Department of the Environment, Canada

ECONOMIC BENEFITS OF A CLEAN ENVIRONMENT: SUDBURY CASE STUDY

Nigel H. Richardson
Beth I. Savan
Laszlo Bodnar

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N. H. Richardson Consulting
203 Old Orchard Grove
Toronto, Ontario M5M 2E6

416 482 2713

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SUMMARY

The choice of Sudbury, Ontario, as a case study of the extent to which a cleaner environment can contribute to economic development arose logically from Sudbury's recent history. At the beginning of the seventies, the nickel-mining and smelting industry which largely constituted Sudbury's economic base provided the city both with a high level of economic prosperity and with a severely degraded environment. By the early eighties both the economy and the environment had been transformed, the former by drastic employment cuts in Sudbury's basic industry coupled with growth in other sectors of its economy, the latter by large reductions in atmospheric pollution which in turn permitted a successful program of revegetation to be undertaken.

The principal aim of the case study was not so much to arrive at definitive conclusions about the relationship between environmental improvement and economic change, as to examine the methodology and data available to test relevant hypotheses. The first step was to examine in detail the changes which had taken place in both respects. The principal sources of environmental data were the Ontario Ministry of the Environment and the Regional Municipality of Sudbury, and of economic data, detailed employment statistics provided by Statistics Canada. These data sets proved quite adequate for the purposes of the study, though comparable environmental data would not necessarily be available in other cases.

The employment figures revealed a dramatic drop in mining, milling and smelting jobs during the study period of 1971 to 1986: from over 24,000, representing 38% of Sudbury's total labour force, to 11,500, or 16% of a labour force which had actually grown by 11% despite a decline in population. This growth in the total labour force is accounted for by the fact that the number of female workers almost doubled in the same period, corresponding to a 68% increase in jobs in the service sector, from 30,000 (46% of the labour force) to 50,000 (70%). The number of jobs in the community,

business and personal service category, including government employment, grew by 80%.

From being almost entirely a mining town in 1971, by 1986 Sudbury had, in fact, become a major provider of government, health, educational and other services to Ontario's northeastern region.

During the same period, technological improvements in the smelting process which resulted in large cuts both in work-force and in emissions together with the construction of a "Superstack" to diffuse the atmospheric emissions from INCO Limited's smelter, brought about a great improvement in air quality, reducing average SO_2 levels from .042 ppm in 1970 to .007 in 1988. This in turn has improved the quality of Sudbury area lakes. It also made possible a program of revegetation which has, since it began in the mid-seventies, covered thousands of hectares of once barren, blackened land with grass, shrubs and trees.

Two aspects of Sudbury's economic diversification appeared likely to have been particularly influenced by this striking improvement in environmental quality. One was "white collar" employment, mainly in the service sector, which grew by 80% during the study period, but whose growth might have been expected to be significantly hampered by environmental conditions which would tend to discourage people in this group from moving to or remaining in Sudbury. The other was the "hospitality industry" (hotels, restaurants etc.), in which employment grew extremely rapidly during the seventies and now appears to be growing equally rapidly after levelling off in the early eighties.

To examine these hypotheses, and also to obtain informed opinion about the importance of environmental improvement to Sudbury's economy in general, two surveys were conducted. One covered a selection of people whose roles in public, community or business affairs give their judgements considerable weight. The other was a pilot survey of a small sample of white collar workers and their managers.

The principal conclusions suggested by the two surveys were these:

1 In general terms, environmental improvement has indeed been very important in helping Sudbury to recover from the effects of cutbacks in the mining industry, particularly in helping it to assume its emerging regional role.

2 However, the contribution of environmental improvement has been not so much as a **generator** of economic development, as in removing what would otherwise probably have been a major **constraint** on such development. It is therefore not possible to quantify this contribution, or to establish direct causal links between environmental improvement and economic change.

3 In the case of the hospitality industry in particular, which Sudbury expects to play a major role in its economic future, environmental improvement has indeed been a critical factor.

4 In the case of white collar employment in general, the importance of environmental quality as a factor in employment-related decisions is not clear from the limited survey that was carried out. A methodological problem arises here from the fact that respondents either would not have known the "old" Sudbury at all to compare present conditions with, or would at best be comparing a known present with remembered conditions.

This problem of comparing apples with oranges -- actual conditions in a particular place either with "what-if" hypothetical conditions in the same place, or with actual conditions in another place which inevitably will not be exactly comparable -- is the basic weakness of the case study approach to examining the issue. This approach undoubtedly has some value, considering that the present study has produced useful if necessarily tentative conclusions. However, it is the view of the consultants that it does have inherent limitations, and they suggest that a different approach to the economy-environment relationship might be explored.

Bearing in mind the massive shift from a goods-producing to a service-providing and knowledge-based Canadian economy, this

approach would focus on the importance of environmental considerations in corporate decision-making with respect to the location and expansion of operations, and private decision-making on the part of professional, skilled technical and other white collar workers (and their spouses) with respect to place of employment and abode.

ACKNOWLEDGEMENTS

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1 INTRODUCTION

This study was commissioned by the Department of the Environment to contribute to the pursuit of sustainable economic development in Canada by examining the hypothesis that environmental improvement can encourage economic growth, using Sudbury, Ontario, as a case study. Specifically, as set out in the terms of reference the objective was "to evaluate the economic and social benefits in terms of industrial, residential and recreational industry growth and economic diversification that resulted from the clean-up of pollution damage in the Sudbury area" during the period 1971 - 1986.

The choice of Sudbury was not made at random. As described in the following sections of this report, in the past two decades Sudbury has undergone a remarkable twofold transformation: from almost total dependence on mining and smelting to a much more diversified economic base in which government and other services now play a major part, and from a state of severe environmental degradation to one that is increasingly clean, green, and attractive. But social and political changes have been almost as dramatic: from fragmentation and antagonism to a high level of cooperation and perhaps the most advanced program in Canada of deliberately "holistic" or comprehensive community planning. Sudbury was therefore an obvious but also a complex choice for examination of the economic benefits of environmental improvement: obvious because of striking and more or less simultaneous economic and environmental change, complex because these changes did not take place in isolation but were related to others perhaps as fundamental.[1]

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[1] Some of the different aspects of this process of change have been described by one of the authors in an earlier report [ref. 21] commissioned by the Ontario Ministry of Municipal Affairs on behalf of the Organisation for Economic Cooperation and Development, and

With service industries and professional and highly specialised technical skills fast replacing "smokestack" industry as the foundation of the North American economies, it has become conventional wisdom among planners and economic geographers that the traditional economic factors -- transportation, proximity to primary resources, and the like -- are being, if not replaced, at least rivalled by "amenity" or "quality of life" as attractors of economic growth. What matters to a knowledge-based "high tech" industry, in other words, is likely to be the good schools, safe and attractive surroundings, recreational and entertainment facilities and the like that will enable it to attract and retain well educated, highly trained, well paid and mobile employees.

The terms "amenity" and "quality of life" obviously embrace many different factors, but it seems almost self-evident that one of them must be the quality of what is usually, if not always entirely accurately, thought of as the "natural" environment: air, water, land and vegetation (landscape), together with the accompanying recreational values. This assumption has in fact been confirmed by research [ref. 7]. The authors of the present study therefore assumed that they would be able to find earlier empirical research on the importance of what we term collectively "environmental quality", as a factor in corporate decisions about plant or office location and in private decisions about jobs and place of residence. While we cannot claim unequivocally that no such studies have been published, such a search as was feasible within the constraints of this project revealed very little.

For this reason also, then, the present study is exploratory. We did not expect or set out to reach definitive conclusions about the importance of environmental quality to economic development, merely to take some tentative steps towards such conclusions.

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referred to in the present report as the "OECD report". The authors are grateful to the Ministry for permitting the use of material from the OECD report in the present report.

Primarily, the aim was to explore the nature, direction and feasibility of further research, and the adequacy of the relevant data.

2 BACKGROUND

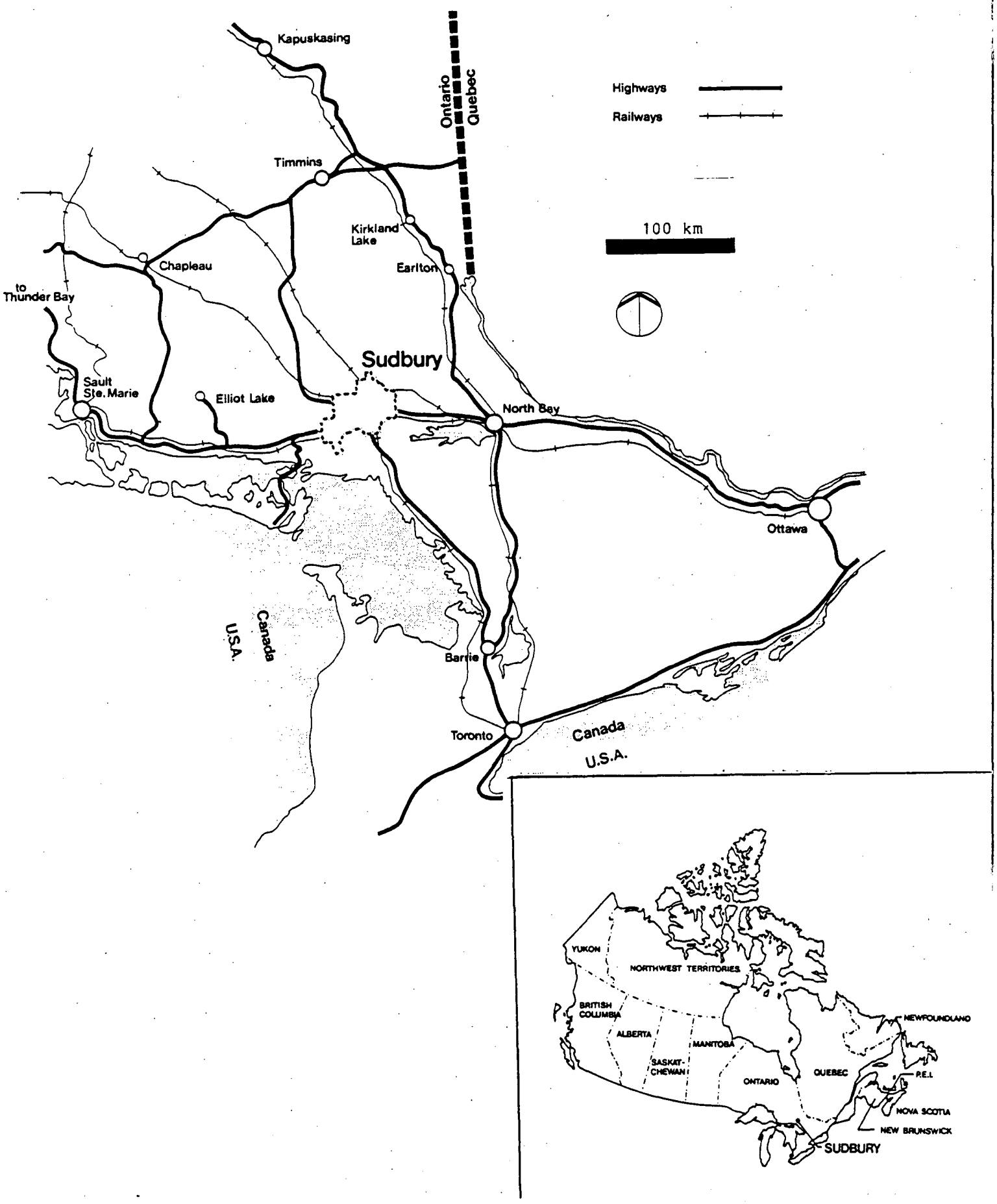
2.1 History

Sudbury, Ontario, some 300 km north of Toronto, was born in 1883 as a CPR construction camp and survived initially as a lumber town. When the construction of the railway revealed deposits of copper and nickel only a few kilometres to the north, the Sudbury area became the second world source of nickel just as a strong demand for that metal was emerging. Mining operations and small communities, several of them company towns, spread around the low hills forming the rim of the 60 by 30 km Sudbury Basin.

Despite the boom-bust cycles characteristic of the mining industry, by 1970 the nickel production of the Basin reached 200,000 tonnes annually, at peak prices. The City of Sudbury had 100,000 people, one of the highest levels of income per household in Canada, an economy which was beginning to diversify, good transportation links to the industrial and population centres of southern Ontario, and cultural and advanced education institutions. It was, however, a deeply divided community, with a history of bitter labour-management and inter-union conflicts in the mining industry.

The flourishing growth of Sudbury's economy was matched by the equally dramatic deterioration of its physical environment. Sudbury in fact became notorious across the country for the air pollution and the barren, blackened landscape created by its smelters. Thousands of hectares of land around the city were virtually denuded of vegetation. Nearby lakes were highly acidic and polluted with metals. The environment paid a high price for Sudbury's prosperity.

The year 1970 marked the zenith of that prosperity. With growing international and domestic competition and a steady decline in nickel prices, Sudbury's fortunes changed drastically in the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MANITOBA
ONTARIO
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SUDBURY

years that followed. At the beginning of 1970, nearly 30,000 workers were employed in the mines, mills and smelters of the International Nickel Company (now INCO Limited) and the smaller Falconbridge Nickel Mines (now Falconbridge Limited). By the time of the 1971 census, this number had already been cut to less than 25,000, and a series of further layoffs reduced it to less than 17,000 by the late seventies. A short-lived recovery in 1979 and 1980 was followed in 1982 by more layoffs and also by extended shutdowns by both companies. By 1983, mining company employment in the Sudbury area had fallen to less than half what it had been at the beginning of the seventies. In that year, despite considerable out-migration, the area's unemployment rate reached 17%.

The four "boom-town" decades which ended in 1970 left Sudbury with certain assets in coping with the situation. A combination of factors including population growth, prosperity, and the beginnings of a region-wide role in the provision of commercial, educational and health services had begun the process of economic diversification. They had also taken Sudbury across an intangible but critical threshold in its evolution from railway construction camp through logging settlement and mining town to city. The formation of the Regional Municipality of Sudbury in 1973 brought the City of Sudbury and all the other communities of the Sudbury Basin together in a federation of seven local municipalities with a total area of 1,810 square kilometres and, at the time, approximately 167,000 people. This action by the provincial government established a single planning agency for the area, consolidated the management of the basic municipal services, and paved the way for a more sophisticated municipal administration.

(Unless otherwise specified, "Sudbury" in this report refers hereafter to the Regional Municipality.)

Sudbury's new-found civic identity undoubtedly shaped and strengthened the collective response to the period of adversity which was to follow. Perhaps the most remarkable feature of this response was the emergence of an impressive and vigorous spirit of

cooperation to replace the antagonisms of a few years earlier. This embraced much improved labour-management and inter-union relations, but extended to an informal but very effective alliance among the official and unofficial leaders of Sudbury's principal power and interest groups, political, industrial, business, and labour. The most conspicuous manifestations of this alliance were the community economic development program called "Sudbury 2001", started in 1978, and the "task forces" set up by the Regional Chairman to help Sudbury respond to the layoffs of 1982 (see ref. 21).

2.2 An Overview of Change from 1971 to 1986

(All tables are at the end of the report.)

The drastic decline in mining-related employment after 1970 was accompanied by substantial changes both in the structure of Sudbury's economy (see fig. 1) and in its demographic and social characteristics. While the jobs lost in mining, milling and smelting caused high levels of unemployment, the problem was mitigated by strong growth in the service sector. At the same time Sudbury's population declined and its characteristics changed. Today's Sudburians have, on average, more education but lower incomes than in 1971, and more women work. These changes are described more fully below; details of changes in the structure of the economy are given in section 3 and in the tables at the end of the report.

Despite the loss of jobs in the mining companies and a decline in Sudbury's population, the total labour force actually rose by 11% between the census years of 1971 and 1986, from 64,100 to 71,400. This is accounted for by a 96% increase in the number of female workers, raising the proportion of women in the labour force from 24% in 1971 to 43% in 1986 (table 1, fig. 1).

During this period, however, mining employment fell by 58%, from 18,200 workers to 7,700. The number of smelter workers dropped

EMPLOYMENT STRUCTURE, REGIONAL MUNICIPALITY OF SUDBURY, 1971 AND 1986

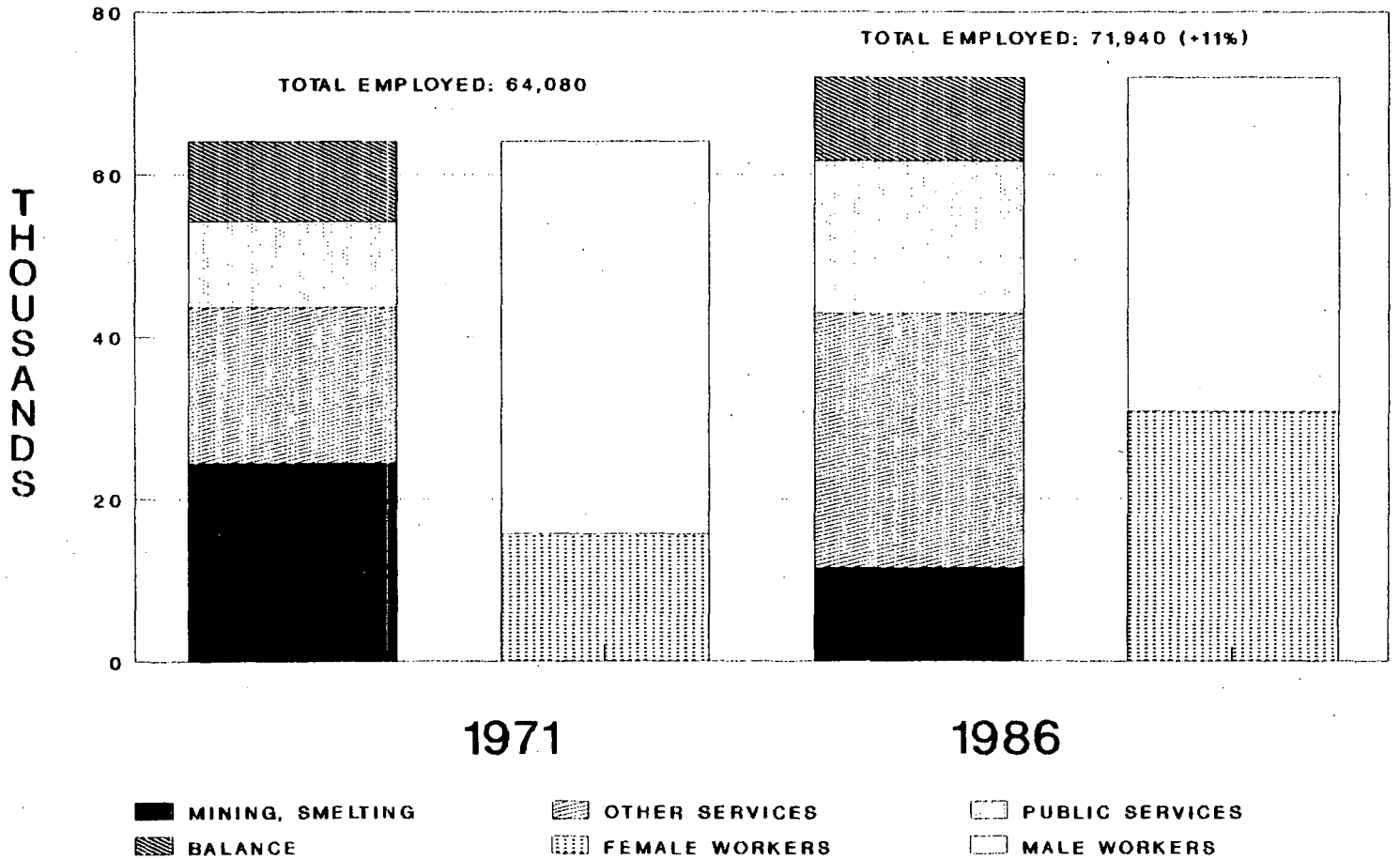


FIG. 1

by 39%, and construction workers by 40% (though construction employment stabilised after 1981).

(The use of census data partially disguises what was actually an even sharper drop in the number of mining and smelting jobs, because there were substantial cutbacks just before the 1971 census and just after that of 1981.)

On the other hand, machinery manufacturing jobs grew by 214%, though the absolute numbers were small. The big increases in employment took place in the service sector. The highest percentage growth of any major industrial category -- 128% -- took place in public administration and defence, but by far the greatest absolute growth, almost identically matching the 10,500 lost mining jobs, was in community, business and personal services.

In 1971, 38% of Sudbury's labour force was employed in mining and smelting. By 1986 the proportion had dropped to 16%. In the same period, the proportion of the labour force working in the service sector rose from 47% to 70%. All other employment categories together remained almost stable as a percentage of the total labour force.

During the study period out-migration reduced Sudbury's population by 10% from 169,200 to 152,500 (table 2). (Assessment estimates for 1988 suggest that this decline is continuing.) Changes in age composition followed the national trend, with a substantial decline in the proportion of the population under 20 and an increase in the proportion 65 and over (table 2). Correspondingly, the average household size fell from 4.0 in 1971 to 2.9 in 1986 (table 3).

Applying the multiplier of 1.53 used in Laurentian University's INORD report [ref. 12, p. 89] (see s. 9 below), the loss of nearly 13,000 mining, milling and smelting jobs would have meant a total drop in employment of almost 20,000, nearly a third of the entire 1971 labour force, had these losses not been offset by job creation in other sectors. One result would certainly have been massive out-migration, particularly in the 20 - 44 age group, leaving a disproportionately aged population.

Reflecting the loss of well-paid jobs in the mining industry and the substitution of often lower paid service sector jobs, average household income fell from 115% of the national average to 87% (table 3). Expansion of the service sector did, however, provide many more opportunities for female employment.

Educational levels rose significantly. In 1971 only 16% of the population aged 15 and over had post-secondary, non-university education, and 10% had attended university; in 1986 these figures had risen to 21% and 14% respectively. Nevertheless, the proportion of Sudbury's population with a university education remained significantly below the provincial average. (Table 4)

The root causes of the employment cuts by Sudbury's mining companies were greatly increased competition and severe declines in both demand and price. The companies responded by reducing production, but also by introducing major technological improvements in plant and operations to attain much higher productivity, so that fewer employees were needed to achieve the same output. The silver lining to the dark cloud of major layoffs, from the community's point of view, lay in the fact that the same program of plant modernisation, propelled in part by provincial government clean-up orders, greatly reduced the levels of pollutants released into the atmosphere by INCO's smelter. This, in combination with the "Superstack" that helped to keep them away from Sudbury itself, was the key to a dramatic improvement in environmental quality in the region; cleaner air meant improved water quality as well, and also permitted a large-scale and successful program of revegetation that is turning Sudbury's landscape green again. INCO's modernisation program is continuing; the latest phase started in 1989 and will be completed in 1993.

3 EMPLOYMENT BY INDUSTRIAL CLASSIFICATION, 1971 - 1986

(For details, see the tables at the back of this report.)

Between 1971 and 1986 Sudbury's population declined by 10% and the number of mineworkers fell by 58%, from 18,195 to 7,720 (on top of a substantial drop shortly before the 1971 census). Nevertheless, greatly increased female participation raised the total labour force by 11%, from 64,080 to 71,375 (table 1).

3.1 Manufacturing and Construction (Tables 5, 6)

Total manufacturing employment in Sudbury fell from 8,925 in 1971 to 6,655 in 1986, a decline of 33%. However, this was due largely to a sharp drop in the number of workers employed in one category, primary metal manufacturing: i.e., milling and smelting. Primary metal employment dropped by 46% from 6,210 (70% of all manufacturing jobs) to 3,765 (57%).

Leaving aside primary metal, other manufacturing employment actually rose by 6%. This growth was attributable mainly to machinery manufacturing, in which employment increased by 214%, most of the growth occurring between 1981 and 1986. While the absolute figures are relatively small (see table 6), they are nonetheless significant as evidence of the recent expansion of firms producing, for the most part, mining-related machinery, with considerable support from the federal and provincial governments, and increasingly looking to national and even international markets. [Ref. 21]

The other manufacturing industry in which significant growth occurred was printing and publishing. In this case the growth took place between 1971 and 1981, levelling off thereafter for a net increase of 55% in the study period.

In other types of manufacturing, employment generally declined. In the food and beverage industries it dropped

substantially between 1971 and 1981, then recovered somewhat for an overall loss of 8% in the study period. Paper and allied products followed a similar pattern, but suffered an overall loss of 48%. Employment in the chemical industry fell continuously, losing 60% in the study period, while in the waning wood industries employment dropped by 80%.

Construction employment (table 5) also followed the pattern of a sharp decline between 1971 and 1981, followed by relative stability. It fell from 10% of the labour force in 1971 to 5% ten years later, but remained at that proportion in 1986, for an overall job loss of 40% since 1971. As shown in table 7, the value of building permits issued in the eighties rose substantially in the latter part of the decade, so construction employment is probably rising again despite more labour-efficient practices in the industry.

The total value of building permits (table 7) issued from 1980 to 1988 was $582.6 million, 60% of the total value being residential, 26% commercial and industrial and 14% institutional. The value both of residential and of commercial and industrial permits increased significantly in 1986, 1987 and 1988 compared with the early eighties.

3.2 Service Industries

3.2.1 **Transportation, Communications and Utilities** (Table 8)

Employment in transportation grew by 19%, remaining between 4% and 5% of the labour force throughout the study period, and employment in utilities grew by 35%.

Employment in communications grew by 72%, reflecting a considerable expansion in the local media, both print and broadcasting. In 1971 Sudbury had one daily newspaper with a circulation of 39,500 and one weekly with a circulation of 5,000. In 1986 the circulation of the daily had dropped by 28,000, but five weeklies had a combined circulation of 60,000, while a monthly business paper published in Sudbury had a circulation of 16,000

throughout northern Ontario. This expansion is reflected also in the employment figures for printing and publishing.

3.2.2 **Trade** (Table 9)

Employment in trade rose by 32% during the study period, from 13% to 17% of the labour force. In fact this growth took place almost entirely by 1981; between 1981 and 1986 employment levelled off (wholesale) or actually declined (retail).

The gross retail figures (table 10), however, conceal some substantial variations. Employment in food stores, the largest single retail group, grew fairly steadily throughout the study period for a 39% increase, despite the decline in population and household income. The next largest group, general stores, grew quite rapidly between 1971 and 1981, but by 1986 had fallen again almost to the same number of jobs as in 1971, perhaps reflecting the lower income levels.

Other important retail groups which grew rapidly between 1971 and 1986 were motor vehicle dealers (45%); clothing and shoe stores (66%, 1971 - 1981 being the actual growth period); furniture, appliances, radio and TV (38%, an overall figure which masks actual decline between 1971 and 1981 followed by strong growth after 1981); and drug stores (131%, again with the growth occurring mainly between 1971 and 1981).

Although they are not very significant in the total employment picture, it is interesting to note that employment in the sale of such "luxury" commodities as books and stationery, jewellery and watches, and liquor and beer, experienced substantial net percentage growth over the study period (though in the case of books and stationery, employment fell sharply after 1981). While quantitatively insignificant, as an indicator of social change the particularly sharp growth in employment in florists' shops is rather striking.

3.2.3 Finance, Insurance and Real Estate (FIRE) (Table 11)

Total FIRE employment grew rapidly between 1971 and 1981, but dropped slightly to 2,700 in 1986 for a net increase of 58%. Finance was the largest of the three categories, but insurance was by far the fastest growing, with an increase of 150% over the study period.

3.2.4 Community, Business and Personal Services (CBP) (Table 12)

This group accounts both for a large share of total employment in Sudbury and for much of the growth in employment: altogether, in 1971 CBP provided 12,770 jobs, 20% of the labour force, but in 1986, 23,150 jobs, 32% of the labour force, an increase in employment of 81%.

The largest single category under this heading was education (table 13), where employment grew by 36% from 1971 to 1986. As might be expected, most education jobs were in elementary and secondary schools, but the area of strongest growth, 305%, was post-secondary, non-university. (Cambrian College of Applied Arts and Technology was founded in 1966.) University employment (Laurentian University, founded in 1960) grew by 38%.

These figures are reflected in the higher levels of education in Sudbury's population (table 4).

The health and welfare employment group showed very strong growth, from 2,895 in 1971 to 5,600 in 1986 (93%) (table 14). Hospitals provided the most jobs, but the most rapid growth in employment was in related health and welfare offices (261%), and in general diagnostic and therapeutic services (898%). These figures partly reflect the increased numbers of elderly people, but clearly indicate the expansion and diversification of health services in Sudbury.

In the accommodation and food services category total employment increased by 104%, from 2,325 to 4,750 (table 15). The largest and fastest growing number of employees worked for

restaurants, caterers and taverns; this group grew from 2% to 5% of the labour force. Employment in hotels and motels grew substantially from 1971 to 1981, but actually dropped slightly thereafter for a net increase of 38% over the study period.

Sudbury's "hospitality industry" is discussed in more detail in s. 7.

3.2.5 **Public Service and Defence** (Table 16)

Federal government employees accounted for the fastest growth in the public service category, and by 1986 were the largest component of that category. Non-defence federal employment grew by 448% between 1971 and 1986. Much of this growth is attributable to the 1981 opening of a federal Taxation Data Centre, which provides 630 full-time and many more part-time jobs.

Local (municipal) employment nearly doubled between 1971 and 1981, largely due to the creation of the Regional Municipality in 1974, but fell slightly by 1986 for an overall increase of 80%.

Provincial government employment grew by 34%, from 1,115 to 1,490; within the next two or three years it will be further increased by some 500 jobs as a result of the relocation of the Ministry of Northern Development and Mines, including the Ontario Geological Survey, from Toronto to Sudbury.

3.3 Related Aspects of Economic Change in Sudbury, 1971 - 1986

Three aspects of economic change in Sudbury deserve special notice:

-- the changing balance of employment in Sudbury relative to the Northeastern Region of Ontario (the Regional Municipality of Sudbury and the Districts of Algoma, Cochrane, Manitoulin, Nipissing, Parry Sound and Sudbury) as a whole;

-- the growth in economic importance of the public sector;

-- the growing numbers of women in the labour force.

As the service sector became dominant in Sudbury's employment picture between 1971 and 1986, Sudbury gained a larger share (28%,

up from 24%) of the growing number of service sector jobs in the Northeastern Region as a whole (table 17). In the region, service sector employment grew from 57% of the labour force to 68%, the general provincial level, while in Sudbury the increase was from 47% to 70%.

During the study period, employment in Sudbury became increasingly dependent not just on the service sector in general, but on the public and publicly funded part of that sector specifically: i.e., the education, health and welfare and the public service employment categories (tables 14, 16). Total employment in these categories rose from 10,580, or 16% of Sudbury's labour force, in 1971, to 18,830 in 1989, 26% of the labour force.

Clearly related to the growth of the service sector in general and of the public/publicly funded portion of it in particular is the growth of female participation in the labour force (table 1); in 1986, 92% of all female workers were employed in the service sector, a slight increase over the 1971 percentage. In 1971, 24% of the total Sudbury labour force was female; by 1986 the proportion had risen to 43%, so that the size of the labour force actually increased substantially despite a decline in population.

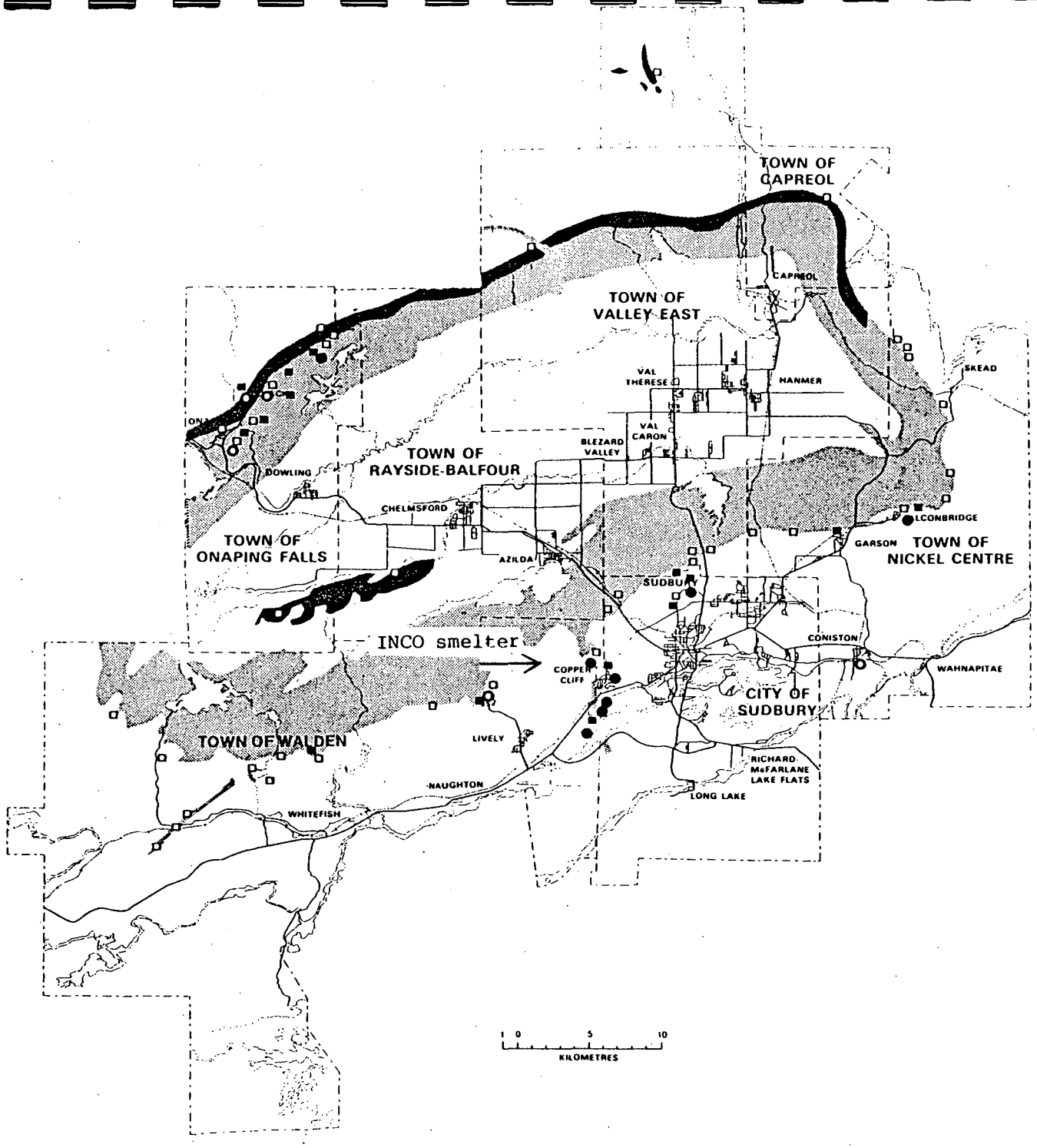
4 ENVIRONMENTAL IMPROVEMENT

4.1 History and Background

The City of Sudbury was born as a construction camp and survived mainly as the fortuitous consequence of a nearby ore discovery. It is hardly surprising that by the end of its first half-century or so, many of its buildings, mostly built of wood, were becoming dilapidated, and it had acquired few urban amenities; while its surroundings were increasingly marred by mine tailings and slag-heaps.

Furthermore, as nickel production increased, so did the pollution of Sudbury's air from the smelting process. By 1970, INCO's smelters poured nearly 5,000 tonnes of sulphur dioxide (SO_2) into the atmosphere daily (see map following this page). This and other effluents completed the work started by the nineteenth-century lumbermen and continued by the early open-air wood-burning smelting process. Thousands of hectares of land were virtually denuded of vegetation. Nearby lakes were highly acidic and polluted with metals. Many sport fish were locally extinct or gravely endangered. The grime of the smelters lay permanently over the City, and in certain atmospheric conditions the entire town would be enveloped in a choking smog. The flourishing growth of Sudbury's economy was matched by the equally dramatic deterioration of its physical environment. Sudbury acquired a reputation across Canada as the very archetype of the ugly, grimy mining town.

If smelter emissions had not been reduced, Sudbury's environment would present an even bleaker picture today than it did in 1970. Air pollution would be as bad or worse. Water pollution would certainly be worse, following the cumulative impact of severely acidic precipitation. Soil pollution would also be worse, and the effects of continuing pollution would render revegetation a practical impossibility.



THE REGIONAL MUNICIPALITY OF SUDBURY

SUDBURY BASIN

4.2 Sudbury's Environment Since 1970

Over all, the natural environment in and around Sudbury has in fact been greatly enhanced since 1970. The general appearance of the area and the actual levels of contamination in the air, water and soil have all improved dramatically over the past twenty years.

Historically, environmental conditions in and around Sudbury have depended more or less directly on the airborne emissions from the smelters. Air quality is an obvious function of smelter releases. Over a slightly longer term, water quality has also responded to changes in the deposition in the area, which is in turn determined largely by smelter emissions. Finally, large tracts of devastated land could be restored when air quality improved to the point that it no longer contaminated fresh topsoil or caused direct damage to vegetation.

According to the draft Official Plan for the City of Sudbury (October 1987; s. 3.1.1) [ref. 22]: "The reduction of air pollution from smelter emissions remains the City's most significant environmental priority. Any reduction in emissions through improved controls or technological advances will significantly reduce air pollution impacts (air quality impacts, acidification of soil and water, vegetation loss, health impacts, image impacts) within the area and surrounding regions."

Changes in air, water and soil, vegetation, and urban environmental quality since 1970 will each be outlined below. There is extensive published literature documenting these trends; the data recorded below are drawn from a selection of these publications. Public perceptions of environmental quality, as indicated by complaint records, will also be discussed. The final part of this section summarises the implications of the changes in environmental quality in Sudbury for more distant areas downwind of the smelters.

4.2.1 Air Quality

The technological improvements brought about by the combined pressures of the market and government regulation, together with various interruptions in production, resulted in a roughly five-fold reduction in annual emissions of SO_2 in the Sudbury area since 1970. (Fig. 2 [from ref. 5]) illustrates this dramatic decline.)

In 1970 the Ontario government ordered INCO to reduce its SO_2 emissions by 85% by the end of 1978. INCO fell well short of this target, arguing that the economic burden would be insupportable, but did cut its emissions substantially nevertheless. Furthermore, in 1972 it commissioned the so-called "Superstack", at 381 m far higher than any of the stacks previously used for the dispersal of gaseous wastes [ref. 24]. The Superstack merely dispersed the emissions further afield, causing increased acid deposition downwind, but it did make an enormous difference to Sudbury itself. Atmospheric inversions no longer smothered the City in sulphurous fog; it became possible for Sudbury to "clean up", and trees could grow in and around it again.

Synopses of the measures leading to declining emissions are shown in fig. 3 and in Appendix 1. Measures of air quality in Sudbury reveal a similar pattern: mean SO_2 levels have declined from 0.42 ppm in 1970 (at Ash Street sampling station, [ref. 15]) to 0.07 in 1988; in 1970 there were 263 hours when SO_2 levels at the same sampling station exceeded the one-hour criterion of 0.25 ppm, while in 1988 there were only 17 hours. (See figs. 4 and 5 for a graphical depiction of this trend.)

4.2.2 Water Quality

Although there is no single set of data documenting changes in the water quality of Sudbury area lakes over the past twenty years, several different data sets cover portions of this period. All reveal consistent trends in pH, sulphates and metals (see refs. 10, 11, 13, and 15). There has been an increase in pH in Sudbury area lakes from values as low as 4 in the mid to late seventies to

KILOTONNES OF SULPHUR DIOXIDE EMITTED FROM SUDBURY AREA SMELTERS EACH YEAR

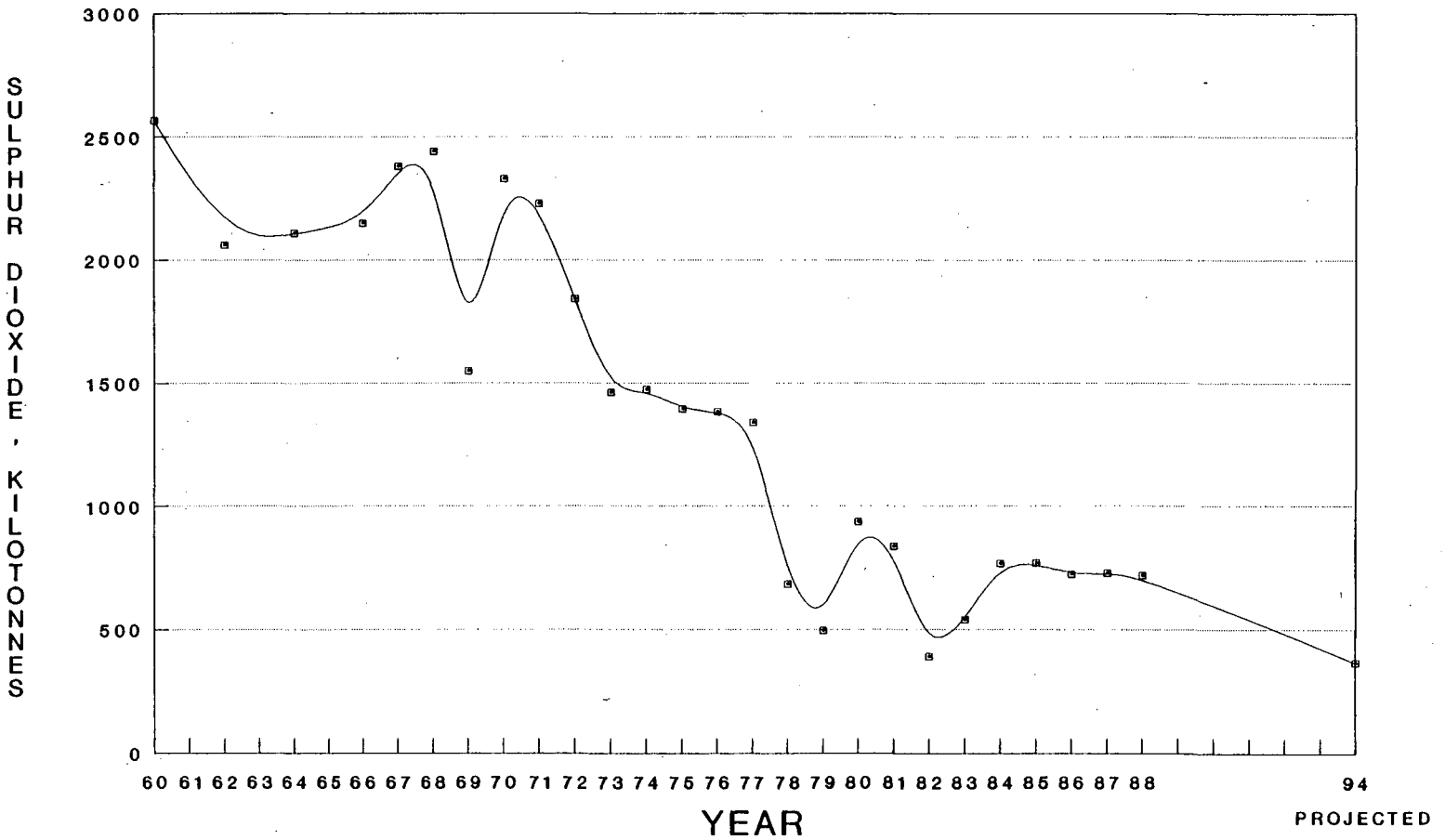


FIG. 2

SULPHUR DIOXIDE EMISSIONS
INCO COPPER CLIFF SMELTER

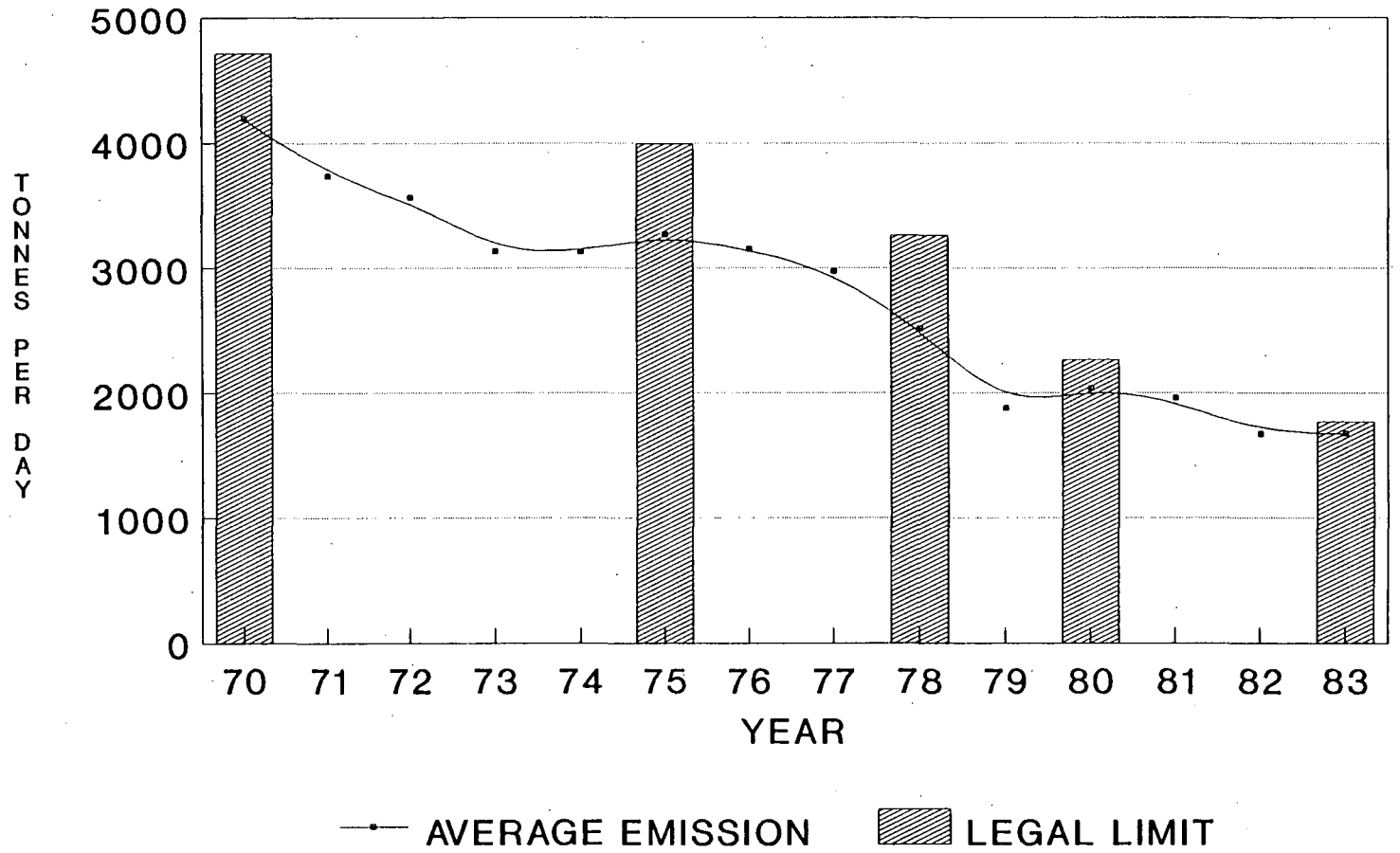


FIG. 3

ASH ST. STATION - HOURS/YEAR OVER .25 PPM SULPHUR DIOXIDE

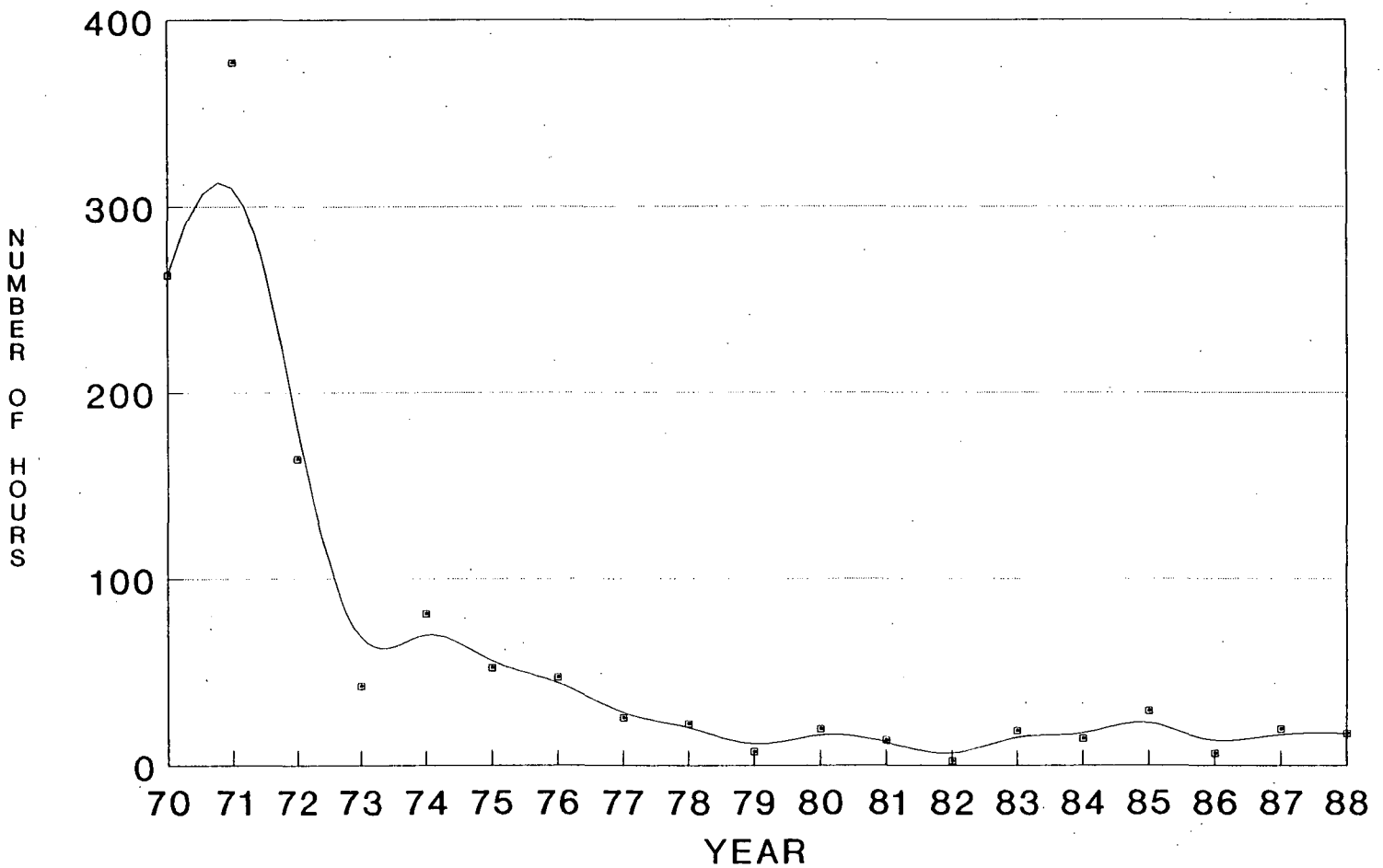


FIG. 4

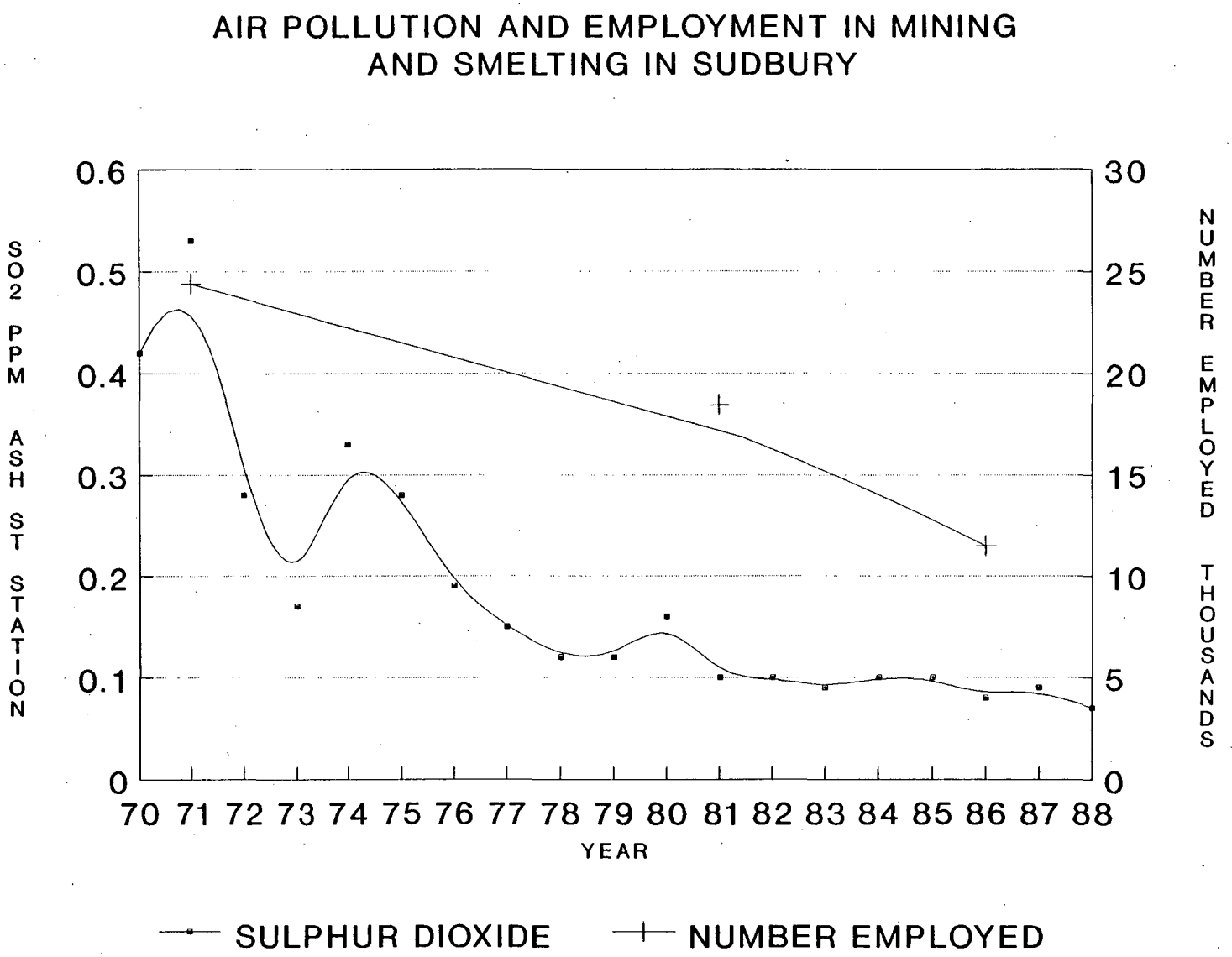

AIR POLLUTION AND EMPLOYMENT IN MINING
AND SMELTING IN SUDBURY
SO2 PPM ASH ST STATION
NUMBER EMPLOYED THOUSANDS
0.6
0.5
0.4
0.3
0.2
0.1
0
30
25
20
15
10
5
0
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
YEAR
SULPHUR DIOXIDE
NUMBER EMPLOYED

FIG. 5

values over 5 in recent years. Sulphate and heavy metal concentrations have declined dramatically, and other water quality indicators show similar amelioration.

As a result of the improved aquatic environment, the biological community in these lakes has begun to recover. Planktonic rotifer diversity has grown since the mid seventies [ref. 11], and invertebrates and plankton generally are gradually recovering [ref. 9]. Sport fisheries are also enjoying a resurgence due to reduced atmospheric deposition of acids [ref. 8].

4.2.3 Revegetation

Improved air quality has also permitted what is often called "the greening of Sudbury". The commissioning of the Superstack in 1972 opened the possibility that Sudbury's devastated landscape might be restored. The incidence of direct damage to vegetation by SO_2 fumigation declined as the quality of the air improved, and members of Laurentian University's biology department and of the provincial Ministry of Natural Resources joined forces, with funding from the latter, to experiment with revegetation. The early attempts failed, but new techniques developed at the university began to produce first grass and clover and then saplings on formerly barren land. The Regional Municipality became an active participant in the reclamation program in 1974. Following a deliberate strategy, it first concentrated on the areas most conspicuous from approach highways, and later on areas within established communities. Initially, schoolchildren and volunteers were used in grassing; but beginning in 1978 these limited efforts were substantially augmented by university students hired under a federal program to provide student summer employment. Since 1982 the students have been joined by unemployed workers, under various federal and provincial job-creation programs, to carry out both grassing and tree-planting activities. [Ref. 24]

This ambitious program of land reclamation now affects large parts of the Regional Municipality. In all, nearly 3,000 hectares have been successfully seeded during the past eleven years, and in

1989 Sudbury celebrated the planting of the millionth tree. (Detailed data are shown in table 18.)

The results are impressive. Slag-heaps and bare, blackened rock have not disappeared (and some local people argue that as part of Sudbury's history they should never be allowed to do so completely), but large tracts of land that were bare and grim not many years ago are now, in summer, green with grasses and birch, poplar and other tree species, and once forbidding approaches to Sudbury are now inviting.

4.2.4 Perceptions of Environmental Conditions

It is interesting to note that Ministry of the Environment data on complaints reveal a rather different picture of the public **perception** of environmental pollution (see table 19 and ref.9). The number of complaints regarding SO_2 does not appear to have changed over all since 1975, and complaints about odour and smoke have, if anything, increased since then. This is probably a reflection of the increasing public awareness and abhorrence of environmental pollution, rather than any actual increase in the amount of pollution experienced in Sudbury. In fact, the rarity of fumigation episodes may make the public less tolerant and more eager to complain when they do experience pollution incidents [ref. 19]. Complaints about drinking water have also gone up since the mid seventies, though complaints about fresh water pollution appear to have declined somewhat.

In economic terms, one of Sudbury's principal liabilities continues to be the perception of its environmental quality generally held by non-Sudburians. This perception has always tended to overlook such assets as Lake Ramsey, only a couple of kilometres from the centre of the city and always an important recreational asset, and the variety of other outdoor recreation resources available within easy reach. Despite the existence of such attractions, in 1984 an economic development strategy report prepared for the Sudbury Regional Development Corporation (SRDC) [ref. 1] identified Sudbury's negative "image" as one of four

weaknesses "inhibiting the economic development of the Region": "Almost uniquely in Ontario, Sudbury suffers from outside perceptions as a dirty, almost ugly mining town plagued by acid rain . . . No matter how unrealistic this image may be, it nevertheless is widely held and difficult to overcome since it requires experience with the 'new' Sudbury to change."

That this image in fact continues to dominate outside perceptions of Sudbury is confirmed by a survey of attitudes in southern Ontario conducted for the Sudbury Community Adjustment Project in 1988. [Ref.2]

4.3 The Urban Environment

Despite the state of the environment in the nineteen-sixties, some very positive changes began to take place in Sudbury during that period. Laurentian University was opened in 1960; a second post-secondary educational institution, Cambrian College, in 1966; and a museum and arts centre in 1968. And the same decade saw the start of a major effort to reverse the decay of the downtown area.

Under the National Housing Act's provisions for federal-provincial-municipal cost-sharing, an urban renewal study was completed in 1963 and a detailed renewal scheme in 1968. The latter proposed the redevelopment for business uses of an area of old, run-down commercial and residential buildings near the centre of the City; a site for new public buildings; and the provision of housing for people displaced by clearance. Implementation of the scheme saw a large downtown shopping mall built in the early seventies, incorporating a department store and linked to a hotel and office building.

The urban renewal proposals for a complex of public buildings were also carried out in substance. This now includes a striking building shared by the administrations of the City and the Regional Municipality and physically linked to a provincial government office building, both facing an attractively landscaped Civic Square. Nearby is a second new hotel and a 400-seat theatre, opened

in 1982 after ten years of volunteer fund-raising efforts which brought support from all levels of government as well as from private and corporate donors. A new building to house the relocated Ministry of Northern Development and Mines is now under construction.

Plans for the further improvement of downtown Sudbury are currently proceeding under the sponsorship of Sudbury Metro Centre, an association of downtown businesses supported by the City of Sudbury and the Ministry of Municipal Affairs. These plans include streetscape enhancement, the restoration of an old theatre and the creation of a new park, as well as substantial commercial redevelopment.

Perhaps the most notable feature of the "new" Sudbury, however, is "Science North", opened in 1984 on the shore of Lake Ramsey. This impressive building, designed by one of Canada's leading architects, houses scientific and technological exhibits, emphasising the natural history and the resources of northern Ontario; Science North incorporates a mining exhibit created from an actual worked-out mine. It is not only a valuable (and popular) educational and recreational asset for Sudburians, but also an economic asset as a lure for tourists (see s.7.1). INCO contributed $5 million to the project; most of the balance of the cost was contributed by the (then) Ministry of Northern Affairs.

4.4 Downwind Environmental Impacts

The construction of INCO's Superstack in 1972 merely dispersed the same amount of pollutants over a wider area, reducing the quantity deposited in Sudbury by sending the balance downwind. Thus the Superstack initially increased downwind pollution deposition, though this has since been reduced by the reductions in emissions later achieved through techological improvements in the smelting process. The most prominent environmental impacts of this deposition have been the acidification of local lakes, with

the attendant impacts on resident biota described above and in the literature (e.g., ref.17).

5 THE CORRELATION BETWEEN ECONOMIC GROWTH AND ENVIRONMENTAL IMPROVEMENT IN SUDBURY

The changes that we have documented in environmental quality and economic structure in Sudbury both have the same root cause: plant modernisation at INCO and Falconbridge. The technological improvements in smelting made the companies more efficient and capital-intensive, greatly reducing the number of staff needed to run the plant. Although the modernisation was primarily intended to make the operations more profitable, it also had the effect of allowing the companies to meet increasingly stringent environmental regulations by reducing the emissions of sulphur dioxide into the environment. The two lines on fig. 5 representing, respectively, SO_2 emissions and the level of employment in mining and smelting show the parallel nature of the two trends which resulted.

The consequences of these twin changes for the economic structure of Sudbury since the early seventies are more complex. Once air quality in Sudbury began to improve, further improvements, both environmental and economic, became possible. The end of severe SO_2 fumigation permitted revegetation of the barren landscape. Local lakes began to recover. But the link between all these environmental improvements and the economic diversification we have witnessed in Sudbury is much more difficult to document.

The data presented above in this report describe a clear metamorphosis in population characteristics and employment patterns. To recapitulate briefly, while the number of jobs in mining and smelting has dropped sharply, taking with it the relative level of household income, the community has been enriched in many other ways. Sudbury has become a regional centre, and the government, financial, educational, health and cultural services available to its residents have greatly expanded. The number of jobs in these service sector areas has grown correspondingly. In fact, by 1983/84, the number of new service sector jobs matched the

number of jobs lost in the mining and smelting industries, and unemployment in Sudbury stabilised, albeit at a relatively high level. Fig. 6 clearly shows this compensation by new service sector jobs for lost mining and smelting jobs. When the data for decreasing SO_2 emissions are transformed to represent rising air quality, and are added to the graph, the correspondence between service sector employment and environmental quality becomes apparent.

But the question remains: did the service sector grow as a function of environmental improvement, or were the two trends merely coincidental?

Several of the results presented above in this report suggest that the increasing environmental appeal of Sudbury did play a significant role in the changing economic and social character of the community. The hospitality industry grew rapidly during the study period: over all, employment in accommodation and food services increased by 104% between 1971 and 1986. Employment in health and welfare services grew almost as quickly, with an increase of 93% in the study period. There was strong growth in communications also, with a 72% increase in local media jobs. Sudbury's population was changing at the same time, and today's residents are a more sophisticated and demanding group than their predecessors of the sixties and early seventies. Sudburians are better educated now, and more women work. They want a more pleasant and convenient lifestyle: to illustrate, employment in the florist business grew by 443% in the study period. As their objective environment was unquestionably improving, Sudburians became more critical of environmental conditions and complained more strongly about odour, smoke and the quality of drinking water.

While it is possible that Sudbury's growing economic diversification and social sophistication were completely unrelated to the improved environment, the data presented above in this report led us to explore two ways in which these twin changes might have been linked. In both cases, we proposed that environmental improvement was probably not a direct cause of economic

AIR QUALITY AND EMPLOYMENT PATTERNS IN SUDBURY

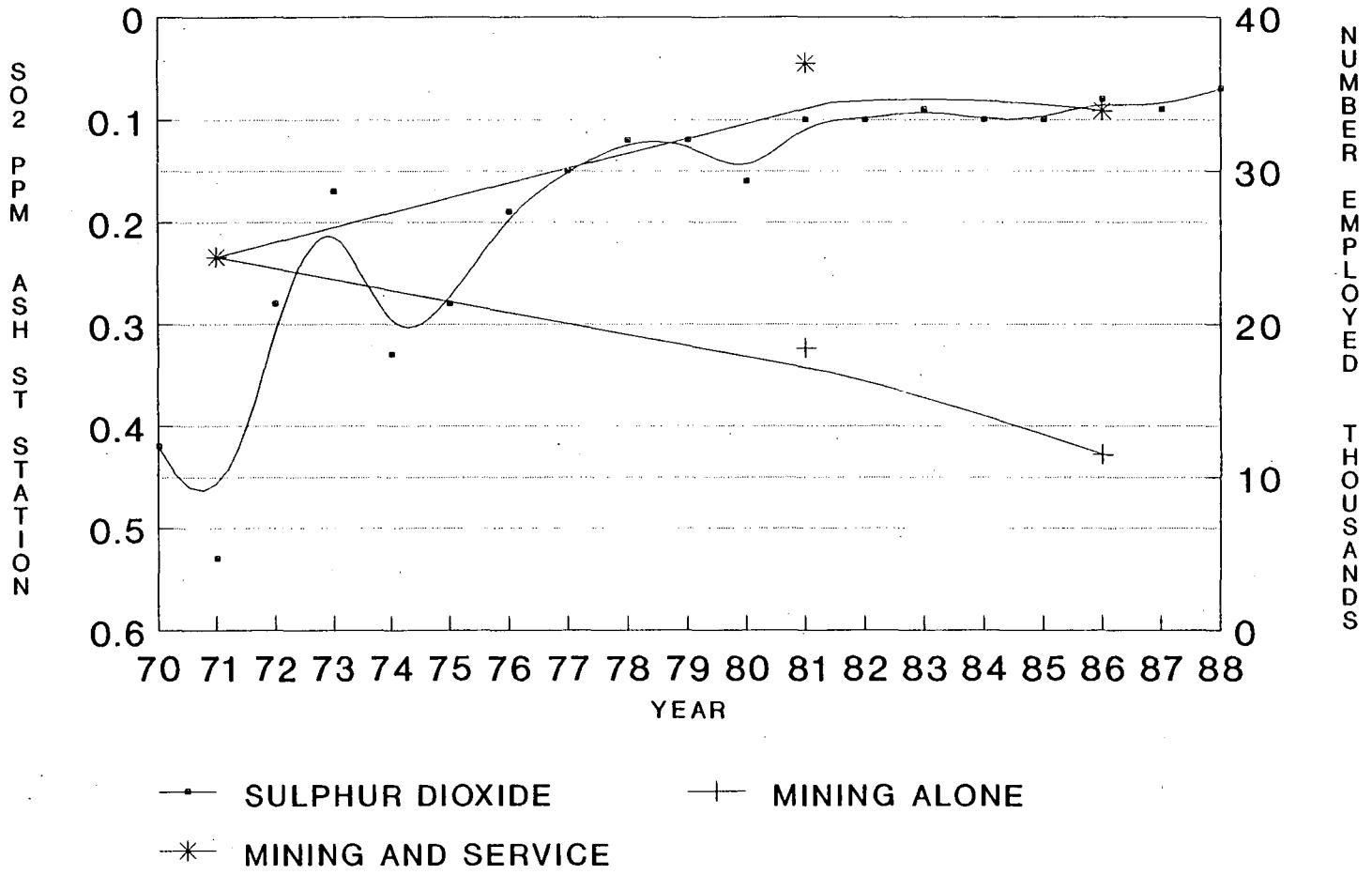


FIG. 6

diversification, but rather was a necessary condition without which the economy might have languished. In other words, while government policies and other factors certainly changed Sudbury's economic structure, we suggest that these policies might not have achieved their intended result without the improvements in environmental quality that took place.

Specifically, the picture of Sudbury's economic, social and environmental evolution which emerged from the first phase of the study suggested two research hypotheses which provided the structure for the second phase.

First, we conjectured that both the professional people who came to Sudbury in the late seventies and early eighties, and the Sudburians who stayed there to work in "white collar" jobs, might not have done so had not the improved environment made Sudbury a pleasanter place to live.

Second, we proposed that the hospitality industry would not have been able to flourish had the improved environment not made Sudbury more attractive to tourists and businessmen alike.

In other words, while environmental improvement may not have generated economic benefits directly, it could have provided the conditions necessary for the positive economic changes in Sudbury to take root and flourish. In ecological terms, environmental quality could be a factor which does not directly **produce** economic benefits but which, when lacking, can **limit** economic development.

These two hypotheses were tested by means of interviews in the second phase of the project, and the results of these investigations are presented below. A third area, relating to the direct economic consequences of technological improvements related to pollution abatement, is also discussed in s. 9 below.

This study did not directly address the economic impacts of changes in deposition further afield, downwind of the Sudbury area smelters. It is likely, however, that the acidification of lakes and damage to vegetation downwind of Sudbury has affected the potential if not the actual development of the tourism and hospitality sector in that area.

6 THE IMPORTANCE OF ENVIRONMENTAL IMPROVEMENT TO SUDBURY: THE "LEADERS AND OBSERVERS" SURVEY

6.1 The Survey

To determine informed opinion on the connection between environmental improvement and economic change in Sudbury, 24 personal interviews were carried out. The respondents were not a random sample of the population but were, on the contrary, deliberately selected as people who by virtue of their current or previous positions in the community were familiar with Sudbury's recent history and current affairs, and able to provide informed judgements on the subject of the study. They included present and former municipal and provincial elected representatives; senior officials in Sudbury of the provincial and federal governments, of the Regional Municipality, and of economic development bodies; business people; Chamber of Commerce and union officials; and members of the Laurentian University faculty and the media. (See appendix 2.) No "environmentalists" as such were included in the survey because as far as could be discovered there is no active environmental group in Sudbury.

Typically of a community of Sudbury's size, several respondents played, or had played, more than one role. A number had been active participants in the Region's endeavours to diversify its economy and to cope with unemployment in the late seventies and early eighties. Only five had been familiar with Sudbury for less than ten years; several were native Sudburians.

At the beginning of each interview the respondent was asked to read a brief written description of economic and environmental change in Sudbury, generally based on the data presented in earlier sections of this report. This was necessary in order to establish an agreed frame of reference for the remainder of the interview.

Some respondents suggested modifications of the description, but none disputed its general validity.

An interview guide (appendix 3) was employed, but no attempt was made to force an interview into the mould if the respondent preferred -- as a few did -- to talk about the subject generally rather than follow a prescribed pattern. As a result, responses to particular questions do not necessarily total to the number of interviews.

Typically, an interview lasted about an hour, though several extended considerably longer.

6.2 The Results of the Survey

6.2.1 Factors Contributing to Sudbury's Economic Recovery

After reviewing the introductory account of Sudbury's recent history, the respondent was asked to select from a list of nine factors (identified mainly on the basis of the 1984 OECD study, ref. 21) the three, in order of importance, which he or she felt to have contributed most to Sudbury's economic recovery.

(As some respondents pointed out, the list did not include the rise in nickel prices of the past couple of years and the payment of substantial bonuses to nickel-workers. However, this was too recent -- and perhaps transitory -- an occurrence to have much relevance for the purposes of the survey, and is not taken into account in this study.)

Since respondents tended to ignore location and transportation linkages as a distinct factor and subsume this consideration under Sudbury's regional central place role, these two were combined in the analysis. As several respondents did not make a distinction between federal and provincial government funding in support of the private sector, and other actions by the two governments (such as support for public programs, and the construction of the Taxation Data Centre), these two were similarly combined. As a result, the total number of factors considered in the analysis was reduced to seven:

(i) The emergence of Sudbury as the regional centre of northeastern Ontario;

(ii) Actions by the federal and provincial governments, including various forms of financial support;

(iii) Local political leadership;

(iv) The efforts of local (official and unofficial) economic development and similar agencies and organisations;

(v) The initiative of local entrepreneurs;

(vi) Community spirit and cooperation;

(vii) Environmental improvement.

The outcome of this question is shown in table 20 and fig. 7. For the purposes of this study, the significant point is that environmental improvement did **not** emerge as a perceived major contributor to economic recovery. Only one respondent rated it as the most important factor, two as second most important, and two as third. Nineteen of the 24 did not include it in their top three selections at all.

On the other hand, the three factors most frequently placed in the top three were government intervention; Sudbury's emerging regional role; and community spirit. Arguably, there is a connection between environmental improvement and each of these. This point is discussed in s. 10 below.

6.2.2 The Significance of Environmental Improvement

The next two questions addressed the importance of environmental improvement directly, first by asking the respondent how important he or she considered it to have been to Sudbury's economic recovery **in general**, and then by repeating the question in relation to each of the economy's principal growth areas. The results are shown in table 21.

Thirteen of the 24 respondents rated environmental improvement as "extremely important" in general terms, and nine as "important", leaving only two who regarded it as "not very important" and none who considered it "not important" at all.

Some respondents stressed that while the interview guide referred specifically to revegetation and the improvement of air and water quality, improvement of the **urban** environment, particularly in downtown Sudbury, was an important aspect of environmental improvement generally.

Opinions about the importance of environmental improvement in relation to individual sectors varied quite widely, which is not surprising given the differences in background of the respondents and in their knowledge of the particular areas. Over all, the importance of environmental improvement was rated somewhat lower than it was in response to the previous question. Only in the case of the "hospitality industry" (tourism, hotel accommodation, conventions, restaurants, etc.) did a majority consider environmental improvement to be extremely important. Nonetheless, the total of "extremely important" and "important" responses for all five sectors was 80, compared with a total of 28 "not very important" and "not important" -- a substantial margin.

On the face of it, the survey results presented so far appear contradictory. In response to one question, environmental improvement is not identified as one of the principal factors in Sudbury's economic recovery; yet in response to subsequent questions it is regarded as important and even as extremely important.

One possible explanation for this seeming inconsistency relates simply to the form of the questions, with the second and third singling out environmental improvement for attention where the first did not. There is, however, an alternative explanation which will be discussed below.

6.2.3 Sudbury's Economic Future and the Role of Environmental Improvement

Respondents were next asked what they considered to be Sudbury's major future economic growth areas, and whether such growth would be encouraged by further environmental improvement.

Responses focussed strongly on Sudbury's role as the regional centre of northeastern Ontario; this was alluded to, explicitly or implicitly, by 18 of the 24 respondents. (See map in s.2.) Mentioned specifically were the provision of health services (11), government services (10, with two respondents pointing out that with a stable or declining regional population, government services would probably not continue to expand indefinitely), education (8), business services (4), cultural, artistic and entertainment services (3), and commercial services (2).

Eight respondents mentioned the hospitality industry, though some had reservations about its stability and/or real economic value. Six referred to manufacturing, especially mining-related, though not envisaging dramatic growth in this sector, and two to the possibilities of "high tech".

(These responses are generally consistent with the findings of the 1984 economic development strategy report [ref. 1], which identified public and private sector services and machinery manufacturing as the areas with the highest growth potential for Sudbury.)

To the second part of the question, on the value of further environmental improvement, 14 respondents gave a clear affirmative, three quite strongly; three others gave a rather uncertain or qualified yes; only two thought that further environmental improvement would not help Sudbury's future economic growth much, if at all. One respondent felt strongly that with some imagination Sudbury could do much more to exploit its natural environment to its economic advantage.

6.2.4 Environmental Improvement and the Community

The last two questions on the interview guide dealt with the respondents' perceptions of social and attitudinal change and the reciprocal effects between these changes and environmental improvement. The economic significance of this subject is discussed in s. 10.

Ten of the 24 respondents referred in one way or another to the emergence of a more positive attitude and a new loyalty towards their community among Sudburians; the word "pride" was used spontaneously by seven. Numerous illustrations were given, such as the widespread volunteer participation in organising and managing the 1988 World Junior Games, and the adverse public reaction to a magazine article regarded as denigrating Sudbury.

Next most frequently mentioned (five references) was Sudbury's change in character from a largely "blue collar", "lunch-bucket" town to one with a substantial managerial/professional middle class.

Four respondents mentioned the large number of mining company retirees, including many people who have taken early retirement, now living in Sudbury: more people than are currently on the companies' payrolls. (According to the INORD report [ref. 12], 94% of INCO's retirees have remained in the Sudbury area.) Their pensions thus contribute significantly to the local economy. The implication was that without environmental improvement a large proportion of these retirees would probably have moved elsewhere.

In general, the picture painted collectively by the respondents, if not in every respect rosy, was of a more diverse, more "sophisticated", more self-confident, more cohesive and more outward-looking community than in the past, no longer dominated psychologically by the mining companies as it is no longer dominated by them economically.

There was no strong consensus as to the effect of these social changes on attitudes towards the environment. However, eight respondents felt, two quite strongly, that they had led to greater environmental awareness, a view which is consistent with the increase in complaints about air quality noted in s. 4.2.4 above. Some comments suggested that changing attitudes towards the environment in Sudbury perhaps reflect changing attitudes in Canadian society at large at least as much as they do the changing characteristics of Sudbury itself. While this may well be so, five of the 24 respondents made the point that environmental degradation

is no longer simply accepted in Sudbury as the necessary price of prosperity, and that there is on the other hand at least some measure of acceptance of job losses as the necessary price to be paid for a cleaner environment.

As to the converse, the effect of environmental improvement on community spirit in Sudbury, there was a very clear consensus: 17 respondents believed that there had been a positive effect, four of them expressing this view quite strongly. One disagreed, while one considered the relationship between community spirit, environmental improvement, and other factors, to be too complex to permit a clear answer.

6.2.5 Other Comments

At the conclusion of each interview the respondent was given the opportunity to offer whatever general observations he or she wished. These were recorded with the comments and remarks provoked by the earlier questions, and have been drawn upon as appropriate in the foregoing discussion.

6.3 What Role did Environmental Improvement Play?

It was suggested above that there is a second possible explanation for the apparent inconsistency between the answers to different questions in the survey. This explanation rests on the distinction between environmental improvement perceived as a **generator** of growth, and as a **condition** of growth.

Although the consultants were conscious of the possible significance of this distinction at the outset of the study, no explicit reference was made to it in the early interviews (which were carried out in random order, according to the availability of the respondents) in order to avoid the possibility of introducing bias. However, the responses in general, including the spontaneous comments of respondents, seemed to point so consistently to the importance of the distinction that eventually the interviewer decided to deal with the issue directly. All the remaining

respondents (about half the total) were presented explicitly, when the interview guide had been completed, with a two-part proposition: (a) That economic recovery in Sudbury has involved a number of different kinds of factor interrelated in too complex a fashion to permit the contribution of any one factor to be established with precision; and (b) If environmental improvement could not be seen as having **generated** economic growth to any great extent, it was a factor **without which** economic recovery would have been seriously retarded.

Without exception, every respondent to whom this proposition was put endorsed this analysis.

7 THE IMPORTANCE OF ENVIRONMENTAL IMPROVEMENT TO SUDBURY: THE HOSPITALITY INDUSTRY

The two hypotheses developed in s. 5 above point to two categories of employment as likely to be significantly affected by environmental quality: the "hospitality industry" (businesses heavily dependent on tourists and other visitors); and government, community and business services with largely "white collar" professional, technical, skilled and clerical employees. Taken together, the employment data (s. 3) and the results of the "leaders and observers" survey point to the same categories as current and future growth areas in Sudbury. The hospitality industry is discussed in this section of the report, and white collar employment in the following section.

7.1 The Growth of the Hospitality Industry in Sudbury

"Hospitality industry" is a blanket term covering the various services that are primarily for the benefit of tourists, convention participants and other visitors: hotels and motels, restaurants, tourist attractions, etc.

Unfortunately, there is no single comprehensive source of data on the hospitality industry (partly because it is not a very clear-cut economic sector; restaurants, for example, obviously cater to local people as well as to visitors). The following information has therefore been pieced together from several sources to provide a general picture of recent trends in the industry in Sudbury, especially in the eighties, when a significant change seems to have taken place.

A tourism strategy [ref. 14] commissioned by the Regional Municipality of Sudbury in 1982 produced the following estimates

of visits to Sudbury in that year, and their economic effects:

- 622,000 person-trips
- 632,000 person-nights
- jobs created: 530 full-time, 470 part-time
- income generated in Sudbury: $17.484 million
- municipal tax revenues generated: $1.8 million.

In 1988, the Sudbury Regional Development Corporation estimated visitation in 1987 at 1,258,000 person-trips and 1,987,650 person-nights [ref. 25]. This would represent an increase of 102% in person-trips and 215% in person-nights (representing a 64% increase in the average length of stay) in a period of five years. In its report, the SRDC noted that according to the industry (hotel and motel operators) 1988 visitation was up significantly over 1987.

One factor that would help to account for this rapid increase was the opening in 1984 of Science North (see s. 4.3). Science North was intended from the first to be at least as much a tourist attraction as a local educational resource, and has succeeded: a survey carried out in 1988 showed that out of 173,000 summer visitors, only 16% were local residents; 45% came from southern Ontario and 9% from the U.S. The survey also showed that 48% of the visitors gave Science North and the associated Big Nickel Mine as the main reason for their visit to Sudbury; that 59% were staying in Sudbury for one night or more; and that 57% had household incomes of $45,000 or more.

There are currently several proposals for additional tourist attractions in Sudbury, and the City of Sudbury is developing a "Leisure Plan" which, though intended primarily to benefit its own citizens, can also be expected to enhance its attractiveness to visitors. One concrete new development which explicitly has both aims is the "Farmers'/Festival Market" established in 1988 under the aegis of Sudbury Metro Centre (see s. 4.3), and open on summer weekends on the edge of the downtown area.

According to census figures employment in Sudbury hotels and motels grew by 106% between 1971 and 1981, from 940 to 1,935, but

actually fell by 100 by 1986 (table 16). In 1988, according to the City of Sudbury's Convention and Visitors' Services Bureau (CVSB) [ref. 23], there was a total of 1,417 hotel and motel rooms in the Regional Municipality; but in the same year, according to the SRDC [ref. 25], the opening of two new hotels with a total of 318 rooms was imminent. These alone would represent an increase of 22% in the total number of rooms available. It is therefore reasonable to assume that the 1991 census will show a strong recovery in hotel and motel employment.

Only a fairly small proportion of the occupancy of these rooms, however, will be accounted for by "off the road" tourists. According to the proprietor of Sudbury's largest hotel (during the "leaders and observers" survey), this share of his business is declining and now accounts for only a small proportion of the total, the majority being supplied by business and conference occupants. One of the striking features of the hospitality industry in contemporary Sudbury is in fact the growth in conference attendance (including conventions and a variety of special events such as the 1988 World Junior Games). In 1989, 47 such events are being held, with an estimated total attendance of 100,000 - 120,000 (250,000 - 280,000 person-nights) [ref. 25]. In 1984 the Regional Municipality even commissioned a convention centre feasibility study, though the Council decided against proceeding for financial reasons.

According to census figures, employment in food services (restaurants, caterers and taverns) grew by 124% between 1971 and 1981 and by 18% between 1981 and 1986, still a fairly healthy rate of growth considering the population decline in that period (table 15).

Over all, the available data depict a hospitality industry which, after a slump in the early eighties, is now growing rapidly. This coincides with the trend in the province as a whole; according to the Ministry of Tourism and Recreation [ref. 18], travel in Ontario declined by 9% in 1982 and 1983 but increased by 17% between 1983 and 1987, with particularly strong growth in 1986/87.

The recent upsurge in Sudbury's hospitality industry can also be attributed in part to Science North and in part to the increasing popularity of Sudbury as a venue for conferences and other events.

7.2 The Role of Environmental Improvement

The significance of environmental improvement as a contributory factor is attested to by the interviews carried out in the course of this study. In the "leaders and observers" survey, 16 out of 24 respondents rated environmental improvement as "extremely important" to the hospitality industry, and 6 as "important"; the remaining two did not respond explicitly to the question. Furthermore, when this specific question was addressed to respondents directly involved in the industry but not included in the "leaders and observers" survey (officials of the Ministry of Tourism and Recreation, the SRDC, and the Rainbow Country Travel Association), similar replies were given. It is, in fact, more or less self-evident that neither casual tourists nor conference organisers would be greatly attracted to the barren, grimy, air-polluted Sudbury of old.

This conclusion tends to be confirmed by the study [ref. 2] carried out in 1988 on behalf of the Sudbury Community Adjustment Project, which revealed that a high proportion of southern Ontario survey respondents, 45% of whom had never been to Sudbury, associated it either exclusively with mining or with mining plus barrenness and pollution. This "image problem", emphasised in the 1984 economic development strategy report [ref. 1], is well known to such bodies as the SRDC and the CVSB, which have been working hard for a number of years to overcome it. It is reasonable to assume that with the passage of time the real environmental changes in Sudbury will be increasingly reflected in the outside world's perception of the community, accompanied by an increasing propensity to visit.

Some of the respondents in the "leaders and observers" survey expressed some scepticism as to the economic value of the

hospitality industry to Sudbury. It is true that jobs in hotels and restaurants pay considerably less, in general, than jobs in mines and smelters, and many of them are seasonal or part-time. (One of the SRDC's aims is to promote Sudbury as an attraction for winter as well as summer visits: see ref. 25, p. 3). Nonetheless, if the figures developed in the 1982 tourism development strategy project are applied to the current rapid growth in visitation, the results indicate a substantial contribution to Sudbury's economy in the forms of visitor spending and gross income generated, as well as enhanced municipal tax revenue. The SRDC's Tourism Officer [ref. 26] estimates the value of this contribution at $100 million annually.

8 THE IMPORTANCE OF ENVIRONMENTAL IMPROVEMENT TO SUDBURY: THE "WHITE COLLAR" SECTOR

Earlier sections of this report have stressed the remarkable growth of the service sector in Sudbury's economy. Omitting such categories as the hospitality industry, trade, and personal services, leaves us with an approximation of the number of professionals and office workers generally termed "white collar" (census categories: finance, insurance and real estate; education; health and welfare; religious organisations; services to business; public services). This employment group grew by 80% during the study period. From 13,000, 20% of the labour force, in 1971, the number of white collar workers increased to 23,500, 33% of the labour force, in 1986.

Our first hypothesis, developed in s. 5 above, postulates that this growth could not have taken place without prior environmental improvement in Sudbury; this section will help to test this hypothesis.

To illustrate the growing importance of white collar employment, we look briefly at some concrete examples of Sudbury's prospects under that heading, followed by an account of a pilot survey directed specifically at white collar workers.

8.1 The Outlook for White Collar Employment in Sudbury

8.1.1 The Ministry of Northern Development and Mines

One of the major events in Sudbury's shift from a "hard hat" economy to one based on services, specifically public sector services, will be the transfer of the Ministry of Northern Development and Mines, including the Ontario Geological Survey (OGS), from central Toronto in 1990 and 1991. Not only will this bring a $20 million payroll to Sudbury; it will make the city to a considerable extent the "capital of the north", the focal point

for many governmental/administrative functions and for a variety of activities related to mining and minerals. According to a senior civil servant in the Ministry, the intention is that its Sudbury building will genuinely be its headquarters, not merely the base of ancillary functions, and that it will depend as far as possible on local services and supplies as well as the recruitment of local workers.

In preparation for the move the Ministry has been organising bus tours of Sudbury for its Toronto staff, as well as providing them with information on such matters as community facilities and house prices. Although, according to the informant, this has been very effective in changing initially negative attitudes, she expects only about 10% of non-OGS Ministry employees actually to move from Toronto to Sudbury, but attributes this to personal ties to Toronto rather than antipathy to Sudbury. Also, the Ministry is facilitating transfers to other ministries for those who prefer to stay. In the case of the OGS, however, with a high proportion of professional and technical staff whose expertise and experience relate specifically to the work of the Survey, 40 to 50% are expected to move.

8.1.2 The Cancer Treatment Centre

A priori, it seems reasonable to expect that environmental quality might assume relatively greater importance in the locational decisions of people whose training and occupations are such as to allow them a fairly wide choice according to personal preference. Physicians and medical and related specialists are an obvious case in point, and one which is particularly relevant to Sudbury because of its emerging role as a regional health care centre. The constraints of this study did not permit intensive investigation in this area, but the consultants did approach Dr R.E.T. Corringham, Director-designate of the new Regional Cancer Treatment Centre, the "crown jewel" of Sudbury's regional health care role.

In response Dr Corringham wrote: "I think it would be very difficult to establish the new Cancer Treatment Centre had there been no improvement in the environment. I agree . . . that it might not have been feasible at all. I would not have come myself, and with my family had the environment been seriously polluted." [ref. 3]

While it expresses only one person's opinion, Dr Corringham's letter does imply strongly that without environmental improvement it is quite possible, perhaps even likely, that Sudbury could not have become the regional health care centre of northeastern Ontario, a function which is a key element of the regional role widely regarded as the foundation of Sudbury's economic future.

8.1.3 Science and "High Tech" in Sudbury

Two other projects, one in operation and one proposed, further illustrate what may be the path of the future for Sudbury.

The Northern Ontario Teleconference Network was born as a provincially funded means of enhancing health services in northeastern Ontario through the use of telecommunications to link regional health care facilities with each other and with southern Ontario. It has expanded to serve a wide range of users in the private as well as public sectors, beyond as well as within the northeastern region, and it is now more than 60% self-supporting. NOTN is currently planning to extend its services throughout Canada and into the U.S.

NOTN is in fact an excellent example of the kind of information technology (IT)-based industry which can function as effectively in Sudbury (or Prince George, Swift Current, Chicoutimi or Amherst) as in Toronto.

The Natural Sciences and and Engineering Research Council of Canada and the U.S. Department of Energy are reported to have agreed to contribute about half the cost of constructing a neutrino research laboratory in a 2 km deep Sudbury mine shaft, and it is hoped that the balance will be committed by other federal and provincial agencies. Such a facility would make Sudbury an

important centre of research in physics, and would, in conjunction with its regional health services and the Ontario Geological Survey, greatly strengthen the role of science and "high tech" in its socioeconomic structure.

8.2 The "White Collar" Survey

Recognising the growing importance of professional people, managers, and white collar workers generally in the "new" Sudbury, the consultants engaged a local consulting firm to carry out a pilot survey of a small sample of representatives of this group. The primary objective was to get an indication of the importance of environmental quality to them and also, as they saw it, to Sudbury. The secondary objective was to provide a check on the results of the "leaders and observers" survey.

It should be kept in mind that the "white collar" survey was a pilot survey of a small number of respondents, and the results should be interpreted accordingly.

The interview guide employed in the survey is attached as appendix 4 and the results are summarised in appendix 5. Twenty-eight persons were interviewed, comprising:

- civil servants (federal and provincial) 10
- business executives 8
- providers of business services 5
- owners/proprietors of businesses 3
- professionals 2

Fifteen respondents had lived in Sudbury for less than ten years and 13 for ten years or more (of the latter group, 11 had in fact lived in Sudbury for more than 20 years).

Exactly half the respondents (14) originally came to Sudbury as a result of a job transfer; five had been there all their lives; five came to set up or take over a business or a new office; the rest came for personal or family-related reasons.

As the first substantive question, the respondents were asked to name three factors which they believed had helped Subdury's economic recovery. No "leads" were given.

The factors named most frequently were the influx of government offices and government financial assistance (15 and 14 times respectively). (This may in part reflect the high proportion of civil servants among the respondents.) Next came Sudbury's regional services role, specifically in education and health (8), followed by the increased price of nickel, improved services, economic diversification (6 each), and attitudinal change (5). Environmental improvement was mentioned only three times.

Respondents were then asked specifically about the importance of environmental quality, first in relation to Sudbury's economic recovery, and second, with regard to their personal decisions to (as appropriate) move to, locate a business in, or remain in Sudbury. The responses were as follows:

White collar survey: importance of environmental quality:

	- to economic recovery	- to personal decision
Not important	8	13
Not very important	3	2
Important	3	4
Extremely important	14	5

Residents of ten years or more attached somewhat greater importance than did residents of less than ten years to environmental quality as a factor in economic recovery: nine of the former group saw it as important or extremely important, versus four who saw it as not important or not very important, while the relative newcomers were almost evenly divided. There was no significant difference between the two groups with regard to the importance of environmental quality to themselves directly.

Asked about future directions of economic growth for Sudbury, respondents opted very strongly for government, health and educational services, named altogether 22 times. Tourism and conventions came next (9), and then manufacturing (5). A strong majority (23) thought that future growth would be affected by environmental quality.

Respondents were next asked to name the features of Sudbury they liked. Some 26 factors were named altogether, though the distinctions between several of them are not sharp and the categorisation is therefore a little arbitrary.

Most votes (15) went to Sudbury's closeness to nature, with friendliness a close second (14). Size and services were mentioned nine times each, and shopping and recreation got seven votes each. Environmental and scenic qualities, as such, were mentioned only four times.

In evaluating these results, two important qualifications must be kept in mind.

First, the sample is too small to permit statistically reliable conclusions to be drawn. Also, interpretation and grouping of responses is to some extent a matter of judgement. Hence, the results of the survey can only be regarded as indicative.

Second, perceptions of the importance of environmental quality in Sudbury would tend to be affected by the passage of time. INCO's Superstack, which more than anything else turned Sudbury around in environmental terms, is now nearly twenty years old; the "greening" program began fifteen years ago. Newcomers would have no personal experience of Sudbury's environmental transformation, and even for long-time residents the memory of the Sudbury of old is inevitably fading. Thus there could well be a tendency to take the present level of environmental quality for granted and so underestimate its importance.

Nevertheless, in most respects the general pattern of responses in the "white collar" survey is quite similar to that in the "leaders and observers" survey, in the identification of government actions and Sudbury's regional role as the major factors

in economic recovery; in the choice of government, health and educational services as the leaders of future growth; and in the importance attached to environmental quality as a contributor both to current recovery and to future growth. The similarity even extends to the apparently inconsistent failure to fix on environmental quality, in response to an "open" question, as one of the factors which helped economic recovery.

There is a rather striking difference, however, between the importance of environmental quality to Sudbury's economy, as perceived by the respondents, and their (presumably more reliable) evaluation of its importance to themselves. Of the 28 respondents, 17 saw environmental quality as either extremely important or important to the economy, but only nine considered it extremely important or important in their own decisions to come to or remain in Sudbury. However, this finding must be interpreted in light of the fact that at most a small minority of the respondents had made a completely independent decision to move to Sudbury; most of those who had not grown up there arrived due to some kind of career move.

While few respondents explicitly mentioned environmental quality as one of the things they liked about Sudbury, closeness to nature appears to be the community's most popular feature, and this is undoubtedly related to the concept of environmental quality. Any further investigation along these lines should explore the extent to which environmental quality (clean air and water, green surroundings, etc.) is defined in terms of "closeness to nature".

9 THE IMPORTANCE OF ENVIRONMENTAL IMPROVEMENT TO SUDBURY: THE ECONOMIC IMPACTS OF INCO'S EMISSION ABATEMENT PROGRAM

In addition to the hospitality industry and the white collar sector, there is a third area in which we have some concrete information on the economic effects of environmental improvement in Sudbury. This concerns the **direct** economic impact of the technological improvements which are reducing atmospheric pollution.

9.1 The INORD Study

In 1985 the Ontario Ministry of the Environment requested INCO Limited to report on the employment and other economic consequences of the emission abatement program undertaken by INCO in response to the Ministry's requirements. INCO accordingly contracted with Laurentian University's Institute of Northern Ontario Research and Development (INORD) to study this question, and INORD's Report on the Socio-Economic Impact on the Sudbury Region of INCO's Emissions Abatement Program [ref. 12] was submitted to INCO in November 1988. It is used here with the kind permission of INCO Limited.

The $500 million emission abatement program will bring about both temporary construction employment and permanent reductions in operating employment in INCO's mill and smelter complex. INORD used an economic base model to calculate the multiplier effects of these shifts in employment and of INCO's purchases of materials on Sudbury's economy. The results are shown in table 22 (table VI.2.1 of the INORD report).

During the construction phase (1989 - 1993) employment generated directly and indirectly by construction will rise to a peak of 828 in 1989 and decline to zero by 1994. Operating employment will increase temporarily, but will decline after 1990 and by 1994 will reach a level 380 jobs below that of 1988.

According to the INORD report (pp. 2, 3):

"The abatement program will cause a 1,978,000 man-hour increase in total regional employment and a $44,478,000 increase in total regional income in 1990. This includes the direct employment and earnings in the construction and operation of the mill, smelter and acid plant, the indirect employment and earnings in the purchasing of materials and the employment and income induced by the direct and indirect employment. However, once construction is completed and employment at the mill, smelter and acid plant is adjusted to the lower requirements in 1994, total regional employment and income will decline by 1,122,000 man-hours and $16,980,000.

"The increase in direct, indirect and induced employment of 1030 full-year jobs by the end of 1990 is less than 2 percent of current regional employment, and should not cause any major disruption to the local economy. The eventual decrease in direct, indirect and induced employment of 584 full-year jobs by the end of 1994 -- less than 1 percent of current regional employment -- should not cause any major disruption to the local economy either. No additional employment changes related to the emissions abatement program will occur after 1994."

The INORD report (pp. 3, 4) also points out that "While there will be a relatively small decline in employment over the long run, the effects of this quantitative decline must be viewed within the context of a qualitatively much improved work environment for the remaining workers. . . . there will be a net positive change in the 'culture' of the work environment for all concerned in the milling, smelter and sulphur products complexes. This change, like the dramatic reduction in sulphur fumes emissions generally, will ultimately benefit the Sudbury community as a whole."

9.2 Other Economic Impacts

One of the ways in which Sudbury's economy will certainly benefit, at least marginally, from the emission abatement program

is through the supply of items of equipment directly employed in the emission reduction process. While some specific examples could be identified, exploratory discussions with INCO managers made it clear that even with the company's full cooperation it would be difficult and time-consuming to establish with any accuracy the total sums involved. Purchasing, hiring and accounting procedures and records are part of the problem; another is that the modernisation of INCO's plant is a complex matter in which the various elements cannot, on the whole, be attributed exclusively to a single objective such as the reduction of pollution. Nevertheless, careful investigation with INCO's assistance would probably permit a reasonable estimate of the total spending in Sudbury directly attributable to pollution control measures.

Another potential benefit is through the use of by-products of emission reduction. One possibility which has been seriously investigated is the use of sulphuric acid in combination with phosphates from the Kapuskasing area to produce fertiliser. While this appears to be feasible, there is at present no certainty that the fertiliser plant, if built, would be located in Sudbury rather than near the phosphate deposits.

10 CONCLUSIONS

During the past two decades Sudbury has changed from a hard-hat mining town with an economy dominated by the extraction and processing of nickel ore, to a regional centre of government, health, educational and commercial services, with a small but growing machinery manufacturing industry; a city in which the mining industry continues to be important but which it no longer dominates. In many ways, this represents a change to a more environmentally benign, sustainable form of economic development in an area which has traditionally based its economy on resource exploitation and has accepted the associated environmental costs.

What role has the "cleaning and greening" of Sudbury played in this economic (and social) transformation?

10.1 The Complexity of Change

The consultants do not believe that any definitive, quantified, rigorously verifiable answer is possible. Change in any human community is intricate and subtle, and it has been so in Sudbury perhaps more than in most. Economic, demographic, social, political, historical, physical and environmental strands interweave in a complex pattern, each continuously influencing and influenced by the others. Three of these strands were identified in the "leaders and observers" survey as being particularly important to Sudbury:

-- The city's emergence as a regional service centre, in itself a complex phenomenon to which various factors internal to Sudbury contributed, but perhaps owing most to geographical location and transportation improvements;

-- Strong support from both the federal and the provincial governments, particularly in the forms of direct job creation in the public sector, and financial aid to secondary industry: undoubtedly a key factor in Sudbury's recovery;

-- The combination of strong community spirit, active cooperation among different groups and interests, and effective local political leadership: the intangible but critical factor which many observers regard as the key to everything else.

In view of this diversity of influences, one of the conclusions of the OECD study was that, except in quite specific and limited instances, it was not possible to link economic growth and diversification in Sudbury with any certainty to particular economic development inputs. It is reasonable to assume that the same must be true *a fortiori* of environmental improvements; and in fact the consultants found no firm evidence of direct causal relationships. Rather than seek a clear, one-way, cause-and-effect link between environmental quality and economic development, it is more realistic to see both as elements of a continuing, complex process within which they interact simultaneously with each other and with a diversity of other elements.

This is our first conclusion; and its corollary is that none of the other conclusions can be "proven" or quantified.

10.2 Environmental Improvement a Condition of Growth

Our second conclusion is that very little of Sudbury's economic growth can be said to have been **caused** by environmental improvement, but environmental improvement provided conditions **conducive** to growth, conditions without which such growth would almost certainly have been limited.

We cannot say that Sudbury would not have recovered from the loss of mining jobs if its environment had remained as it was in 1970; indeed it would almost certainly have done so to some extent. Laurentian University and Cambrian College were founded before 1970; the Taxation Data Centre would probably have been built anyway, and Science North might have been; environmental conditions were probably of marginal importance to the new machinery manufacturing firms; Sudbury's strategic geographic location vis-a-vis other centres in northeastern Ontario is not affected by its

environment. Nevertheless, the results of the "leaders and observers" survey, supported by other evidence such as Dr Corringham's letter, strongly suggest that Sudbury's emergence as the regional service centre of northeastern Ontario would have been significantly hampered by the continuance of pre-1970 environmental conditions.

To put it in a more positive way, it is reasonable to believe that environmental improvement created conditions in which the expansion of regional health services, the relocation of a provincial ministry, the expansion of commercial and business services to a regional scale, and similar moves, became reasonable options where otherwise they might well not even have been seriously contemplated.

However, as we have already stressed, it is misleading to think in terms of any simple straight-line linkage between environmental conditions and economic growth. As an example, many factors underlie the expansion of health services in Sudbury, including the establishment of the new Cancer Centre. One of these factors was certainly the vigorous, cooperative efforts of the four Sudbury hospitals, the municipal authorities, and other groups, during the late seventies and early eighties. This same cooperative action contributed substantially to the "greening" program, and was at the same time fostered by the reduction of pollution and the vision of a (literally) brighter future. Thus, even to say that environmental improvement provided conditions conducive to growth is, though probably true, an oversimplification of a much more complex kind of relationship. It would be more accurate to say that environmental improvement was part of a dynamic set of conditions conducive to growth.

10.3 The Hospitality Industry

The evidence of the "leaders and observers" and supplementary interviews undoubtedly supports the hypothesis that environmental improvement contributed substantially to the recent burgeoning of

Sudbury's hospitality industry. Not only does it make Sudbury generally more attractive to visitors, but it makes possible such special events as the World Junior Games. Environmental improvement also provides conditions in which new attractions for visitors (such as a system of snowmobile trails, and new scenic parks) can reasonably be (and are being) considered.

Even in this case, though, to assert that environmental improvement is the **cause** of growth would be to oversimplify. Much of the growth in the hospitality industry seems to be attributable to Science North and to Sudbury's new regional role and its consequent attraction of business visitors, conferences, seminars and the like. Once again, therefore, environmental improvement has to be seen in the context of a broader set of circumstances.

10.4 "White Collar" Workers

Our other hypothesis was that the people who are central to government, community and business services -- professional, managerial and skilled technical workers -- would have been discouraged from moving to or remaining in Sudbury by pre-1970 environmental conditions. Here the results of the study are inconclusive, partly because the worst of the environmental "bad old days" are now two decades in the past, so that it is difficult for people to make realistic comparisons with present conditions. On the one hand, it is clear that environmental conditions are only one factor, and generally not the most important, when people decide where to live and work. On the other hand, "quality of life" is widely recognised as an important locational factor in the growth industrial sectors, and environmental conditions undoubtedly contribute to quality of life. This is a subject which we believe should be further explored; see s. 11.

10.5 Opportunities for the Future

We have stressed that environmental improvement as a factor in economic change cannot be separated from other influences at work within Sudbury. In turn, these collectively cannot be separated from broader trends in the Canadian economy and society. Among these trends are the shift from a goods-producing to a service-based economy [ref. 20] and the "technological revolution", specifically the marriage of computers and telecommunications called information technology, or IT. Together, these changes mean that to an increasing extent economic activities are becoming "footloose", no longer firmly anchored to specific types of location.

What environmental improvement has done, we firmly believe, is to put Sudbury in a position to take advantage of these new economic circumstances. As a centre of regional education, government, health and other services, within a few hours' drive of Toronto, surrounded by opportunities for outdoor recreation, Sudbury has some definite assets from the point of view of the footloose firm, but it is hard to imagine that the management of any such firm would opt for polluted air and grimy, barren physical surroundings. As things are, the home-grown Northern Ontario Teleconference Network could well prove to be a forerunner of Sudbury's economic future.

11 COMMENTS ON METHODOLOGY; INFORMATION GAPS; FUTURE RESEARCH

This project was explicitly intended to be exploratory, designed more to test research approaches and the availability of data than to produce definitive conclusions. The following comments therefore deal with what the consultants believe can be learned from this case study to guide further investigation of the economic benefits of a clean environment. They fall under two headings. The first relates to the extension of the Sudbury case study itself, and to the conduct of similar case studies; the second to a rather different direction for research.

11.1 The Sudbury Case Study

11.1.1 Economic and Environmental Data

The availability of data on economic and environmental change presented no serious problems.

The basic indicator of economic change was a detailed breakdown of employment by industry in the Regional Municipality of Sudbury in 1971, 1981 and 1986, from a special tabulation prepared by Statistics Canada. This was supplemented by additional information from municipal and other sources, for example on the annual value of building permits issued. Some further information, particularly on the hospitality industry, might have been available if the period of the study had not unfortunately coincided with a protracted strike of municipal employees, but in general the availability of adequate economic data was not a constraint.

The same is true of information on environmental improvement. Air quality in the Sudbury area has been thoroughly monitored over the study period by the Ontario Ministry of the Environment. Water quality data are less consistent and had to be assembled from different sources, but in total were adequate to provide a clear picture of water quality improvement. The revegetation program has

been fully recorded by the Regional Planning Department and by Professor Keith Winterhalder of Laurentian University.

We would note, however, that historical data on environmental change would not necessarily be as fully available in other places, and that this could be a constraint on other case studies.

11.1.2 The "Leaders and Observers" Survey

The main purpose of the "leaders and observers" survey was to obtain the opinions of **informed** Sudburians on the importance of environmental improvement as a factor in economic recovery. We are satisfied that this was accomplished; the survey established quite clearly that among this group environmental improvement is regarded as important, though as one of a number of related factors rather than in isolation. While the number of respondents is small as a statistical sample, we think it very unlikely that further interviews, using the same criteria for selecting respondents, would significantly alter the general pattern of results.

11.1.3 The "White Collar" Survey

As a pilot survey, the white collar survey could be improved in some respects if repeated. A larger sample would produce statistically more reliable results; a clearer distinction could be made between employers/managers and employees; and some improvements in interview format could be made. We are, however, doubtful about the value of this particular kind of survey, mainly because the respondent is being asked, in effect, to compare present reality with conditions that he or she either has not experienced at all, or experienced some considerable time ago.

Rather than extend or repeat this survey, we believe it might be more instructive to survey all employees of the Ministry of Northern Development and Mines, **and** their spouses (who are often much more concerned about the non-professional aspects of locational decisions) about the considerations affecting their decisions regarding relocation to Sudbury, and about the changes in attitude which may have been brought about by actual exposure

to the "new" Sudbury. A similar study could be designed around the recruitment of professional, scientific and technical staff for Sudbury's health care institutions.

We stress, however, that no survey of this nature could altogether avoid asking the respondent, in one way or another, to compare apples with oranges: actuality with a hypothetical, or at best a recollected, state of affairs.

11.1.4 Other Areas of Study

Further investigation of the economic benefits of environmental improvement to Sudbury could involve several other areas of study, though some would present data problems and probably none would reveal very substantial contributions to the local economy. They include:

(i) Local expenditures directly related to environmental improvement; in particular, though not exclusively, expenditures on smelter reconstruction.

(ii) Agriculture, tree nurseries, and related activities, including the operation of the Farmers'/Festival Market,

(iii) Propensity of INCO and Falconbridge retirees and pensioners to remain in Sudbury rather than moving elsewhere.

(iv) The types of industry and business showing an interest in starting operations in Sudbury, and their locational requirements. (The SRDC, the Ministry of Industry, Trade and Technology, the Ministry of Northern Development and Mines, and the Department of Regional Industrial Expansion are all possible sources of information.)

11.2 Other Approaches

In general, though, our conclusion is that while the study of a particular case such as Sudbury can shed some light on the economic benefits of environmental improvement (and, we believe, has done so), its value is limited. This is not, at least in the Sudbury case, due to lack of data but rather to the fundamental

impossibility of drawing a true and reliable comparison between the reality of Sudbury today and the hypothetical Sudbury that would exist if no action had been taken to check and reverse environmental degradation. We believe that the study's value would almost certainly be enhanced if Sudbury's experience could be compared with that of other communities. In particular, if another community in similar circumstances in which no clean-up program had been undertaken could be found, the contrast might be very instructive.

We believe that it would also be useful to look more closely at the other side of the coin: the economic harm resulting from environmental degradation. The inherent difficulties of linking environmental improvements to economic benefits are certainly mirrored in the latter relationship; that the former may be underestimated may imply that the relationship between environmental damage and economic decline is also inadequately appreciated.

However, the case study approach suffers from the inescapable handicap that the actuality of City X can only be compared with either (a) the hypothetical state of affairs in City X had certain things been done or not done, or (b) the actuality of City Y, in which circumstances will inevitably be different in significant respects from those of City X. In short, the apples-and-oranges-comparison problem is inescapable. Therefore, while we do not suggest that the case study approach should be completely abandoned, we do suggest that future research should explore a different direction.

The economy of Ontario, like that of much of the western world, is shifting from a goods-producing base to a service-providing base. According to the Ontario Study of the Service Sector [ref. 20], in 1986 Ontario's service industries accounted for "73 per cent of employment, 70.2 per cent of Gross Domestic Product and an estimated 80 per cent of all new jobs that will be created over the next decade." This is broadly true of most of Canada, if not to quite the same extent. We are, furthermore, in

the era of a "knowledge-based" economy which puts a premium on specialised professional, technical and managerial skills, and in which information technology to a large extent removes traditional locational constraints. Increasingly, key workers are loyal to their vocations rather than to a particular employer [ref.4]. Thus the personnel upon whom an important part of the economy is highly dependent tend to be mobile, able to a great extent to work where they choose to live rather than being compelled to live where they are able to work.

So, as noted in the Introduction, the "quality of life" that is offered becomes a significant economic locational factor. Perhaps the best-known illustration -- though there are certainly other factors at play -- is the massive shift in the U.S. economy from the "Rust Belt" of the north-east, once the nation's economic heartland, to the "Sun Belt" of the south-west. The community that can provide the amenities and services sought by well-paid, well-educated professionals, skilled technicians, trained managers and entrepreneurs, has an advantage in attracting "leading edge" industries and businesses. "The quality of urban environments is recognized as a significant factor in influencing the location of new knowledge-based industries and personnel." [Ref.6, p. 35.] And there is evidence from research, as well as from personal experience and observation, that environmental conditions are seen as an important aspect of the quality of life: studies at the University of Glasgow [ref.7] established "pollution" and "scenic quality" as, respectively, fourth and sixth in importance out of 19 quality-of-life factors, as rated by British respondents in the professional/managerial socioeconomic groups. (Only low crime levels and good health services were considered more important than freedom from pollution.)

We therefore believe that future research on the economic benefits of environmental improvement should focus more on types of business and industry and on classes of people than on places, with a view to determining the importance of environmental quality

to both corporate and individual locational decisions. Specifically, we suggest that research might be aimed at:

(i) Corporate decision-makers in the public and private sectors who determine the location of regional headquarters, new branches, etc.

(ii) White collar employees, including professional, technical and managerial workers, concerning the importance of environmental quality relative to career considerations and to other quality-of-life factors when faced with a move; with particular emphasis on women (both as workers and as spouses/mothers).

(iii) Professionals, entrepreneurs and others who are reasonably footloose, that is, have a fairly wide and relatively unhampered choice in deciding where to live and work; with similar emphasis on women.

TABLES

Table 1. Labour Force by Industry Group and Sex

Regional Municipality of Sudbury

1971 and 1986

	1971						1986						Percent change 1971-1986		
	Female		Male		Total		Female		Male		Total				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Female	Male	Total
Goods producing industries	1,405	9.0	32,260	66.2	33,665	52.5	1,600	5.2	17,395	42.8	18,995	26.6	+13.9	-46.1	-43.6
Service industries	14,170	90.3	15,620	32.7	29,790	46.2	28,250	91.8	21,940	54.1	50,195	70.3	+99.4	+40.5	+68.5
Unspecified or unidentified	105	0.7	520	1.1	625	1.0	910	3.0	1,275	3.1	2,185	3.1	-	-	-
Total	15,680	100.0	48,400	100.0	64,080	100.0	30,760	100.0	40,610	100.0	71,375	100.0	+96.2	-16.1	+11.4

Source: Special Tabulations
Census Operations Division
Statistics Canada

Table 2. Population Characteristics

Regional Municipality of Sudbury

	1971	1976	1981	1986	1988
Total Population	169,580	167,705	159,779	152,476	151,314
Index (1971 =100.0)	100.0	98.9	94.2	89.9	
Sex:					
Percent Male	n.a.	50.8	49.6	49.3	
Percent Female	n.a.	49.2	50.4	50.7	
Age: Percentage by age group					
0 - 19	n.a.	40.9	36.2	31.3	
20 - 44	n.a.	36.2	37.1	38.7	
45 - 64	n.a.	17.3	19.8	21.2	
65 and over	n.a.	5.6	6.9	8.8	

Source: Census of Canada 1971, 1976, 1981, 1986; and Regional Assesment 1988.

Table 3. Persons Per Household and Household Income

Regional Municipality of Sudbury

	1971	1976	1981	1986
Persons/Household				
Ontario	3.4	3.4	2.8	2.8
Sudbury	4.0	3.5	3.1	2.9
% of Ontario difference	+17.6	+2.9	+10.7	+3.6
Household income (Average $)				
Ontario	10,460	n. a.	25,577	38,022
Sudbury	11,990	n. a.	23,764	32,996
% of Ontario difference	+14.6	n. a.	-7.1	-13.2

Source: Census of Canada, 1971, 1976, 1981, 1986.

Table 4. Highest level of Schooling

Regional Municipality of Sudbury

1976, 1981 and 1986

	1976		1981		% increase 1976-1981		1986		% increase 1976-86	
	Ont.	Sudbury	Ont.	Sudbury	Ont.	Sudbury	Ont.	Sudbury	Ont.	Sudbury
Population 15 years of age and over	6,190,685	118,310	6,649,725	118,725	+7.3	-	7,132,810	117,115	+15.2	-1.0
Elementary and Secondary only										
Number	4,293,020	88,005	4,231,530	82,315	-1.4	-6.8	4,221,020	75,395	-1.7	-14.3
Percent	69.2	74.4	63.7	69.3			59.2	64.4		
Other Non-University only										
Number	1,077,250	18,706	1,294,575	21,680	+20.2	+15.9	1,519,690	24,805	+41.0	+32.6
Percent	17.3	15.8	19.5	18.3			21.3	21.2		
University										
Number	820,415	11,599	1,123,620	14,730	+37.1	+27.0	1,392,100	16,905	+69.8	+45.7
Percent	13.5	9.8	16.9	12.4			19.5	14.4		

Source: Census of Canada, 1976, 1981 and 1986

Table 5. Employment by Industry Group

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change
	No.	%(1)	No.	%	No.	%	1971-1986
I. Goods Producing Industries							
Agriculture	105	0.2	340	0.5	365	0.5	+247.6
Forestry	245	0.4	205	0.3	485	0.7	+98.0
Fishing and Trapping	-	-	25	-	40	0.1	-
Mining	18,195	28.4	13,020	18.1	7,720	10.8	-57.6
Manufacturing	8,925	13.9	8,125	11.3	6,655	9.3	-25.4
Construction	6,195	9.6	3,875	5.4	3,730	5.2	-39.8
Sub-total	33,665	52.5	25,590	35.6	18,995	26.6	-43.6
II. Service Industries							
Transport, Communications and Utilities	4,090	6.4	5,325	7.4	5,390	7.6	+31.8
Trade	8,180	12.8	12,555	17.5	12,020	16.8	+46.9
Finance, Insurance, Real Estate	1,705	2.7	2,865	4.0	2,700	3.8	+58.4
Community, Business and Other	12,770	19.8	20,765	28.9	23,150	32.4	+81.3
Public Administration	3,045	4.8	4,840	6.7	6,935	9.7	+127.8
Sub-total	29,790	46.5	46,350	64.4	50,195	70.3	+68.5
III. Unspecified or Unidentified	625	1.0	-	-	2,185	3.1	
Total	64,080	100.0	71,940	100.0	71,375	100.0	111.4

(1) Percent of the total labour force

Source: Special Tabulations, Census Operations Division, Statistics Canada.

Table 6. Employment in Manufacturing

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		% change
	No.	%(1)	No.	%	No.	%	1971-1986
Food and Beverage	675	1.1	555	0.8	620	0.9	-8.1
Tobacco Products	-	-	5	-	-	-	-
Rubber and Plastics	25	-	95	0.1	95	0.1	+280.0
Leather	5	-	5	-	-	-	-
Textile	15	-	5	-	25	-	+66.7
Knitting Mills	-	-	-	-	-	-	-
Clothing	5	-	20	-	40	0.1	+700.0
Wood	350	0.5	175	0.2	80	0.1	-77.1
Furniture and Fixtures	30	-	65	0.1	80	0.1	+166.7
Paper and Allied Products	115	0.2	20	-	60	0.1	-47.8
Printing and Publishing	260	0.4	430	0.6	420	0.6	+61.5
Primary Metal	6,210	9.7	5,410	7.5	3,765	5.3	-39.4
Metal Fabricating	460	0.7	525	0.7	550	0.8	+19.6
Machining	140	0.2	200	0.3	440	0.6	+214.3
Transport Equipment	45	0.1	25	-	45	0.1	-
Electrical Products	70	0.1	90	0.1	50	0.1	-28.6
Non-Metallic Mineral Products	175	0.3	225	0.3	190	0.3	+8.6
Chemical	240	0.4	145	0.2	95	0.1	-60.4
Petroleum and Coal Products	10	-	30	-	20	-	+100.0
Miscellaneous	95	0.1	95	0.1	75	0.1	-21.1
Total Manufacturing	8,925	13.9	8,125	11.3	6,655	9.3	-25.4

(1) Percent of total labour force.

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 7. Building Permits

Regional Municipality of Sudbury, 1980 - 1988.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	Total
Residential										
$000's	17,375	18,970	13,606	15,159	30,272	36,825	43,223	85,535	89,000	349,960
% per year	44.1	42.0	35.0	48.4	61.4	73.5	63.4	70.4	64.0	60.0
Commercial/Industrial										
$000's	15,737	18,551	10,170	12,656	12,935	8,445	18,866	25,331	27,000	149,691
% per year	40.0	41.0	26.2	40.5	26.3	16.9	27.7	20.9	19.4	25.7
Institutional										
$000's	6,245	7,667	15,040	3,458	6,047	4,796	6,135	10,606	23,000	82,994
% per year	15.9	17.0	38.8	11.1	12.3	9.6	8.9	8.7	16.6	14.2
Total										
$000's	39,357	45,188	38,816	31,273	49,254	50,066	68,224	121,467	139,000	582,645
% of total 1980 - 88	6.8	7.8	6.6	5.4	8.4	8.6	11.7	20.8	23.9	100.0

Table 8. Employment in Transportation, Communications and Utilities

Regional Municipality of Sudbury

	1971		1981		1986		% change
	No.	%(1)	No.	%	No.	%	1971-1986
Transportation	2,720	4.3	3,310	4.6	3,225	4.5	+18.6
Communications	855	1.3	1,435	2.0	1,470	2.1	+71.9
Utilities	515	0.5	580	0.8	695	1.0	+35.0
Total	4,090	6.4	5,325	7.4	5,390	7.6	31.8

(1) Percent of total labour force

Source: Special Tabulations
Census Operations Division
Statistics Canada

Table 9. Employment in Trade

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change 1971-86
	No.	%(1)	No.	%	No.	%	
Wholesale	1,820	2.9	2,735	3.8	2,860	4.0	+57.1
Retail	6,360	9.9	9,820	13.7	9,160	12.8	+44.0
Total	8,180	12.8	12,555	17.5	12,020	16.8	+46.9

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 10. Employment in Retail Trade

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change 1971-86
	No.	%(1)	No.	%	No.	%	
Food Stores	1,590	2.5	2,075	2.9	2,205	3.2	+38.7
General Stores	1,330	2.1	2,050	2.9	1,380	1.9	+3.8
Tire, Battery and Access.	225	0.4	475	0.7	245	0.3	+8.9
Gas Service Stations	535	0.8	555	0.8	565	0.8	+5.6
Motor Vehicle Dealers	410	0.6	500	0.7	595	0.8	+45.1
Motor Vehicle Repair Shops	250	0.4	675	0.9	535	0.7	+114.0
(Motor Vehicle Related)	(1,420	2.2	2,205	3.1	1,940	2.6)	(+36.6)
Clothing and Shoe Stores	605	0.9	980	1.4	1,005	1.4	+66.1
Hardware Stores	205	0.3	195	0.3	170	0.2	-17.1
Furniture, Appliance, Radio, T.V.	405	0.6	385	0.5	560	0.8	+38.3
Drug Stores	195	0.4	405	0.6	450	0.6	+130.8
Book and Stationery Stores	20	-	70	0.1	35	0.1	+75.0
Florists' Shops	35	0.1	110	0.2	190	0.3	+442.8
Jewellery and Watch	120	0.2	140	0.2	185	0.3	+54.2
Liquor and Beer Stores	100	0.2	135	0.2	180	0.3	+80.0
Tobacconists	20	-	15	-	-	-	-
Other	315	0.4	1,055	1.3	860	1.1	+173.0
Total	6,360	9.9	9,820	13.7	9,160	12.8	+44.0

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division, Statistics Canada.

Table 11. Employment in Finance, Insurance and Real Estate

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change
	No.	%(1)	No.	%	No.	%	1971-86
Finance	975	1.5	1,485	2.1	1,305	1.8	+33.8
Insurance	170	0.3	425	0.6	425	0.6	+150.0
Real Estate	560	0.9	950	1.3	970	1.4	+73.2
Total	1,705	2.7	2,865	4.0	2,700	3.8	+58.4

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 12. Employment in Community, Business and Personal Services

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change
	No.	%(1)	No.	%	No.	%	1971-86
Education	4,640	7.0	5,800	8.1	6,295	8.8	+35.7
Health and Welfare	2,895	4.5	4,830	6.7	5,600	7.8	+93.4
Accomodation and Food	2,325	3.5	4,540	6.3	4,750	6.7	+104.3
Religious Organizations	150	0.2	320	0.4	335	0.5	+123.3
Amusements and Recreations	380	0.6	965	1.3	975	1.4	+156.6
Services to Business	850	1.3	1,505	2.1	1,950	2.7	+129.4
Personal Services	985	1.5	1,245	1.7	1,615	2.3	+64.0
Miscellaneous	725	1.2	1,560	2.3	1,630	2.2	+148.3
Total	12,770	19.8	20,765	28.9	23,150	32.4	+81.3

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 13. Employment in Education

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change 1971-86
	No.	%(1)	No.	%	No.	%	
Kindergarten, Elementary and Secondary Schools	3,460	5.4	4,180	5.8	4,340	6.1	+25.4
Schools of Arts and Performing Arts	50	0.1	45	0.1	50	0.1	-
Vocational, Trade Schools, Business Colleges	30	0.1	15	-	55	0.1	+83.3
Post-Secondary, Non-University	210	0.3	570	0.8	850	1.2	+304.8
Universities and Colleges	620	1.0	740	1.0	855	1.2	+37.9
Libraries, Museums	90	0.1	95	0.1	100	0.1	+11.1
Non-specified	-	-	155	0.2	45	0.1	-
Total	4,640	7.0	5,800	8.1	6,295	8.8	+35.7

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 14. Employment in Health and Welfare Services

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change 1971-86
	No.	%(1)	No.	%	No.	%	
Hospitals	2,050	3.2	2,570	3.6	3,065	4.3	+49.5
Related Health and Welfare Services	350	0.5	1,240	1.7	1,265	1.8	+261.4
Offices of Physicians and Surgeons	315	0.4	410	0.6	495	0.6	+57.1
Offices of Paramedical	35	0.1	110	0.1	125	0.2	+257.1
Offices of Dentists	70	0.1	215	0.3	180	0.3	+157.1
Diagnostic and Therapeutic Serv.	40	0.1	150	0.2	400	0.5	+1,000.0
Misc. Health Services	35	0.1	135	0.2	70	0.1	+100.0
Total	2,895	4.5	4,830	6.7	5,600	7.8	+93.4

(1) Percent of total labour force

Source: Special Tabulations
Census Operations Division
Statistics Canada

Table 15. Employment in Accommodation and Food Services

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change 1971-86
	No.	%(1)	No.	%	No.	%	
Hotels, Motels	940	1.4	1,395	2.5	1,295	1.8	+37.8
Lodging Houses	65	0.1	30	-	40	0.1	-38.5
Camping Grounds	40	0.1	15	-	35	0.1	-12.5
Restaurants, Caterers, Taverns	1,275	1.9	2,855	4.0	3,380	4.7	+165.1
Not specified	5	-	245	0.3	-	-	-
Total	2,325	3.5	4,540	6.3	4,750	6.7	+104.3

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 16. Employment in Public Service and Defence

Regional Municipality of Sudbury

1971, 1981 and 1986

	1971		1981		1986		Percent change
	No.	%(1)	No.	%	No.	%	1971-86
Defense	220	0.3	270	0.4	300	0.4	+36.3
Federal	560	0.9	1,010	1.4	3,070	4.3	+448.2
Provincial	1,115	1.7	1,420	2.0	1,490	2.1	+33.6
Local	1,150	1.9	2,140	2.9	2,075	2.9	+80.4
Total	3,045	4.8	4,840	6.7	6,935	9.7	+127.8

(1) Percent of total labour force

Source: Special Tabulations

Census Operations Division

Statistics Canada

Table 17. Employment by Industry Group

Northeastern Ontario and Regional Municipality of Sudbury, 1971 and 1986

	1971				1986				Percent increases 1971 - 1986	
	N.E. Ont.		Sudbury		N.E. Ont.		Sudbury		N.E. Ont.	Sudbury
	No.	%(1)	No.	%	No.	%	No.	%	%	%
Goods Producing Industries	92,050	49.3	33,665	52.5	82,325	31.5	18,995	26.6	-10.6	-43.6
Service Industries	123.965	57.4	29,790	46.5	178,920	68.5	50,195	70.3	+44.4	+68.5
Total*	216,015	100.0	64,080	100.0	261,245	100.0	71,375	100.0	+20.9	+11.4

(1) Percent of the total labour force

* Non-specified

Sudbury, 1971: 625 (1.0%)

Sudbury, 1986: 2,185 (3.5%)

Northeastern Ontario: Districts of Algoma, Cochrane, Manitoulin, Nipissing, Parry Sound, Sudbury, Temiskaming and Regional Municipality of Sudbury.

Source: Census of Canada 1971 and 1986; Special Tabulations, Census Operations Division, Statistics Canada.

Table 18. Land Reclamation Program

Regional Municipality of Sudbury

1978 - 1988

Year	Area seeded (ha)	Trees planted	Number of employees	Total cost ($000's)	Salaries ($000's)
1978	114.8	-	174	293	213
1979	420.8	4,250	325	573	409
1980	299.3	1,300	218	520	374
1981	173.4	4,600	207	584	403
1982	305.2	-	464	2,409	1,972
1983	935.4	228,080	1,277	7,198	5,458
1984	215.9	149,350	171	743	529
1985	106.0	154,600	129	578	428
1986	30.0	80,300	31	164	96
1987	64.7	264,880	82	370	250
1988	34.8	118,885	55	-	-
TOTAL	2,699.7	1,006,245	3,133		

Source: Regional Municipality of Sudbury, Land Reclamation Program Report 1985, and supplementary unpublished information provided by Bill Lautenbach.

Table 19. Sudbury District Office Complaints Statistics, 1975 - 1989.

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989*
Spills	124	114	120	83	62	27	134	102	152	53	50	25	55	148	121
Sulphur dioxide	44	146	176	90	48	140	51	12	82	111	151	87	121	81	26
Other unknown	0	0	9	3	2	5	19	7	14	16	18	27	9	87	8
Other	18	13	27	32	22	82	98	120	151	100	156	124	249	108	15
Well water (drinking)	1	5	9	2	2	12	45	79	52	75	58	66	82	45	14
Water Pollution (lakes, streams, etc.)	54	65	85	93	52	91	117	88	83	57	67	42	54	37	12
Litter waste	1	14	5	6	3	23	41	35	25	31	33	41	63	47	11
Smoke	8	24	21	21	3	20	32	24	19	14	52	33	34	23	5
Dust/Particulate	119	120	66	117	133	65	257	69	90	119	100	77	79	48	13
Noise	0	11	9	10	0	7	7	9	5	7	8	10	24	5	6
Odour	5	27	13	20	6	23	30	30	50	40	50	64	61	62	9

* The data for 1989 includes only the period January 1st to April 30th.

Table 20. "Leaders and Observers" survey.

Question 3 - Factors contributing to economic recovery.

Total number of interviews = 24.

Factor	Ranking 1	2	3	First 3 total
Location/regional role (combined)	6	4	6	16
Government aid (combined)	6	7	6	19
Local political leadership	7	2	2	11
Local economic development bodies	0	2	1	3
Local entrepeneurship	1	0	3	4
Community spirit, cooperation	7	4	1	12
Environmental improvement	1	2	2	5
Other	0	0	2	2

Table 21. "Leaders and Observers" survey

Questions 4 and 5 - Importance of environmental improvement

Total number of interviews = 24.

	Not important	Not very important	Important	Extremely important
In general	0	2	9	13
Public sector	0	8	9	5
Private sector, white collar	0	3	13	6
Hospitality industry	0	0	6	16
Retail and wholesale trade	1	6	11	3
Secondary manufacturing	4	6	8	3
Total (individual sectors)	5	23	47	33

Table 22. (Table VI.2.1 of INORD study)

Estimated Economic Impact - Sudbury (CMA)

Change in Total Employment (Full-Year),

Total Man-Hours (Thousands of Hours),

and Total Income (Thousands of 1988 Dollars)

Due to the Mill, Smelter and Acid Plant Construction,

Local Construction Materials Purchases and

Mill, Smelter and Acid Plant Operation

(Base - January 1988)

	1988	1989	1990	1991	1992	1993	1994
Hours (000)							
Construction	5	352	1,589	1,338	829	143	0
Materials	0	72	215	150	84	15	0
Operation	0	94	173	-194	-267	-802	-1122
INCOME (000)							
Construction	$121	$8,659	$39,047	$32,861	$20,361	$3,524	$0
Materials	$0	$936	$2,808	$1,950	$1,092	$234	$0
Operation	$0	$1,422	$2,623	($2,934)	($4,045)	($12,135)	($16,980)
EMPLOYMENT							
Construction	3	184	828	697	432	75	0
Materials	0	37	112	78	44	8	0
Operation	0	49	90	-101	-139	-418	-584
TOTALS							
Hours (000)	5	518	1,978	1,293	645	-644	-1,122
Income (000)	$121	$11,017	$44,478	$31,877	$17,408	($8,377)	($16,980)
Employment	3	270	1,030	674	336	-335	-584

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APPENDICES

APPENDIX 1

Air Quality Improvements in the Sudbury Area
(excerpted from Report on Land Reclamation, Regional Municipality of Sudbury, 1985 [ref. 24])

"In 1972, improvements of major proportions were achieved locally through company actions and legislated reductions under Ministerial Orders of the Ministry of the Environment.

"These improvements consisted of emission reductions by closing INCO Limited's Coniston smelter, reducing emissions at INCO Limited's iron ore plant to 225 tonnes/day, commissioning INCO Limited's 381 metre 'superstack', and closing Falconbridge Limited's pyrrhotite plant. (Winterhalder, 1978; 1984). Other actions around this time period which also contributed to atmospheric improvement included: the construction of acid plants by INCO in 1967 and Falconbridge in 1978 for the purpose of manufacturing sulphuric acid from waste gases and the construction of a new smelter at Falconbridge in 1978.

"During this same time period, Ministry of the Environment control orders progressively reduced allowable sulphur dioxide emissions from the Copper Cliff smelter to less than 4,720 tonnes/day. By 1983, this limit was reduced to to 1,770 tonnes/day. A similar 1969 control order limited Falconbridge to 930 tonnes/day. By 1979, this limit was reduced to 420 tonnes/day (Government Task Force, 1982.)

"As a result of these initiatives, particulate and gaseous emissions were significantly reduced and better dispersion of existing pollutants achieved (Winterhalder 1978, 1984). Reduced demand for metal products, company shutdowns, strikes, emission reductions and wider dispersal each have interacted to create noticeable improvement in local plant growth. These factors have also resulted in a marked reduction of air pollution fumigation occurrences within the Sudbury area."

APPENDIX 2: "LEADERS AND OBSERVERS" SURVEY RESPONDENTS

H.R. Akehurst, Chief Administrative Officer, Regional Municipality of Sudbury

Michael Atkins, publisher

Sterling Campbell, M.P.P., Sudbury

Dave Caswell, Sheraton Caswell Hotel

Richard J. DeMarco, General Manager, Laurentian Publishing Co.

Dick DeStefano, Executive Director, Northern Ontario Teleconference Network Inc.; Chairman, Community Leisure Plan Steering Committee

Aime Dimatteo, Area Manager, Ministry of Northern Development and Mines

David Edgar, Executive Vice-President, Dominion Trustco Corp.

Jim Gordon, former Mayor of Sudbury, former M.P.P. and member of provincial Cabinet

Frank Hess, General Manager, Sudbury Regional Development Corp.

M.A. Klugman, Regional Director, Ministry of Natural Resources

Floyd Laughren, M.P.P., Nickel Belt

Maureen M. Luoma, Executive Director, Sudbury Metro Centre

Ron Macdonald, United Steelworkers of America

Gordon N. MacNeil, Senior Business Consultant, Ministry of Industry, Trade and Technology

Jim Marchbank, Chief Executive Officer, Science North; member of Sudbury City Council

Elie Martel, member of Environmental Assessment Board; former M.P.P., Sudbury East

Steven A. Megannety, Community Adjustment Project Corporation

Mark Mieto, Commissioner of Social Services, Regional Municipality of Sudbury

Debbi M. Nicholson, General Manager, Sudbury & District Chamber of Commerce

Gilbert Riou, President, Sudbury & District Chamber of Commerce

Oiva Saarinen, Department of Geography, Laurentian University
Mel Soucie, former Regional Economist, Department of Employment and Immigration
W. Winegard, Manager, Community Planning Advisory Branch, Northeast Region, Ministry of Municipal Affairs

APPENDIX 3

"Leaders and Observers" Survey

Interview Guide

ECONOMIC BENEFITS OF A CLEAN ENVIRONMENT

A Case Study of Sudbury

Introduction

Twenty years ago, Sudbury was a very prosperous community with one of the highest average wage levels in Canada, derived almost entirely from the nickel industry. The other side of the coin was a devastated environment, defoliated and dirty, with high levels of air and water pollution.

Since then, Sudbury has experienced major economic disruption as employment in the nickel industry fell by more than half. At the same time, there is now clear evidence of economic recovery based on employment in largely new areas, principally the secondary manufacturing sector and the service sector (public service, financial and related services, health services, the "hospitality industry" including tourism and conventions).

During the period of major economic change Sudbury's environment has been strikingly improved, with substantial reductions in air and water pollution, extensive revegetation (the "greening" program), and redevelopment of the downtown area. Sudbury has experienced an environmental transformation since the early seventies.

The purpose of this research project is to determine what contribution environmental improvement has made to the restructuring and recovery of Sudbury's economy.

::::::::::::::::::::::::

Please feel free to comment on this subject in any way you want. The questions which follow are intended as a guide only.

THIS INTERVIEW IS CONFIDENTIAL; NO QUOTATION OR COMMENT WILL BE ATTRIBUTED TO AN IDENTIFIED PERSON.

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Interview series 1

Int. #____ Date:_____'89 Interviewee_____

1. How long have you lived in Sudbury, or been familiar with/involved in events in Sudbury?

   Approx. ____ years

2. Do you consider that the brief description that has been given of economic and environmental change in Sudbury is substantially correct? What changes and/or additions to this description would you make?

3. In order of importance (1, 2, 3), what THREE factors do you think have contributed most to Sudbury's economic recovery during the past 10 years (approx.):

   ___ Location/improved transportation links

   ___ Emergence of Sudbury as the regional centre of northeastern Ontario

   ___ Financial assistance from the federal and provincial governments

   ___ Other government actions (e.g. Taxation Data Centre, prov. govt. employment)

   ___ Local political leadership

   ___ Efforts of local economic development bodies (e.g. SRDC, Chamber of Commerce, Rainbow Country Travel Assn., Convention & Visitors' Services, etc.)

   ___ Initiative of local entrepreneurs

   ___ Community spirit and cooperation

   ___ Environmental improvement (cleaner air and water, revegetation, downtown improvement, etc.)

   Other factors:

   ___ _____

   ___ _____

   ___ _____

4. How would you rate the importance of environmental improvement as a factor in Sudbury's economic recovery, in general?

   ___ Not important, insignificant

   ___ Not very important

   ___ Important

   ___ Extremely important, critical

   ___ Don't know

CONFIDENTIAL

5. How would you rate the importance of environmental improvement as a factor in the growth of specific sectors of Sudbury's economy?

	Not important, insignificant	Not very important	Important	Extremely important, critical	Don't know
Public sector (govt. and health services, etc.)	___	___	___	___	___
Private sector financial and similar services	___	___	___	___	___
Tourism, recreation, the "hospitality industry" (including conventions)	___	___	___	___	___
Retail and wholesale trade	___	___	___	___	___
Secondary manufacturing industry	___	___	___	___	___
Other:					
_____	___	___	___	___	___
_____	___	___	___	___	___

5. Looking ahead, what do you consider to be Sudbury's major future economic growth areas?

Could/would these be helped along by further environmental improvements?

6. How has Sudbury changed as a community in recent years (population and social characteristics, attitudes)? Have these changes been reflected in public attitudes towards the environment and environmental issues?

7. Has a pleasanter, healthier, more attractive environment affected community spirit in Sudbury?

APPENDIX 4

"White Collar" Survey

Interview Guide

ECONOMIC BENEFITS OF ENVIRONMENTAL IMPROVEMENT STUDY

Introduction

Sudbury has experienced a period of major economic change in the past few years. At the same time, the environment has been strikingly improved, with substantial reductions in air and water pollution, extensive revegetation and redevelopment of the downtown area.

The purpose of this research project is to determine what contribution environmental improvement has made to the restructuring and recovery of Sudbury's economy.

Interviewee _____ **Date** _____

1. How long have you lived in Sudbury?

2. Why did you move to Sudbury?

3. How long have you been with this employer?

4. Sudbury has been through a long period of economic difficulty due to drastic job cuts in the nickel industry. In the last few years, Sudbury's economy has begun to recover due mainly to growth in the number of jobs in the service sector (government, financial services, health and education services, etc.), tourism and to some extent manufacturing.

   Can you identify three factors which have helped this recovery?

5. "Environmental quality" covers things like clean air, clean water, attractive scenery, generally pleasant surroundings. Some people believe that nowadays a community's economic growth and prosperity depend partly on the environmental quality it provides. How important do you think environmental quality (for example, reduced pollution, tree-planting) has been to Sudbury's economic recovery?

   Not important/ Not very important/ Important/ Extremely important

... /2

6. How important has environmental quality in Sudbury been (to you and your family) in your decision to (as appropriate):

   - locate/expand operations in Sudbury
   - move to/remain in Sudbury (personally)
   - accept/retain your present position?

   Not important/ Not very important/ Important/ Extremely important

7. Looking ahead, what do you consider to be Sudbury's major future economic growth areas?

8. Would future environmental improvements affect this growth?

9. What do you like about Sudbury?

10. Do you have other comments?

APPENDIX 5

"White Collar" Survey

Summary of Results

ECONOMIC BENEFITS OF ENVIRONMENTAL IMPROVEMENT STUDY

SUMMARY OF INTERVIEWS Total number - 28

Q1. How long have you lived in Sudbury?

8	a)	Under three years
4	b)	3 - 6 years
4	c)	7 - 10 years
2	d)	11 to 15 years
10	e)	21 or more years

Q2. Why did you move to Sudbury

3	a)	To open or take over a business
14	b)	Job transfer
5	c)	Always been here
1	d)	Family moved here
2	e)	Transfer to set up new office
1	f)	Came for P.S. education
1	g)	Due to spouse's work
1	h)	To learn English

Q3. How long have you been with this employer?

3	a)	Under two years
5	b)	2 - 5 years
4	c)	6 - 10 years
5	d)	11 - 15 years
10	e)	16 + years

Q4. Three factors that have helped Sudbury's economic recovery.

6	a)	Increased price of nickel
14	b)	Money from governments - for businesses and tourism
15	c)	Influx of government offices (ie. MNDM, Taxation Centre)
3	d)	Greening
6	e)	Increases in services available
3	f)	Work of municipal government to change image of city and to increase and diversify business
4	g)	Geographic location
4	h)	INCO and Falconbridge support for economic diversification
8	i)	Regional services role - education and health
4	j)	Influx of service sector jobs
3	k)	Tourist attractions and push for tourism
1	l)	Government regulations on Sulphur dioxide abatement
5	m)	Change in attitude of local people
6	n)	Economic diversification
1	o)	More stores
1	p)	Influx of construction workers
2	q)	Improved entrepreneurial spirit
2	r)	Increased manufacturing
2	s)	General economy of province and country better
1	t)	Change in Federal leadership and U.S. government

NB. - some respondents stated more than 3 factors

Q5. Importance of Environmental Quality to Sudbury's economic recovery.

8	a)	not important
3	b)	not very important
3	c)	important
14	d)	extremely important

Q6. How important is environmental quality in Sudbury to you?

13	a)	not important
2	b)	not very important
4	c)	important
5	d)	extremely important

Q7. Major Future Economic Growth Areas.

1	a)	Depends of base metal prices
17	b)	Services - hospitals, education, etc.
5	c)	Government jobs and services
7	d)	Tourism
5	e)	Manufacturing
4	f)	Mineral processing/mines will still play major role
3	g)	Small business both service and industrial
3	h)	Education
2	i)	Conventions

NB. respondents could give more than one answer

Q8. Would future environmental improvements effect growth?

a) Yes - 23
b) No - 4
c) Do not know - 1

Comments

a) Economy will remain primarily base metal based

b) Should/could encourage more people to come and stay

c) People come for jobs - environment is a secondary factor

d) Gives better message to outsiders, help shatter the negative 'moonrock' image

e) Environment is good now

f) But what will happen if Sulphur dioxide abatement is scrapped?

g) Town is littered

h) Need landscaping and continued greenification

i) Environmental improvements will have a small impact but interest will likely die in five years or so

j) From a non-business point of view it will help make the city a nice place to live

k) There is still a clear situation in Toronto: once you get enough money you leave the city for at least part of the year

l) Important in that it will make relocating easier

Q9. What do you like about Sudbury?

14	a)	People friendly
4	b)	Geographic location
15	c)	Close to nature
6	d)	No big traffic jams/less commuting time
3	e)	Climate
7	f)	Recreation
6	g)	Entertainment
9	h)	Size of community
4	i)	No big crowds
1	j)	Not much
2	k)	Close to large urban centres
2	l)	Easy air access (travel)
9	m)	Services available
2	n)	Scenic
3	o)	Unhurried pace of life
1	p)	Cosmopolitan
7	q)	Shopping
3	r)	Good job market
2	s)	Green grass/environmental quality
1	t)	Farmer's market
2	u)	Good place to raise children
3	v)	Healthy economy
1	w)	Tourist attractions
1	x)	Restaurants
3	y)	Topography
1	z)	Home town

Q10. Further comments - please see individual interview sheets.