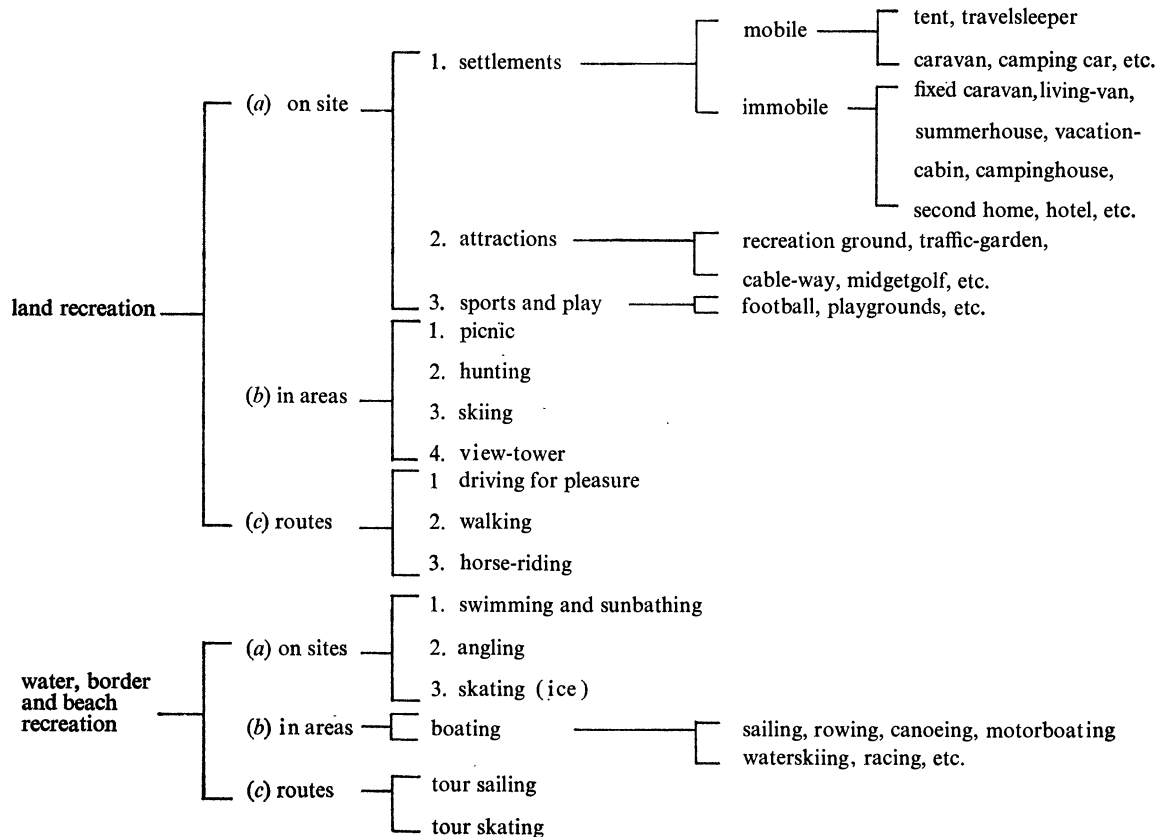


FIGURE 9. Classification of outdoor recreation types (after Segers 1970).

As regards the planning side there are an increasing number of potential techniques to be applied, among other things in land use competition models. To give an idea to what this may lead figure 11 and table 1 show some objectives and criteria and some results of an allocation study concerning a forest of 5000 ha in a peat soil polder of 14 000 ha (Damen 1974). The multi-criteria selection method 'Electra' was adapted to this purpose. Such methods can give a general indication of where to site certain facilities. Introduction of such contradictory viewpoints as 'economic growth' and 'scarcity' may lead to the same allocation preference and in that case the carrying out of a laborious benefit-cost analysis can be avoided. When differences in allocation preferences occur, a nearer study in terms of a benefit-cost analysis will remain necessary.

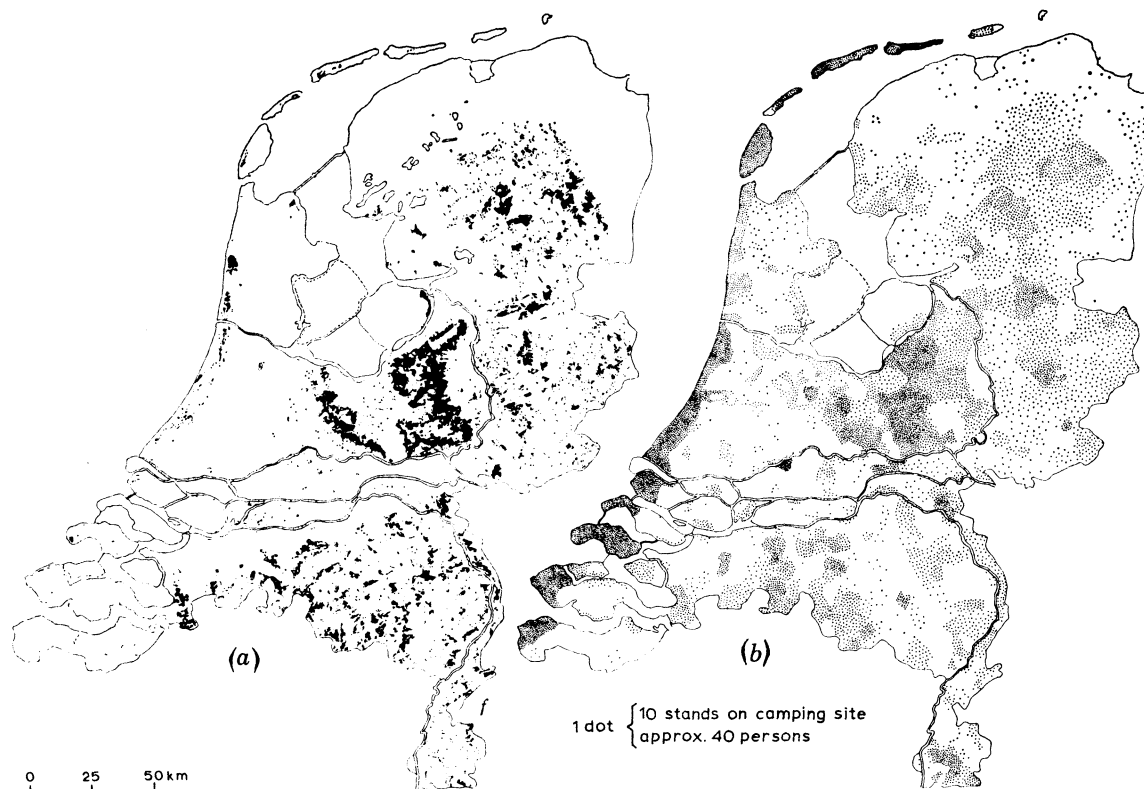


FIGURE 10. Location of forests (*a*, after C.B.S. 1971) and camping-sites (*b*, after IJkelstam 1974) in the Netherlands.

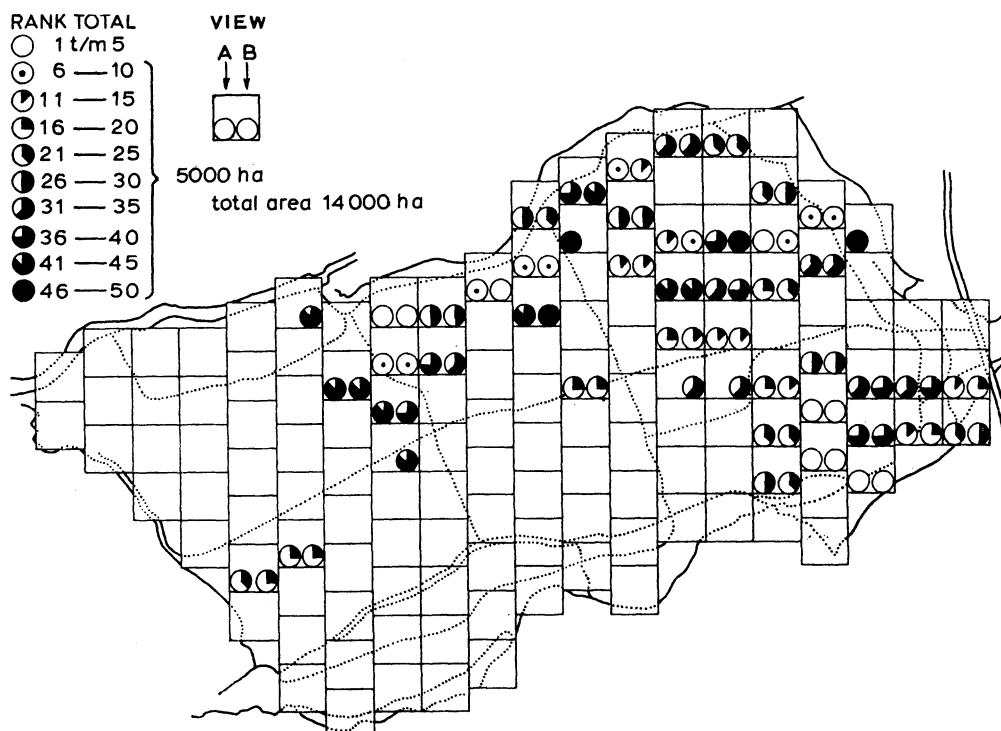


FIGURE 11. Allocation of a forest by means of an adapted 'Electra' method. View A, production; view B, scarcity (after Damen 1974).

TABLE 1. MULTICRITERIA SELECTION PROCEDURE 'ELECTRA' APPLIED ON AN ALLOCATION OF A FOREST IN A POLDER (AFTER DAMEN 1974)

objectives	criteria	weights	
		A (production)	B (scarcity)
(a) unity of 5000 ha forest			
(b) maximalization landscape	open areas	200	400
sacrifice unattractive landscapes	landscape (other)	100	200
(c) max. timber production	variation in yields	125	250
min. production costs	variation in costs	500	250
(d) max. flora and fauna everywhere	intersection nature	20	40
valuable species	potential variation in nature	600	900
(e) max. recreation value	distance to urban centres	167	333
(f) maintenance of important values	existing buildings	1000	1000
	existing nature areas	1000	1200
	sportsfishing	150	100
	agricultural	350	500

3.2. Capacity of facilities

When the siting problem has been solved, the technically and economically feasible capacity of the recreation facilities will have to be determined. The capacity determination works according to the following sequence:

- (1) An insight must be gained of the determinants of the number of recreational visits, a sociological problem;
- (2) an analysis of the actual as well as the future potential demand level for the specific type of outdoor recreation will have to be made;
- (3) the trends and mutations in recreation patterns caused by possible psychological, sociological and technical changes are to be predicted;
- (4) the design year, day, and visit is to be determined.

Regarding the first point there are three general methods one can apply: those based on research in the towns by means of home questionnaires (origin), by means of site questionnaires (destination) and by means of both of them simultaneously (origin-destination). There is a majority of destination research. Origin research is relatively scarce and combinations of origin and destination research are very seldom carried out. In many cases the results are introduced in various models. Figure 12 gives a first systematic approach to such models. Of these, gravity models are the ones mostly used in capacity research. For the evaluation it is necessary to do also a research on competing projects for the type of recreation in question. For the project Midden-Delfland near Rotterdam and The Hague (see figure 1) such a method is now being applied. It appeared here that the distance-decay curve $Y = \alpha e^{-\beta D}$, where $Y = 100V/P$; α is the percentage population involved at zero distance; V the visit on site from origin; P the population of origin; e = base natural logarithms. D , the road distance origin-site (see Van Lier 1973), is very flat for sea-beaches ($\beta = 0.10$), steeper for forests and watersports ($\beta = 0.20$) as also for inland lakes and playgrounds ($\beta = 0.27$) and steepest for town parks ($\beta = 0.55$).

A problem to be solved in all kinds of projects is the setting of the planning capacity. Whether dealing with canals, roads, buildings, hotels or recreation projects, one always has to face it. Also in this matter the intuitive way of problem solving is widespread. Every designer knows, for example, that a low planning capacity generally results in higher costs of management or of maintenance and that the reverse is also true.

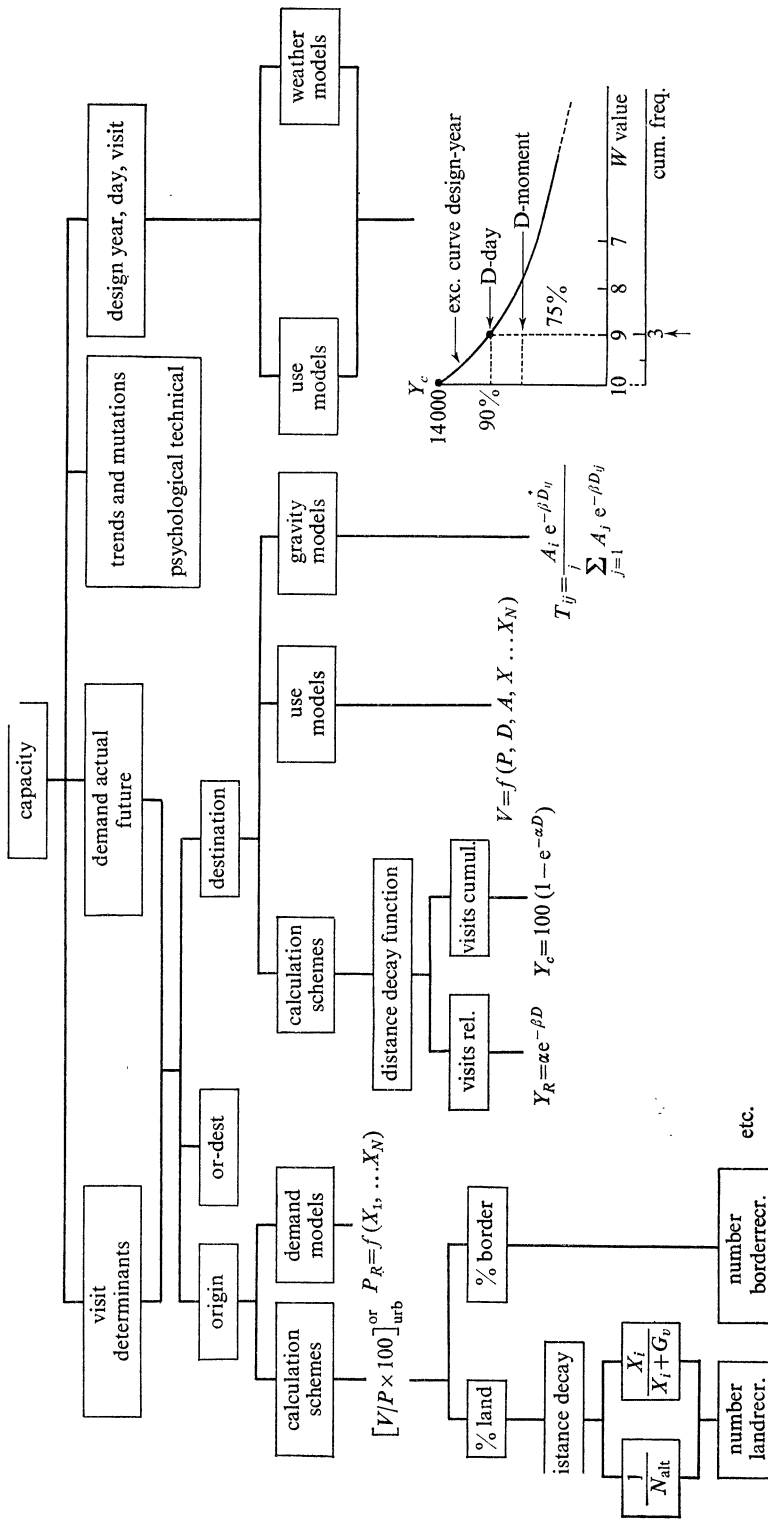


FIGURE 12. Scheme of capacity determination in recreation planning (after Van Lier, Bakker & Bergman 1971).

A systematic approach to the solution of this problem is given in the right hand part of figure 12. A use model of a similar already existing recreation project can give the number of visits to be expected per day-group (for example, Sundays or Saturdays or working days). With the aid of weather values (figure 13) the frequency of occurrence of the number of visits per day-group is determined, with which a curve of exceedance can be drawn for the normative year (figure 14). Taking the third most crowded day as the day having the planning capacity (D-day), the visit on that day is established from the curve. This arbitrary procedure is in

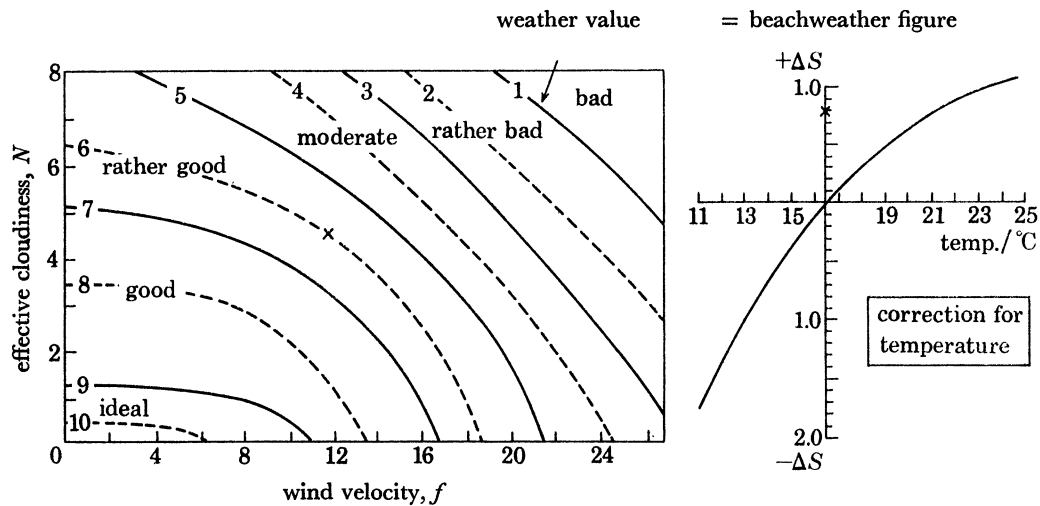


FIGURE 13. Weather value diagram for the North Sea coast of the Netherlands (after Den Tonkelaar 1972).

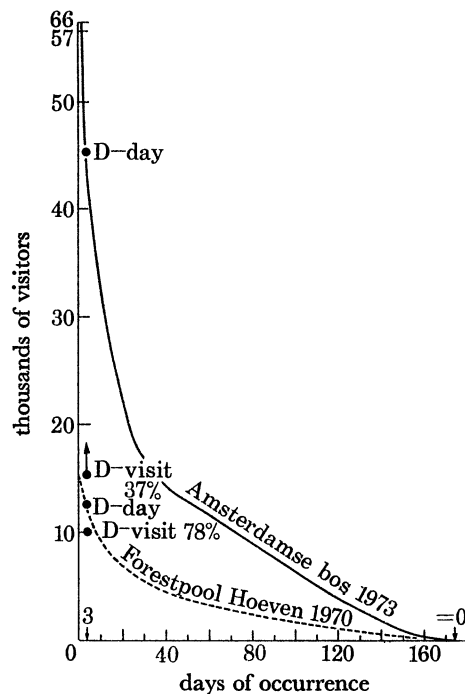


FIGURE 14. Curves of exceedance of day visit to the Amsterdamse Bos and the forestpool Hoeven in the normative (D-) year. (After Van Lier 1973; Bakker 1974a).

accordance with the one applied in traffic design in the case of highways. It is in fact based on some economic issues: in principle the design capacity of a project is justifiable when the marginal benefit–marginal cost ratio (benefit and cost expressed in, for example, recreation days or pounds) has a defined value that is the same for all projects to be financed from the budget under consideration. Knowing the maximum momentary visit on this day as a percentage of the total visit of D-day, the normative number of visits is finally found (Van Lier 1973).

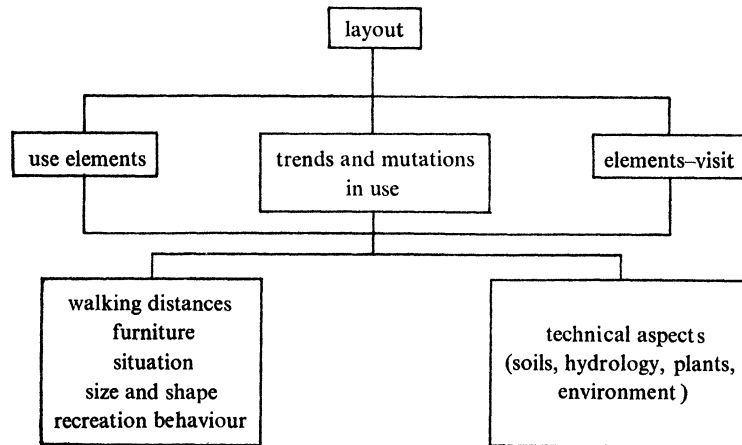


FIGURE 15. Scheme of layout determination in recreation planning (after Van Lier *et al.* 1971).

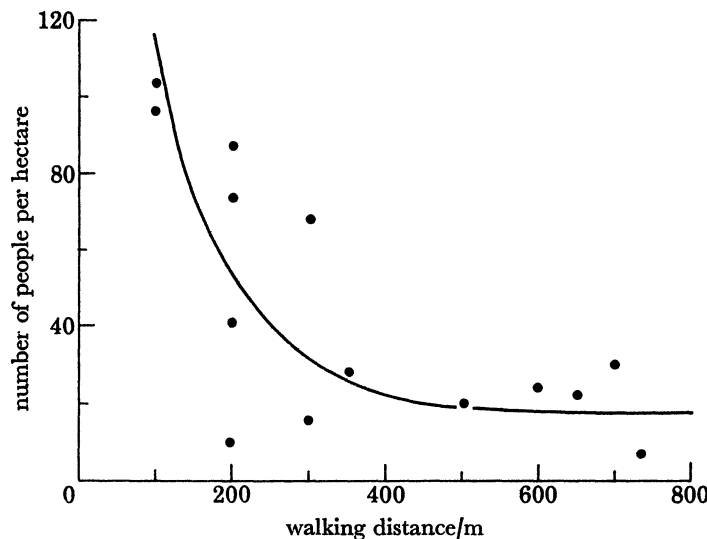


FIGURE 16. Relation between walking distance and crowdedness on playing grounds (0–4 ha) for the Amsterdamse Bos on Sunday, 24 June, 1973 (after Bakker 1974*a*).

3.3. *Layout of facilities*

It must be stated that at present only little systematic knowledge exists about principles for the layout of outdoor recreation facilities. Although general rules are applied by people in charge of building recreation facilities in forests and parks, these are mostly based on unpublished ideas about what recreationists seem to appreciate. For an adequate development of the social benefit of forests it is necessary to analyse the use of recreational elements more

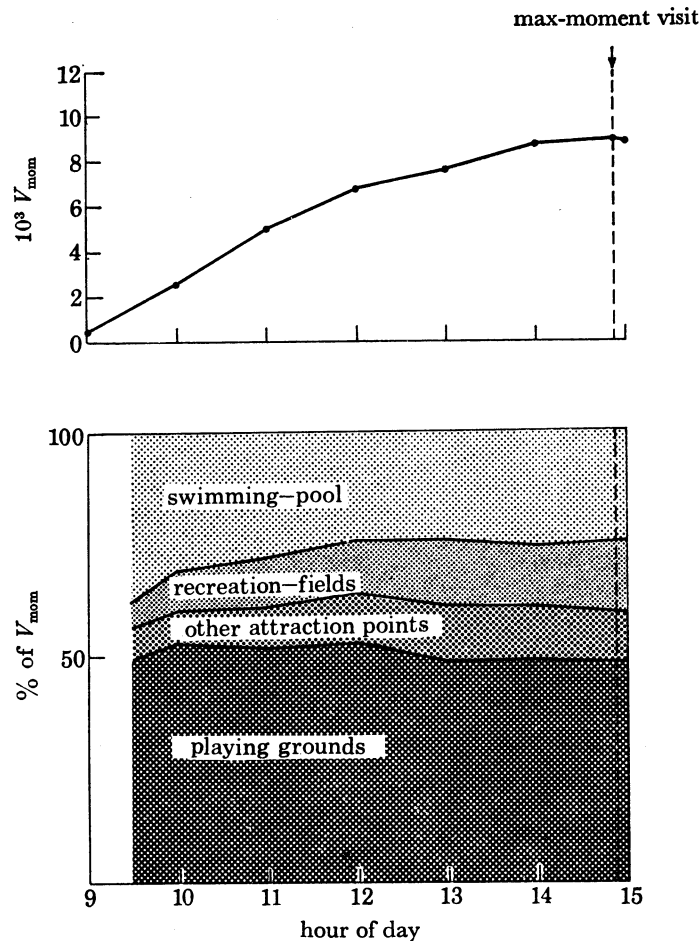


FIGURE 17. Distribution of recreationists over different elements of forestpool Hoeven at different times on Sunday 1 July, 1973 (after Bakker 1974*b*).

systematically, as well as the trends and possible changes in that use and the relation between the characteristics of the elements and the visit. In the scheme given in figure 15 some items are mentioned. A few results of such research are given in the figures 16 and 17.

4. EVALUATION OF RECREATION VALUES

The results of the above mentioned research are more or less a requirement for an adequate judgement of recreation values of forests and parks, otherwise it is to be feared that evaluation will remain entirely intuitive. Technical information can give a basis to solve the problem of evaluation. As a matter of fact the economic discipline must be leading in this aspect of outdoor recreation. It is to be signalled that there is progress on this point, which may be to the benefit for a justified allocation of scarce funds. To give an idea of this, an example will be given of a study on the creation of a 'nature' park in the Netherlands.

The 'park' conception of an area of 4400 ha in a sandy region in the southern part of the Netherlands was judged with a benefit-cost analysis (figure 18). The demand curves and the shifts caused by population increase (10% per 5 years) and income increase (8% per year) are given in figure 19. The consumer surplus results from a confrontation of subjective value

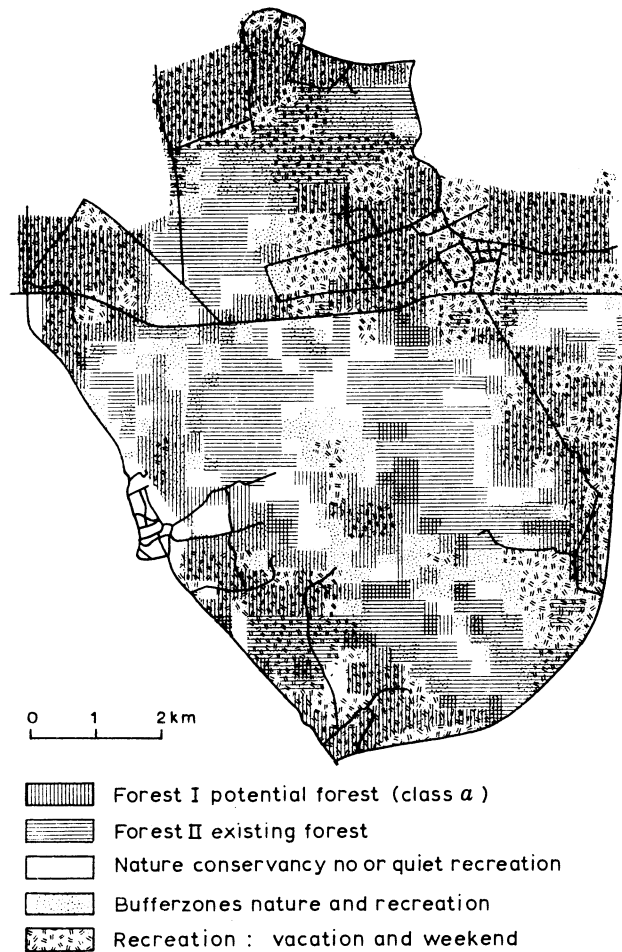


FIGURE 18. Zoning system of recreation area Midden Maasland (after Midden Maasland 1973).

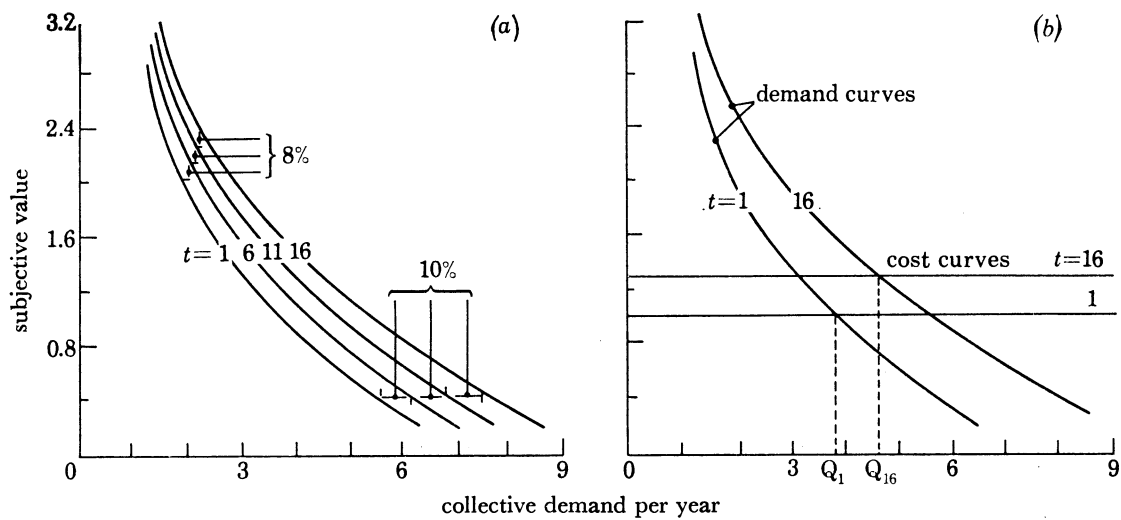


FIGURE 19. Collective demand curve for parks with nature and recreation values for a town with 10000 inhabitants (A) and confrontation of demand and cost curves for such a park (after Midden Maasland 1973).

and costs (figure 20) (Locht 1971). The internal rate of return of this projected 4400 ha park was calculated to be 20%. This percentage can be increased by the introduction of weekend cabins and second home sites in accordance with the bearing capacity of nature and landscape. Rough estimations lead to a very high rate of return of such facilities. This confirms the shifts in demand from camping to second home sites mentioned earlier in this paper and stresses once more the importance of being attentive of such shifts in forest policy.

As outdoor recreation deals with the well-being of people it would not be advisable, however, to use only registrative, technical, economic and social data; such information never will reveal the motivation of behaviour patterns. It is for this reason also that socio-psychological research, more in particular surroundings and perception psychology, must be a part of studies dealing with recreation.

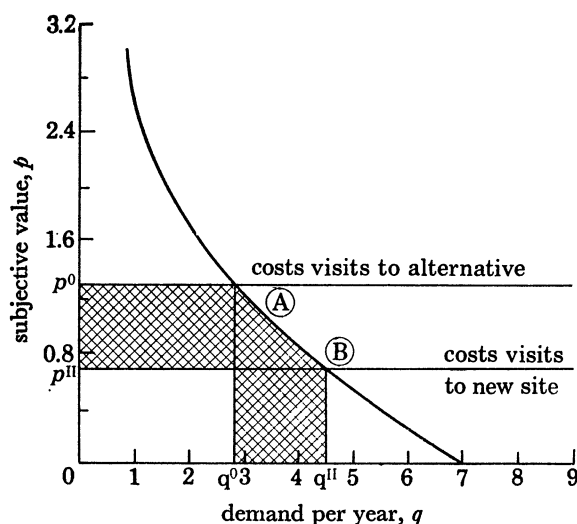


FIGURE 20. Increase in subjective value W (area q^0 , A, B, q^II) for parks and the benefits B (area p^0 , A, B, p^II), including travel costs difference (after Midden Maasland 1973). $W = \int_{q^0}^{q^II} f(q) dq$, $B = \int_{p^II}^{p^0} f(p) dp$.

5. FINAL REMARKS

(a) An increased use of forests for non-professional human activities will further the well-being of human society.

(b) Forest policy should be concentrated more on user-oriented sites for outdoor recreation (transient as well as residential) than on forest areas remote from urban centres.

(c) Integrated physical planning in which foresters, town planners and landscape architects participate is needed to create an acceptable human environment in areas which in future may become partly urbanized.

(d) The social benefits to be derived from the better environmental conditions resulting from forestation of areas which in future are partly to be urbanized will augment the feasibility of forestation plans in such regions.

(e) A more systematic approach, according the sequence allocation–capacity–layout, to determine the requirements of new recreation facilities in forests, will improve the effectiveness of the plans, as well as lowering the difficulties of acquiring funds for outdoor recreation.

(f) A classification of forests according to recreational potential will prove to be of great benefit to planning an increased recreational use. Research on the possibilities of making such classifications should be encouraged.

(g) Data on recreational activities should be included in the census, as such data are becoming indispensable for adequate planning of facilities for outdoor recreation.

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Discussion

R. M. SIDAWAY (*Forestry Commission, Alice Holt Lodge, Farnham, Surrey*)

I would like to congratulate Professor Bijkerk on the careful and thorough approach to recreation planning of his department. This is evident in his paper, which many of us will study more carefully.

In his opening remarks on the day of the meeting he mentioned the recent British experiment with the three day week. I seem to remember an 'experiment' in the Netherlands which took place at the same time – a Sunday without cars. Neither country seems to have learnt much from their experiments.

I would like to ask Professor Bijkerk about the context in which his recreation model has been used – whether its use has been limited to single facilities or applied to the problems of regional planning. The gravity model he advocates has been conventionally criticized for its limitations when travel is assumed to be a cost to the visitor. Has there been any attempt to use systems models in recreation planning in the Netherlands?

C. BIJKERK

The 'three day work week' and 'Sunday without cars' were short duration phenomena with more or less a shock effect. Although there were some positive aspects of Sundays without cars, such as an increase in biking, walking, family-life, rest and pollution control, the authorities think that a repeat (for example once a month) is, let us say, too complicated.

The mentioned models are predominantly applied to new facilities. When these are interfering in the alternative opportunities (Spaarnwoude and Midden Delfland) a regional approach is necessary. For the Province of Utrecht an attempt was made to apply gravity models to physical planning. The problem of introducing the experience of travel time as cost is solved statistically. In destination research a distance-decay function always is found. The attempt to build other system models in recreation planning are rare.

J. S. CRIPPS (*Chairman, The Countryside Commission, 1 Cambridge Gate, Regent's Park, London NW1 4JY*)

In Britain the Forestry Commission have done a great deal, very successfully, in fitting recreation into commercial forests. We have done little to reverse the process by fitting commercial forestry into areas set aside primarily for recreation. I was therefore interested to hear that in Holland, if I understood rightly, you are doing just this. Most of our forests also are remote from the main centres of population. At the present time we are much exercised as to how we can better meet the recreational needs of people living in London, Birmingham, Manchester and other industrial cities in the North – people who can get out only by the day and must rely on public transport. In areas close to towns, as our green belts, have you found that commercial forestry can assist by improving the cost-benefit equation? Do you have commercial forestry in the Amsterdamse Bos, for example?

C. BIJKERK

In general the opinion prevails that in afforestation for mainly recreational purposes the commercial aspect of the forests should be a substantial part of the system. In older existing recreational forests such as the Amsterdamse Bos this was and is not the case. In present day afforestations of future green belts in the neighbourhood of large cities (Amsterdam, Rotterdam, the Hague and others) cost-benefit analyses, including the commercial aspects, are always subjects of study. In this respect the aspects of species, planting systems, management, cutting-cycles, etc. are thoroughly studied.