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# A MODEL FOR THE ANALYSIS OF THE DEMAND FOR AND ECONOMIC IMPACTS OF SUMMER RECREATION IN MANITOBA*

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## Background and Perspectives

The identification of industries with development potential in rural regions is critical to the stimulation of regional growth and development. This task is difficult in rural regions with a limited economic base and restricted export potential. In many instances, feasible alternatives consist mainly of primary, resource-based industries such as agriculture, forestry, fishing, mining and recreation.

Recently, recreation has received increasing attention as an industry with potential to provide opportunities for economic growth and, hence, income and employment in rural regions. Two examples of the increasing emphasis directed toward the recreation industry in the province of Manitoba are planned development of a major resort complex at Child's Lake in the Duck Mountain Provincial Park and the Minneapolis-St. Paul publicity trip taken by the Provincial Minister of Tourism and Recreation [22].

The view that the recreation industry has potential as a development instrument in rural regions is not universal. The Minister of the British Columbia Department of Highways stated that American campers should be banned from the province because they contribute nothing to the provincial economy [23]. Whether the view of the Minister of the Manitoba Department of Tourism and Recreation who encourages non-residents to vacation in Manitoba or that of the Minister of the British Columbia Department of Highways who suggest that non-resident campers be banned from his province is correct poses a difficult problem for policy makers. Namely, is stimulation of the recreation industry an effective means for achieving regional development objectives?

In Table 1, the relative contributions of specified types of recreation activities to selected regional development objectives is hypothesized. Research is required to provide estimates of the demand for specific types of recreation activity and their impact on regional development objectives. This is the reason for this paper.

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TABLE 1: Manitoba Recreation Activities, the Objectives of Recreation and the Hypothesized Impact of Activities on Objectives

| Type of Recreation Activity | Objectives and Hypothesized Impact[a] | | | | |
|---|---|---|---|---|---|
| | Recreation Opportunities to Disadvantaged Groups | Recreation Facilities for Manitoba Residents | Jobs and Income for Native People | Jobs and Income in Rural Regions | General Stimulation of Manitoba's Economic Development |
| 1. Provincial and National Parks-- | | | | | |
| Day-Use Facilities | Medium | High | Low | Low | |
| Camping Facilities | Low | High | Low | Low | Low |
| Cottages | | Medium | Dependent on Related Employment Policy | Low | Low |
| 2. Commercial Accommodation | | Medium | Dependent on Related Employment Policy | Low | Low |
| 3. Wilderness Areas | | Low | | | Low |
| 4. Hunting and Fishing--Lodges | | Low | Dependent on Related Employment Policy | Low | Low |
| Day Users | | High | | Low | Low |
| 5. Local Facilities-- | | | | | |
| Community Parks | High | High | | Low | Low |
| Curling, Golf, Skating, etc. | Low | High | | Low | Low |

[a]Blank indicates that the hypothesized impact is zero.

The paper begins with a statement of its purpose and a brief discussion of previous approaches to the measurement of recreation demand and the measurement of economic impacts of recreation. The next sections present a general description of the model employed and detailed description of its recreation demand and economic impact submodels. Some examples of the models application to the measurement of economic impacts and a brief set of concluding remarks complete the paper.

## Purpose

The purpose of the paper is:

1. To specify a model appropriate for measuring the demand for and economic impact of recreation activities on local regional and provincial objectives.

2. To illustrate application of the model to the recreation industry in Manitoba's Interlake region.

## Measuring Recreation Demand

Three general approaches have been taken in the construction of models to measure the demand for recreation:

1. Analysis of socio-economic variables to measure the propensity to participate in various recreational activities [6, 8, 17].

2. Analysis of selected variables to measure the demand for a particular recreation site [1, 7, 11, 15].

3. A systems approach that examines a state- or province-wide network of recreational sites (e.g., state parks) and the distribution of recreationists among them [3, 4, 5, 16, 25].

The third approach is a logical outgrowth of the first two, which were in fact pursued first in recreation analysis. In regressions of visitation, socio-economic variables did not yield highly significant coefficients, with the exception of distance or accessibility variables included in those studies that took location into account. Numerous regression analyses of visitation at single sites yielded high $R^2$ values, due mainly to highly significant coefficients for the distance variable. However, more recent workers wished to take account of interaction between sites. Hence, there is the current emphasis on state-wide systems analysis.

In some studies, participation in various activities has been estimated from household surveys and then allocated among available sites by criteria selected by park planners [2, 12]. A less arbitrary approach involves fitting "gravity" models to observed visitation at particular sites [5, 9, 10]. A more complex version with better statistical properties is the "inertia" model [21, 24]. Both have been criticized for not taking account of socio-economic

characteristics of visitors, and characteristics of parks. To allow for park quality, various workers have developed indices of attractiveness [3, 4, 5, 20]. The present study extends this concept by relating the demands of selected household types to the facilities available at the various sites in a "compatibility" index.

## Measuring the Economic Impact of Recreation

From a regional point of view, recreation industries generate "invisible exports" just as export industries generate a flow of payments into a region. Attracting recreationists into the region frees the regional economy from endogenous demand constraints due to population size that, otherwise, would be a binding constraint on the growth of the service or tertiary sector. Since the share of employment in the tertiary sector has been growing rapidly, an expanding recreation industry could be the means to offset the declining share of employment in the primary, mainly agricultural, sector. As an export industry, recreation has been viewed as a potential growth industry that would stimulate the development of a regional economy [18].

The economic impact of the recreation industry on the development of a region can be viewed in the time frame of two stages, the preliminary construction period, and the actual operational recreation period. These can overlap. The preliminary construction stage involves the construction of on-site buildings such as cabins or lodges, piers, marinas, concession stands, man-made lakes, access roads, and sewage and water systems. Off-site construction of restaurants, hotels and other commercial establishments can be included in this period. Private developers may develop a recreation site or establish enterprises to serve the users of a public recreation site or the government may construct a recreation site. The construction activities constitute public and private investment in the recreation industry. The construction provides local residents with employment opportunities, many of which are short-term, lasting only for the duration of the construction period, while others are permanent jobs. The impact of the construction stage is significant initially, but decreases over time.

The amount spent by a recreationists depends on the duration of his stay, accommodations used and activities pursued. Campers spend less in the region for accommodation than those who stay in a hotel or cottage. The type of facilities that are provided affects the expenditures of recreationists. Some activities offer opportunities for local people to provide services to recreationists; e.g., guiding hunters and fishermen, and renting boats. These can provide additional jobs and revenues for local residents. A wider variety of activities might induce visitors to stay longer. The day-user, for example, may extend his visit and dine in a local restaurant before journeying home. Local spending may be encouraged by providing for activities[1] such as boating and fishing, which

[1]Recreational planners face an additional economic question. What is the optimum allocation of recreation resources in a particular site between the various types of users? The model presented in this paper could be used to help answer that question by projecting the expenditure patterns of the various types of users given assumed recreational facilities.

generate boat and equipment rental and bait sales.

## THE MODEL

### A General Description

A general description of the model used is illustrated in Figure 1. The model contains a recreation demand and an economic impacts submodel.

In the recreation demand submodel, the demand, measured in user-days, for a particular recreation site is a function of provincial and non-resident population by household type, site characteristics and location. Household types are defined in terms of socio-economic characteristics including age, income, place of residence and family size. Recreation sites are defined in terms of the kind of activities available and day-user capacity. Locational factors include average distance from populations of specified size, number and proximity of similar sites, and distance from major metropolitan populations.

In the economic impact submodel, the impact of site construction expenditures and expenditures by site users are analyzed. In the model, expenditures by recreationists in a region create employment and income for households within the region. Capital expenditures on new recreation sites to satisfy existing or future demands also contribute to the employment and income. Government revenues are derived either directly through government-owned and operated recreational facilities or indirectly through the taxing of expenditures, income generated and higher land values induced by the expansion of the recreational industry. The incomes, employment, and government revenue generated by recreation expenditures feed back into the regional economy. There is also economic interaction between the region and the other regions within the province.

Before proceeding to detailed discussion of the recreation demand and economic impact submodels, some clarification of terminology is required. The term recreation site refers to an area within which recreation activities can take place. Recreation facilities are sections of a recreation site devoted to particular activities. Household user type refers to a household in a specified socio-economic class and recreation use category. Use categories include day, overnight, weekend and vacation use of recreation sites and facilities.

The decision concerning in what units demand should be measured is critical. Demand measurement must be compatible with recreation impact measurement to be conducted subsequent to demand estimation. Since recreation industry decisions are made relative to types of activity and type of user, the demand analysis is structured to facilitate estimation of demand by activity and user type as illustrated in Table 2. User-days are units that have been suggested to measure the demand for a particular site [13]. The recreationist buys one day's use of the site and may participate in a package of one or more activities of his own choosing. A user-day can be viewed as a conglomerate unit of recreation activities pursued on that day. A detailed discussion of each submodel follows:

FIGURE 1: Generalized Recreation Demand and Economic Impact Model

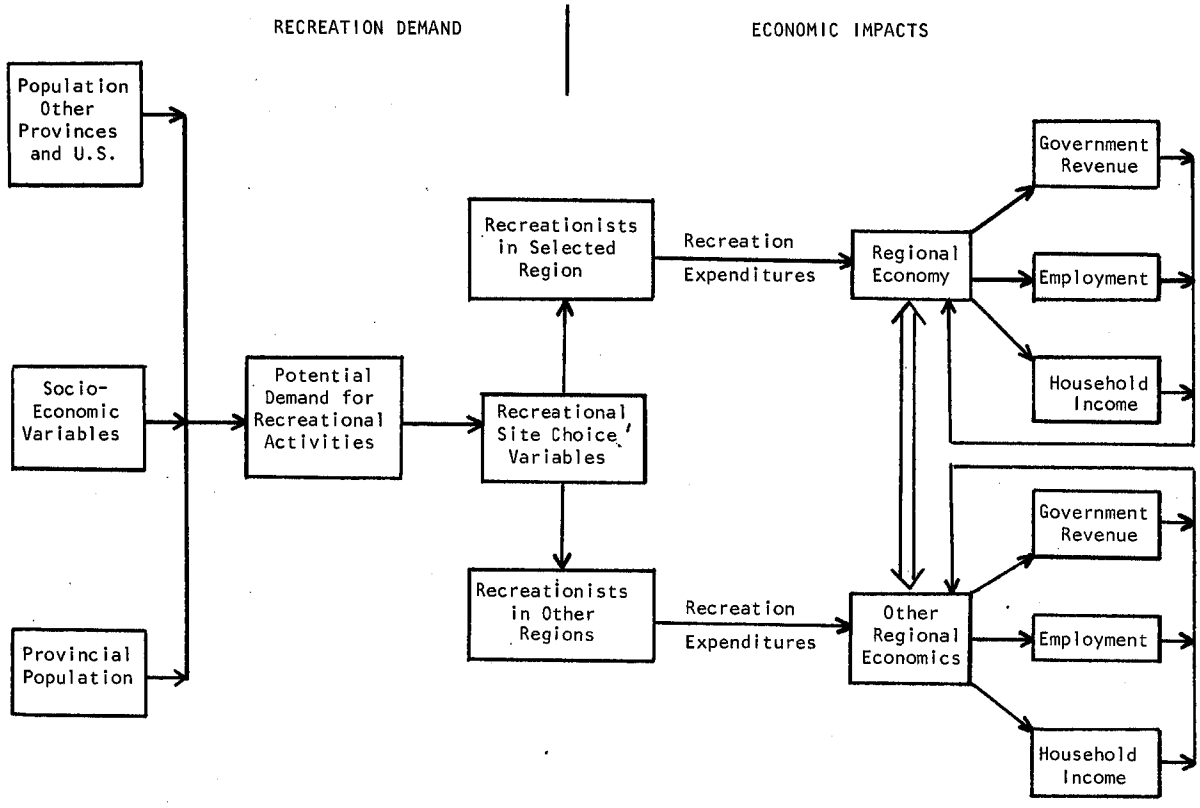

TABLE 2: Recreation Demand Categorized by Types of Activity and User[a]

| Recreation Activity | Household Type[b] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Picnicking | $r_{11}$ | $r_{12}$ | . | . | . | . | . | . | . | .. | .. | $r_{1m}$ |
| Fishing | . | | | | | | | | | | | . |
| Camping | . | | | | | | | | | | | . |
| Hunting | . | | | | | | | | | | | . |
| Hiking | . | | | | | | | | | | | . |
| Swimming | . | | | | | $r_{ij}$ | | | | | | . |
| Boating | . | | | | | | | | | | | . |
| Horseback Riding | . | | | | | | | | | | | . |
| Water Skiing | . | | | | | | | | | | | . |
| Golfing | . | | | | | | | | | | | . |
| Other | $r_{n1}$ | | | | | | | | | | | $r_{nm}$ |
| User Day ($A_j$) | $A_1$ | . | . | . | . | . | . | . | . | . | . | $A_m$ |

[a] $r_{ij}$ indicates the portion of each user-day spent in vacation activity i by a household in socio-economic type and recreation use category j.

[b] Household types 1 through 12 refer to the 12 socio-economic and use categories used to classify households. For example, households in a particular income, age and family size class pursuing recreation on a day-use basis are Type 1 households.

The Recreation Demand Submodel

In the model, the household type j, demand $Q_{sj}$, and total demand $Q_s$ for a recreation site s are defined as:

(1) $$Q_{sj} = b_j^0 + b_j^1 D_{sw} + b_j^2 D_{sa} + b_j^3 I_{sj} + b_j^4 N_s + b_j^5 P_j + b_j^6 E_s/D_s \text{ and}$$

(2) $$Q_s = \sum_{j=1} Q_{sj}$$

where

$Q_{sj}$ = number of user-days demanded by the $j^{th}$ type of household at site s

$Q_s$ = total number of user-days demanded at site s

$D_{sw}$ = road-mile distance from recreation site s to Winnipeg

$D_{sa}$ = radius in miles around the site required to encompass a non-Winnipeg population of 100,000 people

$I_{sj}$ = index of compatibility of site s with households of type j

$N_s$ = average road-mile distance between the site in question and all other sites with facilities like those at site s

$P_j$ = provincial population of households of type j

$D_s$ = road-mile distance of site s from the closest point of entry

$E_s$ = average daily flow of automobiles and recreational vehicles into the province through the provincial point of entry nearest site s during the months of June to September and

$b_j^1$s = regression coefficients

The demand relationship states the number of user-days demanded at a recreation site in terms of factors that account for:

1. The distance users must travel to the site.
2. The degree of compatibility between the user's preference for recreation activities and the site's facilities for activities.
3. The distribution of user-day units of site capacity of each type.
4. The population of households of each socio-economic type delineated.

Specification of demand as in equations (1) and (2) provides for explicit measurement of the impact of: (1) park facilities, (2) park size, (3) population change by socio-economic class, (4) park location, (5) extra-provincial households, on the level of recreation facility use and on recreation facility demands.

While the other variables in equation (1) are self-explanatory, the compatibility index $I_{sj}$ requires elaboration. It is an index designed to measure the compatibility between the recreation activities sought by a household of type j and those available at any site s.

Consider any household type j wishing to consume conglomerate set of recreation activities defined as a user-day labelled $A_j$ and composed of a variety of recreation activities i. Then the user-day sought by household type j may be defined algebraically as:

$$(3) \qquad A_j = \sum_{i=1}^{n} r_{ij} \text{ such that } \sum_{i=1}^{n} r_{ij} = 1,\ 0 \leq r_{ij} \leq 1 \text{ and for}$$

$$i = 1, 2, \ldots, n.$$

where

$r_{ij}$ = proportion of each user-day a user of type j wishes to spend in activity i.

The values of $r_{ij}$ vary between activities and user types. The most easily observable influence of socio-economic variables is whether $r_{ij} \geq 0$. Furthermore, at least one or more $r_{ij} > 0$. The number of different activities that the household could choose is some finite number n. Socio-economic variables influence the values $r_{ij}$ demanded by users of type j and represented by the set of non-zero $r_{ij}$'s. That is:

$$(4) \qquad r_{ij} = f\ (Y_{qj})$$

where

$Y_{qj}$ = set of socio-economic factors q determining each $r_{ij}$ for all i and each user type j.

The socio-economic variables q include income, age, education, family size, place of residence and occupation. The recreational activities included in this discussion are: picnicking, fishing, camping, hunting, hiking, swimming, boating, horseback riding, water skiing, and golfing. They represent only a partial list and are summer-oriented activities. Winter-oriented activities such as skiing and ski-dooing could be incorporated in such an analysis. In short, activity lists can be more or less extensive depending on the research priorities in particular instances.

Given user-day demand for recreation activities as defined in equation (3), the capacity of a site can be defined in corresponding terms. Recreation sites have facilities and a capacity for particular recreation activities. The

particular capacity or conglomerate of user-day activities available at any site s may be defined as a user-day of type $K_s$

where

(5) $$K_s = \sum_{i=1}^{n} r'_{is} \quad \text{with} \quad \sum_{i=1}^{n} r'_{i} = 1 \text{ and } 0 < r'_{is} \leq 1 \text{ and for}$$

$i = 1, 2, \ldots, n.$

$r'_{is}$ = proportion of the composite user-day site capacity available in the form of activity i; and

$K_s$ = composite user-day definition of site s.

If only one activity i is feasible at a site, then its $r'_{is} = 1$ and all other $r'_{is} = 0$. Any site s will possess some subset of the n activities of type i = 1 to n. The number of activities available will be less than n because a specific site will not generally provide facilities for all activities.

The type of user-day sought by households of type j, defined as $A_j$ in equation (3), and the type of user-day available at site s, defined as $K_s$ in equation (5), form the basis for the definition of the compatibility index $I_{sj}$. It is defined as:

(6) $$I_{sj} = \left(\sum_{i=1}^{n} r'_{is}/r_{ij}\right) / B \text{ for all } r_{ij} > 0$$

where

B = number of recreation activities i sought by households of type j and where the maximum value of $r'_{is} = r_{ij}$ for all i.

Ceteris paribus, household will prefer sites that have more rather than less of the desired facilities. Inclusion of the compatibility index $I_{sj}$ in the demand equation provides for estimation of the impact of this user preference on site demand.

## The Economic Impacts Submodel

Measurement of the economic impacts of the recreation industry is based on an application of input-output techniques [14, 19]. In particular, the input-output table constructed previously for the Interlake region of Manitoba is applied [14]. Through its application, the impact of recreation facilities construction and recreation use expenditures on total sales, income and employment are estimated.

The Interlake input-output model is of the following form:

(7) $$X = TX + C + K + G + E$$

where

X = vector of total output by sector

T = matrix of trading coefficients that indicate the level of purchases each sector makes from other sectors in order to produce a unit of output

C = vector of private consumption by sector

K = vector of capital purchases by sector

G = vector of government purchases by sector; and

E = vector of net exports by sector.

The interdependence coefficient matrix $(I-T)^{-1}$ derived through analysis of equation (7) provides the basis for estimating the regional sales impact of changes in recreation expenditure. Given $(I-T)^{-1}$ the regional sales impact of construction and/or recreation use expenditures may be calculated as:

(8) $$X^R = (I-T)^{-1} D$$

where

$X^R$ = vector of total regional sales impact of recreation expenditure; and

D = vector of dollar expenditures on recreation facilities construction and/or operation, depending on the item to be calculated.

Using total regional sales calculated as in equation (8), and sector employment coefficients provided by the earlier Interlake study [14], employment impacts of recreation expenditure are calculated as indicated in equation (9). This equation states that:

(9) $$M = X^R L$$

where

M = vector of employment impacts by sector; and

L = vector of employment coefficients indicating sector employment per dollar of sector output.

Determination of income impacts is based on the income component of sector output as measured for the Interlake region. Income impacts are derived using equation (10):

(10) $$Y = X^R W$$

where

Y = vector of income generated in each sector; and

W = vector of income coefficients per dollar of output of each sector.

Calculation of economic impacts outside the region is based on the same procedure but utilizing the Interlake region import coefficients to calculate sales outside the region. Given those coefficients:

(11) $X^{RO} = X^{R} C$

where

$X^{RO}$ = vector of total sales outside the region; and

C = vector of Interlake import coefficients by sector.

Given the model described above, the ability to generalize results derived from its application to one provincial subregion merits discussion. The ability to generalize the results is dependent on the validity of the assumption that sectoral interdependencies between regions are similar. Since Winnipeg dominates the secondary manufacturing and service industry of the province, all regions of Manitoba are strongly dependent on Winnipeg imports for their recreation activities. The inputs that can be produced and traded intra-regionally are similar between regions. Therefore, we feel that, in the absence of input-output tables for other regions and given high time and money costs to construct them, generalization of the Interlake result is permissible. Further, the judgment is made that the improvement of recreation demand analysis and measurement of direct recreation expenditure patterns should take priority over refinement of interdependence coefficients to measure indirect impacts.

In the following section, examples of the model's application to the analysis of job and income impacts are given.

## Application of the Model

The usefulness of the model is demonstrated through its application to two illustrative examples. In one, the impacts of constructing a $1 million resort complex are estimated. The other is an analysis of the impacts of an assumed increase in recreation user expenditures of $1 million.[2] Table 3 contains the results of both analyses. They indicate quite similar regional sales impacts

[2] In this analysis, recreation expenditures are assumed to sales to travellers in the region. In further studies, expenditures by recreationists will be enumerated in relation to household types and recreation activities pursued.

TABLE 3: Economic Impacts of $1 Million Spent on Each of Construction and Recreation Expenditures[a, b]

| | Regional | | | Rest of Manitoba | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Sales | Jobs | Income | Sales | Jobs | Income | Sales | Jobs | Income |
| Construction | 1,504,500 | 63 | 228,868 | 1,225,028 | 56 | 205,574 | 2,729,528 | 119 | 434,442 |
| Recreation Expenditures | 1,511,150 | 100 | 342,046 | 1,421,645 | 92 | 311,545 | 2,932,795 | 192 | 653,590 |

[a]The job and income impacts specified here are assumed to be complementary to existing activity, i.e., resources employed in construction and recreation stimulated do not require diversion of labor and capital from other economic activity.

[b]These results are preliminary and should only be used for illustrative purposes.

regardless of whether the $1 million is spent on construction of facilities or by recreationists. However, recreation user expenditures generate more impact on sales in the "Rest of Manitoba," and on jobs and incomes in both areas.

## Concluding Remarks

In the authors' view, the approaches to estimating recreation demand and economic impacts identified in this paper can be effectively used to answer many questions concerning the recreation industry. The illustrative results presented are examples of the answers that can be obtained using this model. However, its application will not be simple. Statistical estimation problems may arise in applying the demand estimation procedure. Indeed, it may be necessary to substitute a simultaneous equation system for the independently estimated equations presented here. The task of enumerating the recreation facilities used and expenditures made by household type will be arduous. Nevertheless, if the development potential of the recreation industry is to be adequately evaluated, models of the type suggested here are needed. In addition, complementary research concerning the relative merits of alternatives to recreation development and the cost of satisfying increased demands for recreation must be conducted.

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