This article by Professor G.A. Agranat of the Soviet Union is the result of a cooperative exchange agreement between the Institute of Social and Economic Research and the Institute of Geography, USSR Academy of Sciences. ISER sent a socioeconomic profile paper on Alaska to the USSR Academy of Sciences for publication there in 1976. This cooperative exchange of articles arises from the U.S.-USSR intergovernmental agreement on scientific and technical cooperation signed in 1972.

INTRODUCTION

The development of the northern regions of our planet has become a worldwide trend. Rising rates of economic development of the North are characteristic of all countries lying partly in this zone—the USSR, the USA, Canada, Denmark (Greenland), Norway, Sweden, and Finland. The growth of interest in these regions is due above all to the availability of large sources of minerals, fuel and energy, the need for which is constantly growing throughout the world.

In this article, since we are concerned chiefly with economic-geographical problems of the North, we will therefore define the North from the standpoint of these problems. In our view, the southern boundary of the North is a boundary of stable agricultural development, with grain being the foremost crop. This boundary passes along a line where the annual sum of temperatures of the vegetation period (days with the average temperature over 5 degrees Centigrade [41 degrees Fahrenheit] equals 1,600 to 1,800 degrees). This line, being at first glance of importance only for agriculture, well defines the geographical boundary of the North in general and particularly its major features—the harsh...
# ALASKA REVIEW OF SOCIAL AND ECONOMIC CONDITIONS

**VOL. XIV, No. 3, December 1977**

Published by

Institute of Social and Economic Research
University of Alaska, Fairbanks, Alaska

Institute Editor: Ronald Crows
8th Floor Gruening Bldg.
University of Alaska
Fairbanks, Ak. 99701
907-479-7434

Institute Director: Lee Gorsuch
707 "A" St., Suite 206
Anchorage, Ak. 99501
907-278-4621

## FEATURES

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<tr>
<th>Author</th>
<th>Page</th>
</tr>
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<tbody>
<tr>
<td>G.A. Agranat</td>
<td>1</td>
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<tr>
<td>Daniel A. Seiver</td>
<td>3</td>
</tr>
</tbody>
</table>

DEPARTMENT

Final Report Summary

Linda E. Leask  
Case Study of Fish and Wildlife Protection in the Planning and Construction of the Trans-Alaska Pipeline.

Book Reviews

Arthur E. Hippler  
The Ethnography of Northern North America: an Overview of Current Research  
(Reprinted from *Journal of Ethnic Studies*, Winter 1978.)

Gerald D. Berreman  
Aleuts in Transition: A Comparison of Two Villages

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Professor G.A. Agranat is on the staff of the Institute of Geography of the USSR Academy of Sciences, USSR. Professor Daniel A. Seiver, Ms. Linda E. Leask, and Professor Arthur E. Hippler are all staff members of the Institute of Social and Economic Research in Anchorage. Professor Gerald D. Berreman is a member of the Department of Anthropology, University of California at Berkeley.

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The Institute of Social and Economic Research (ISER) was established by the state legislature in 1961, as part of the University of Alaska, for the purpose of conducting interdisciplinary research in the social sciences and related fields.

Since its beginning, ISER has developed into a broad-scale, social science research institute, undertaking multidisciplinary studies of policies and problems of economic and social change in Alaska. Research subjects have covered a very broad range: economics of petroleum, mining, timber, agriculture, recreation, and other resources; social and economic impacts of major proposed developments; regional and community development studies; program evaluation; survey research; education; social service; legal, ethnographic, and other investigations relating to Alaska Natives; institutional and political studies of federal, state, and regional governments; transportation and energy development; population and manpower; arts and cultural life; and environmental, resource, and wildlife management. The institute also carries out international comparative analyses and Alaska-related studies that have involved the Soviet Union, Japan, and Canada.

Most ISER research is carried out for and in close collaboration with state executive and legislative agencies, federal agencies, and Alaska Native Organizations. Special emphasis is placed on transfer of information and research results to governments, private organizations, and to the public. This is accomplished through an extensive publication program, conferences and symposia, and professional consultation activities by institute staff.

ISER's full-time staff includes professionals in economics, political science, sociology, psychology, anthropology, regional planning, community development, transportation engineering, and other areas.

The institute maintains research offices in Anchorage, Fairbanks, and Juneau. ISER administrative offices and publications are located on the Fairbanks campus.
ALASKA ECONOMIC FORECAST—1978
(Including Review of 1977)

By Daniel A. Seiver

Editor’s note: This is the second year that ISER economist Daniel A. Seiver has presented his Alaska economic forecast for the coming year based on his economic modeling work at ISER. He presented his forecasts for 1978 at the Captain Cook Hotel in Anchorage, January 20, 1978.

1977 REVIEW

The Alaska economy settled back in 1977, following superheated economic growth in the previous three years. The year was certainly not a “bust,” but declining employment and rising unemployment contrasted sharply with the pipeline-boom period. In the paragraphs below, we review the aggregate performance of the state economy as well as disaggregated regional and industrial activity in 1977. We include in this review an evaluation of our 1977 forecasts.

Inflation

Inflation in Alaska subsided in 1977, with the Anchorage Consumer Price Index (CPI) rising 6.3 percent for the year, and the October index 5.8 percent above the October 1976 level. These rates are far below the double digit levels of 1975 and very close to the U.S. inflation rate. The actual rate of inflation was almost exactly equal to our forecasted rate.

Unemployment

Unemployment in Alaska rose sharply in 1977 to the highest levels ever recorded. Based on preliminary data, the average unemployment rate for the year was about 14.5 percent of the labor force, on a “non-CPS” basis. Much of the increase over 1976’s 10.5 percent unemployment rate directly reflects the massive pipeline layoffs. At the same time, however, there has been no doubt been a general easing of the state’s previously tight labor markets. Although unemployment rose throughout the state, it was exceptionally high in Fairbanks, as a direct result of pipeline completion. ISER forecasted record unemployment in 1977, and in fact, our forecasted level of 12 percent for the year was substantially exceeded.

Employment

The post-pipeline employment contraction has been distributed unevenly across the state’s major regions, and across industries. The Fairbanks region was relatively hard-hit, with substantial declines in construction and distributive industries, while the Anchorage region seems to have suffered quite minor employment declines in such sectors as construction, with gains in other sectors, such as services and government. The remainder of the employment declines have occurred in Alaska’s North, as a direct result of pipeline completion. Although our econometric computer model has no regional detail, we suggested in our 1977 forecast that Fairbanks would be particularly hard-hit, having been the most directly impacted during pipeline construction; however, our forecasted employment declines in Anchorage may not have occurred.

Several sectors of the Alaska economy were very strong in 1977, in spite of less expansive economic conditions: state and local government employment grew rapidly, as we forecast last year. Employment

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1As of this writing, only first quarter data are available for 1977. Preliminary data for the remainder of the year is subject to substantial revision, and even the “final” data may be revised. Thus, our review of 1977 results may also require revision.

2During 1978, the Bureau of Labor Statistics will begin issuing the revised Consumer Price Index (CPI) for Anchorage. Our review and forecast, however, are based on the “old” index.

3In 1977, the Alaska Department of Labor began publishing both the Current Population Survey (CPS) and adjusted and non-CPS-adjusted unemployment rates. Since the CPS rates will be substantially revised this year, we have chosen the non-CPS rates for continuity in our review and forecast. See Department of Labor, Alaska Economic Trends (March 1977) for discussion of the CPS. In general, the CPS unemployment rates are much lower, since seasonal workers are considered to be out of the labor force altogether rather than unemployed in the off-season.

4Preliminary data showed declines in state and local government employment, and this data has been revised sharply upward.
in finance, insurance, and real estate also increased. This sector was much stronger than we forecast, apparently continuing to respond to effects of the pipeline boom.

The construction sector contracted sharply in 1977, as forecast, as pipeline completion more than offset a strong construction performance in Anchorage. The transportation, services, and trade sectors all experienced declines in employment of varying magnitudes, although in general these declines will be smaller than forecast, based on preliminary data.

Those sectors of the Alaska economy which are not responsive to local conditions did well in 1977. Manufacturing employment was strong, in particular, as a result of an improving salmon catch, and the mining sector expanded as exploration activity increased in the Northern Gulf of Alaska and permanent operations personnel took over pipeline operations. Employment in the Federal government sector was steady at the 1976 level. We forecasted strength in the “exogenous” sectors in 1977, except for federal government; however, as we pointed out last year, the forecasts of these sectors are not based on results from our econometric model.

In summary, 1977 was a year of transition for the Alaska economy. As the “post-pipeline” era began, those sectors and regions of the state economy most affected by the pipeline boom were also the most affected by pipeline completion. In terms of our overall forecasts, unemployment did reach record levels, prices rose as fast as we had predicted, but employment declined less than we forecast. In particular, the Anchorage economy was stronger than forecast.

### 1978 FORECAST

The Alaska economy will again “mark time” in 1978. With the oil pipeline completed and with no major gas pipeline construction scheduled in 1978, the economy will settle back a little more this year.

#### Unemployment

Unemployment will remain high in 1978, at the record levels of 1977, with the unemployment rate in the first quarter of 1978 exceeding 17 percent of the labor force (see highlights box and Table 1). The annual average for the year will be almost identical to 1977, as the last half of 1978 should witness lower unemployment rates than the last half of 1977.

#### Inflation

Prices will rise more slowly in 1978 than in 1977, as measured by the Anchorage CPI. By the end of 1977, inflation had slowed to under 6 percent, and in 1978, it will further decelerate to about 4.5 percent. This will be the best inflation performance since 1973 and reflects further slackening in the economy.

#### Employment

Employment will also fall in 1978, although by

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**1978 FORECAST HIGHLIGHTS**

- Employment:
  - (Civilian Wage and Salary) Down 4 percent compared to 1977

- Prices:
  - (Anchorage C.P.I.) 4.5 percent higher in 1978
  - 4.7 percent for fourth quarter of 1978

- Unemployment
  - 14.4 percent for 1978
  - 17.5 percent for first quarter of 1978

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6 Non-CPS adjusted method.
7 New index to be issued in mid-1978.
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<td>15.7&lt;sup&gt;b&lt;/sup&gt;</td>
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Change from 1977: +4.5% -4.5% -6.8% -11.6% -28.3% -3.8% -12.6% +7.5%

<sup>a</sup> Old reporting Method (non-CPS).  <br/><sup>b</sup>Preliminary data supplied to ISER by the Research and Analysis Division of the Alaska Department of Labor and Alaska Department of Labor, Statistical Quarterly.  <br/><sup>c</sup>Actual.

A smaller percentage than in 1977. The forecasted 4 percent decline will again be spread unevenly across industries. However, by the fourth quarter of 1978, employment should be higher than 1977, even with no gasline construction.

Employment will fall most sharply in the construction sector, since 1977 construction employment included a substantial number of pipeline workers, prolonged by the reconstruction of Pump Station 8, and there will be very little of this employment in 1978. The residential construction sector will also probably be weaker in 1978. The employment decline is forecast at 26 percent. Excluding Alyeska employment, however, the construction sector employment will fall by 14 percent.

Employment in support sectors will generally show small declines from 1977. Communications, public utilities, and transportation employment will decline only slightly in 1978 (4 percent), while employment in trade (7 percent) and services (12 percent) will fall somewhat more sharply. The larger decline in services reflects the fact that a substantial number of Alyeska employees are included in the services sector. The model also projects a decline in employment in the finance, insurance, and real estate sector (12 percent); but this sector will probably remain flat in 1978.

The state and local government sector will again grow in 1978, mainly as a result of a growing state budget. Employment in state and local government is forecast to rise about 7 percent over 1977.

Employment in Alaska’s “export” sectors is forecast separately from the model. We are forecasting higher employment in mining (mainly oil and gas) and in agriculture, forestry, and fisheries. Employment in manufacturing should also rise with a better salmon harvest. Employment in Federal government should again be steady at 1977 levels.

Overall, the 1978 picture is one of modest declines in employment, continued high unemployment, and a slowing of inflation. By the end of 1978, however, the economy will have completed its post-pipeline transition and will be growing again.
Outlook for the Soviet North

The Soviet North (Figure 1) occupies over a half of the USSR's total area, or over 11 million square kilometers (sq. km.).\(^1\) Using similar criteria, we find that the North also includes almost the whole of Alaska and about 6 million sq. km. of Canadian territory.

\(^{1}\) Or 4,263,565 square miles (2.58 square kilometers equals 1 square mile).

According to estimates as of January 1, 1972, the population of the Soviet North was 7.2 million, or less than 3 percent of the total population of the Soviet Union. The density of population is far greater than in Alaska (302,000 in 1970) and the Canadian North (350-400 thousand people, according to our estimates).

The role of the North in the industrial development of the USSR is already important today. This region supplies oil, natural gas, nonferrous metals and gold, raw material for mineral fertilizers, and also timber and paper.\(^2\)

\(^{2}\) Detailed information in English about the economy of the Soviet North is to be found in a book by Prof. S.V. Slavin, the most long-standing investigator of problems of development of the productive forces of this zone, published in the USSR for foreign readers. See S.V. Slavin, The Soviet North, Present Development and Prospects, (Moscow: Progress Publishers, 1972). Extensive material is also contained in the Soviet scientific symposia, "Problems of the North," translated into English by the National Research Council of Canada since 1959.
Oil and Gas. In the future, the importance of the Soviet North will be growing steadily. According to the "Guidelines for the Development of the National Economy of the USSR for 1976-1980," adopted by the Twenty-fifth Congress of the Soviet Communist Party, by 1980 Western Siberia (most of its oil- and gas-bearing areas belong to the North) will be producing 300-310 million metric tons \(^2\) of oil and 125-155 billion cubic meters \(^4\) of natural gas; the Timan-Pechora oil and gas province (Komi Autonomous Republic) will be producing 25 million tons of oil and 22,000 million cubic meters of natural gas. This will add up to over 50 percent of the total oil and about 40 percent of natural gas produced in the USSR as a whole. In addition, large deposits of gas are to be developed in Yakutia.

\(^2\) A metric ton equals 2,205 pounds, as compared to the U.S. short ton of 2,000 pounds or the U.S. long ton of 2,240 pounds.

\(^4\) One cubic meter equals 35.31 cubic feet.

Mining. Large-scale expansion will be carried out at the Norilsk mining complex plant, which produces not only a major part of all nickel produced in the USSR, but also copper and other valuable components of polymetallic ores. In addition, development is planned for the Udokan copper deposit in the North of the Chita region, one of the largest deposits in the USSR.

There are also prospects in the near future for expanding the mining of a number of nonferrous metals in the Yakutia and Magadan region. The production of apatite, a raw material for phosphate fertilizers, will be expanded in the Kola Peninsula.

The Soviet Union also plans to create new branches of mining in the North. This includes: titanium production in the Komi Autonomous Republic; aluminum raw material in the Arkhangelsk region, the Komi Republic, and in the Yenisei North; industrial production of nephelines (which today form mostly waste products of apatite production); and development of the largest kianite deposits in the

Figure 2. Transportation Routes in the Soviet North.

Editor's note: the maps included with this article are taken from Terrence Armstrong, Soviet Northern Development, with Some Alaskan Parallels and Contrasts (University of Alaska, Fairbanks: Institute of Social and Economic Research Occasional Paper No. 2, October 1970), 37 pp. The maps are furnished here for general information only and do not reflect any growth of railroads, roads, pipelines, or other development in the Soviet North that has taken place since 1970.
Eastern part of the Kola Peninsula.5

Timber. The development of the timber industry, now playing an important role in the economy of the European portion of the Soviet North, will be continued. New industrial timber centers will emerge in the Ob and Yenisei basins within the next 10 to 15 years.

Electric Power. The electric power base of the North continues to expand. Electric power stations are planned for the Lower Angara and Middle Yenisei, with total capacities of at least 10 million kw. In the future, together with the operating large Bratsk and Ust-Ilimsk hydropower stations, these stations will supply electrical energy to the southern regions of Siberia.

Transportation. The Baikal-Amur trunk railway now under construction (Figure 2) will greatly stimulate the development of the North. It will contribute to the development of mineral and forest resources in the north of the Irkutsk and Chita regions, the south of Yakutia, and the North of the Amur region and Khabarovsk territory. In particular, the rich deposits of iron ore will be developed in Southern Yakutia in the near future. Contributing to such development are the nearby deposits of coking coal, already being mined.

A Source of Fresh Water. In the more remote future, the North may also become a supplier of fresh water. The 25th Congress of the CPSU6 set as one of its major tasks the study of scientific problems connected with the plans for diverting part of the flow of big northern rivers, initially the Pechora and Ob, to the arid southern areas of the European portion of the USSR, as well as Central Asia.

The Traditional Sectors. Industrial development of the North and its exploitation as the richest store of mineral, forest, and energy resources does not mean at all that the old, traditional branches of the economy of this region will be neglected. Much attention is also being devoted to hunting, the fur trade, deer breeding, and fishing, which form the economic foundations of the indigenous population. The Soviet North has 2.5 million head of domesticated deer (reindeer), the richest store of all northern regions of the world.


6Communist Party of the Soviet Union.

GENERAL PROBLEMS
IN NORTHERN DEVELOPMENT

As we have said, the increasing development of the North has become a worldwide trend. This is confirmed by forecasts of Alaska's development carried out by the Institute of Social and Economic Research (ISER) at the University of Alaska. According to this institute's predictions, under conditions of accelerated oil development, Alaska will, by 1990, be producing up to 380 million tons of oil a year, and the population will reach about 730,000.7 These are very high growth rates; in 1976, Alaska produced only about 10 million tons of oil and had 340 to 350 thousand inhabitants.

However, developing the North is not an easy matter. Complex natural-geographical and economic-geographical conditions (harsh climate, remoteness, and an unsettled territory) give rise to serious social, economic, technical, and ecological problems. Each country in developing its northern area chooses its own way of solving these problems. However, there are a number of problems whose specific features and ways of solution are similar everywhere. These problems and the methods of solving them can serve as the foundation for scientific and technical cooperation between countries in the development of the North.

The Economic Problem

A primary problem in the development of northern regions is, of course, the economic problem. As a rule, because of geographical conditions, the capital investment required for a project in the North is considerably higher than it would be for a similar project in the well-settled middle latitudes. In addition, returns on investments are much slower. Costs of construction in the North are two to three times (or even higher in particularly inaccessible areas) what they would be in the central regions of the country and because of complex conditions in the North, operational costs are likewise higher.

Also adding substantially to costs of development in unsettled northern regions is the absence there of a production and social infrastructure. Before development can proceed, there must first be created such basic necessities as transport routes, power sources, and settlements—infrastructural elements that already exist in developed or settled regions.

In some cases, the high quality and high concentration of raw material or fuel resources in the northern regions, particularly compared with deposits in developed regions that are being depleted, partly compensates for the high costs of construction and of life in the North. But in national economic terms (that is, considering all outlays—not only directly on the mining of raw materials but also that required for creating an infrastructure) production costs in the North in most cases appear higher compared with similar enterprises in the more developed southern localities.

But all this has to be taken in one's stride, for we have in the North the largest (often unique) deposits of minerals, fuel, and sources of hydropower. Besides, many Soviet economists and planners lean towards the view that we cannot apply the same financial-economic measures to the development of the rich resources of the North as we apply to economic construction in settled regions. In approaching development in the North, one must consider both the long-term and the short-term prospects, as well as the possible, though not easily predictable, growth of incomes and the potential emergence of new enterprises. In this sense, the problems of northern development are similar to problems involved in such long-term, national-economic and scientific/technical programs as space exploration and the use of the world's oceans.

In this connection, the norms of economic effectiveness of investments applied in the central regions (in other words, the time of their recoupment) should not be always strictly applied in the North, but should be lowered somewhat since the period required for recoupment there is longer. This different approach towards investment in the North is particularly essential in creating elements of a production and social infrastructure, for it is precisely infrastructure that adds the highest share to the cost of the developing unsettled regions, while resulting returns on investments are very slow. Yet infrastructure—settlements, transport routes, electric power stations—is the basis that ensures future development of the productive forces in the newly developed regions and yields long-term benefits to the national economy of the regions concerned and, by this token, to the country as a whole.

A reservation should be made here that the above broad social and economic approach simply means that there is a need for the initial impulse—a catalyst for the economic development and settlement of the territory. This stimulus to development may be in the shape of reduced economic norms or, if these remain uniform across the country, in the form of special lump sum subsidies, long-term loans, and credits. Or else, there may be reduced transport rates, reduced payment for fixed production assets, and for the use of land and natural resources. But this support and aid given in the initial stages does not rule out that northern economic construction must be carried out in accordance with traditional principles of strictest financial-economic input-output accounting, and on the basis of general rules and norms applicable to all enterprises.

State Help

It must be said that this economic policy for developing unsettled regions, especially regions with complex conditions of economic colonization, is not something entirely new. Historical experience shows that in the conditions of a private-property economy, the state itself has usually built railways and constructed initial settlements in new areas, where entrepreneurs appeared after that. But this was done mostly at a loss. Or else, the state generously helped these entrepreneurs who became pioneers of colonization of undeveloped lands.

These examples may be found in the history of many countries. The trans-Siberian railway line was built at the end of the nineteenth and the beginning of the twentieth century with funds provided by the Russian government, and, as testified to by historical statistics, the vast investments were made good by the profits of the railway only many years afterwards. But the rail tracks awakened to life the vast Siberian region and thus contributed to the growth of Russia's might.

The policy of state guardianship and state economic protectionism was long characteristic of the colonization of mining areas in Canada back in the 1920s and 1930s. Modern development of the northern regions of Canada and Alaska provides a still better illustration. As is known, the governments there build roads and airports; or it helps private firms to build them, providing a lot of help—much more than in other areas—in the shape of tax breaks and other benefits.

Judging by literary and statistical sources, private firms themselves often apply special yardsticks to the construction of their enterprises in the North. As we see it, they purposefully accept slower, more prolonged returns on capital and, at early stages, even smaller dividends. They believe,

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justly it seems, that in the future they will make up for it with a vengeance. We have noticed, for example, that the projected amortization period of the Arctic Gas pipeline from the northern shores of Alaska and Canada to the southern regions of Canada and the USA designed by the American-Canadian consortium would have covered 37 years!  

Quantitative Systems Analysis of Northern Development

Soviet economists, geographers, and other scientists and experts are now working to provide a scientific-theoretical substantiation of a broad socioeconomic approach to criteria of economic development in the North. Suppose, for example, that it is necessary to prove that it would be more advisable to link by rail than by highway a northern region rich in minerals and where at present only one mine is being built. Even though the highway would be much cheaper and quite adequate to handle the present volume of transportation, one must consider not only the costs today and the foreseeable economic results, but also of a number of other factors, some of which can hardly be calculated in strict quantitative terms. These factors include:

- The impact of a transport route (railway) in accelerating the rates of development and the emergence of new enterprises.
- The social role of the railway in bringing remote areas "closer" to settled areas, which would make them more attractive to new settlers.
- Stimulation of tourism.\(^9\)

It is not easy to take all these factors into consideration. These investigations require the application of new methods of qualitative and quantitative systems analysis. The main feature of these methods is the processing of qualitative indicators that are not strictly formalizable and also consideration of long-range probabilities. Putting it more simply, this requires combining precise methods of investigation with expert evaluations. Electronic computers will also be needed. Only when these investigations have been carried out, will it be possible to decide whether or not it is advisable to apply a broad economic approach to the development of a territory in question (in our case, whether or not to build a railway). Soviet investigators and, in particular, scientists of the Siberian branch of the USSR Academy of Sciences already apply these methods, working out of projected variants (or so-called “scenarios”) for development of Siberian and northern regions.

All this is helpful in drafting long-term (15- to 20-year) plans for developing the productive forces of northern regions. The absence of such plans may result in definite imbalances in development, when discrepancies arise between the level of development of the infrastructure and basic sectors of the economy, or when a delay in the creation of this infrastructure inhibits firm settlement and leads to an unstable population.

Thus, the most pressing problem in the development of the North today would seem to be the need for priority creation of a production and social infrastructure. But care must be taken to ensure that the infrastructure does not outpace the development of basic economic branches, to a larger extent than is necessary.

SPECIFIC PROBLEMS AND CONSIDERATIONS OF NORTHERN DEVELOPMENT

Settlements

Let us now turn to concrete problems of the development of the North. On top of the list is the problem of settlement. Industrial construction in the northern regions of the Soviet Union has long gone hand in hand with the creation of permanent populated centers—towns and workers' settlements. The Soviet Union has the largest towns in the Arctic and subarctic North. In addition to such long-established centers as Murmansk and Arkhangels, industrial construction during the last three to four decades has given rise to Norilsk, Magadan, Vorkuta, and many other large urban-type settlements. The emergence of new towns and the expansion of the existing ones is a continuous process.

But the development of the productive forces in northern territories is a process that differs in its direction and character. Not always and not everywhere does it necessitate the building of large towns, for the backbone of the economy in the North is to this day extractive industries, primarily mining and forestry. These industrial enterprises at times do not require a big workforce, and quite often they are short-lived. But this does not preclude the need to provide workers of these enterprises with decent housing and with all or, at any rate, a sufficient number of socio-cultural establishments, from the


modern standpoint (for example, schools, hospitals, and clubs).

These human needs create serious difficulties in deciding ways and forms of settlement in new territories. The choice of a variant depends above all on a long-term plan for the development of the North mentioned earlier. If there are prospects of further development and emergence of new enterprises in a given area, it will evidently become necessary to build a permanent town or workers’ settlement, even when it does not appear to be quite profitable from today’s standpoint. This is not to say, of course, that a big town must be built at once, but the master plan must envisage the possibility of its expansion and, more important, the creation of all attributes of modern housing—communal, social, and cultural—as soon as the settlement appears.

As we have already said, large urban centers are not needed throughout the North. Most often, multi-functional towns arise only as a base for the development of large areas. Workers of oil and gas fields, mines, collieries, and timber centers begin to gravitate to these towns; settlements are established. These settlements are provided with well-appointed housing, a complex of cultural facilities, and service establishments, though, surely, on a more modest scale than in long-established towns. This settlement scheme is recognized in our country as the most fitting for newly developed industrial areas. This view would also seem to be shared by foreign specialists.

But even this scheme is far from ideal. Sooner or later, numerous oil fields and mines will cease to exist due to the depletion of raw material resources. Then, a settlement has to be abandoned and become a ghost town.

Shift settlements. To deal with problems of workers’ settlements in remote areas, there is much publicity today in the Soviet Union as well as in the USA and Canada for so-called “shift settlements.” These are in fact being used to some extent. In this scheme of settlement, workers come to oilfields, a mine, or colliery from a nearby town-base and work there for several weeks. They then rotate back to their own base and families and their place is taken over by another shift. Shift settlements are provided with a minimum of essentials: dwellings (hostels), a canteen, and, perhaps, a club. Modern house-building techniques and progressive building materials make it possible to quickly build and easily deliver and assemble small houses provided with such essential urban conveniences as central heating, hot water, and sewerage.

The shift method of workforce provision yields considerable savings compared to the traditional method of building permanent settlements. For this reason, it is beginning to come into use on the gas fields of the North of Western Siberia. As far as we know, shift settlements are also widely used in the oilfields of Northern Alaska and have long been used in mining and timber workings in the unsettled areas of Canada.

Nonetheless, the shift method, in our view, must be used with great caution. There is no consensus among Soviet scientists on the matter. As we see it, the shift method is indeed advisable in areas where:

- Unfavorable climatic conditions exist.
- Deposits are small and can keep new enterprises in operation for only comparatively short periods.
- There are no prospects for the emergence of new enterprises.

This method must also be given preference in cases where enterprises are highly automated and require a small number of workers (as, for instance, oil and gas fields). Shift settlements are advisable also because such enterprise areas, oil wells or clusters of wells, are often territorially quite dispersed, at times, tens of kilometers apart. Such an arrangement makes irrational the creation of permanent settlements.

Short-Comings of Shift Settlements. But even in these cases it is extremely desirable, to our mind, to have towns or large base settlements as close as possible to shift settlements, at any rate within the boundaries of the North and in a climate similar to that of the shift settlement. Otherwise, frequent and sharp alterations of climatic conditions (for example, between a shift settlement and a base settlement outside the North) might have a very painful effect on the human organism. Apart from the physiological aspect of the matter, the very need to adapt to new conditions of work and life in every shift could not but have an adverse effect on man’s mood, his capacity to work, and, ultimately, on his productivity. Nor should we lose sight of the moral-ethical aspect, because frequent stays away from one’s family most probably have their grave disadvantages. In any case, these questions require serious medical-physiological and sociological study.

But, perhaps, the principal shortcoming of shift settlements is that, in a manner of speaking, they

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leave nothing for the North; they do not create, unlike any other object of infrastructure, any basis for the expansion of the process of territorial development. Their dwellings and other buildings are moved to other places. They usually do not require roads, and transport communication with them is most often by air. Their energy base consists of movable installations. As one Soviet author put it, the economy of shift settlements is the economy of birds of passage. This type of economy may be acceptable only when one has confidence that a given area is needed for the building of just one enterprise. Such confidence, however, should be based on serious investigation and pondering, for this is an age of unexpected discoveries, when things that are seemingly unimportant today can become extremely valuable tomorrow.

Resource-Related Industries and Rear Support Bases. We have already mentioned the high cost of living and working in the North. This condition makes it expedient to develop there only definite industries or sectors of the economy that correspond to the geographical features of northern regions, above all, industries involved in the mining and primary processing of valuable minerals, exploitation of forest resources in the southern regions of the North, or the use of rivers for large-scale production of electricity. Such industries or industrial sectors make up the backbone of the economy not only in the Soviet North, but also in Alaska and northern Canada.

A compelling factor in narrowing the range of auxiliary and service industries in northern regions is the high production costs there. This applies first of all to the production of building materials and house building. The scientists and specialists of the State Committee for Construction of the Council of Ministers of the USSR evolved the concept of so-called rear-support bases for construction in the North. This concept essentially involves transferring production of building materials and building structures from northern regions, where production costs are prohibitive, to developed regions, where costs are considerably lower, leaving only assembly to be performed in the North.¹²

To this end, large rear-support bases for construction in northern regions will or are being built along the southern periphery of the North, in such big towns as Tyumen and Krasnoyarsk. From there, building structures and prefabricated houses will be delivered to towns, settlements, and new construction sites of the North.

The tendency towards maximum removal of production from the North to developed regions of the middle latitudes is also characteristic of other auxiliary and service branches of the economy. Calculations show that in many cases it is more profitable, for example, to dispatch complex and costly machinery for overhaul to the south. In the Magadan region and Yakutia, major overhaul of mining and transport equipment even in factory conditions is one-and-a-half times more expensive than the original production of a new machine of the same type. Thus, it is more expedient to buy and bring in a new machine than to overhaul the old machine on the spot.¹³

But this approach cannot be universal or applicable at all times. With the growth of the scale of development of the North and the advance of science and technology, the concept of rear-support bases that is economically advisable today may not prove to be the best variant tomorrow. Incidentally, already now, in the case of such major centers of concentrated construction as, for example, Norilsk, the advantages of transferring production of building materials and building structures from the North become minimal or disappear altogether. Another case in point may be Alaska, where building materials, including cement and plastics, are produced in the larger cities, and house-building (prefab) factories have appeared.

The same thought applies to the complex question of the economically advisable limits of raw material processing in the North and the creation of a processing industry there. So far, as we have already said, it is more profitable to ship raw materials out of the North for "deep" processing.¹⁴ In the future, however, the situation may change, for even now the thesis about the disadvantage of deep processing of raw materials in the North is not universally valid. For example, certain economic-geographical conditions have already made expedient the emergence of some processing industries in the Soviet North. We refer to those regions of the Soviet European North where development has been going on for a long time. These regions are comparatively close to


¹⁴The author uses the term "deep" processing to refer to such operations as the reduction of metal ores to pure metal, the conversion of crude oil to heating or diesel fuels, or the production of pulp paper from logs, or other similar levels of processing.
the center of the country, have good communication with it, and possess more favorably natural conditions than other Northern regions. Well developed there are a pulp and paper industry, ferrous metallurgy, chemical industry, and mechanical engineering.\(^{15}\)

There also are examples of developed processing industries in the USSR's Asian North where conditions are much less favorable geographically and economically than in the USSR's European north. For example, the final product of the Norilsk mining metallurgical combine is not ore or concentrates, as in the case of most other similar enterprises of the North, but pure nickel, copper, and other metals. Bratsk is the center of aluminum production.

It may be presumed that in the future the share of so-called secondary industries (that is, industries for deep processing of raw materials) will grow into the branch structure of the Northern economy. However, there are a number of prerequisites for this. It may be expected that the creation of a network of towns and modern-type settlements in the North will help resolve the still rather acute problem of labor. And this is very important for establishment of the secondary branches which, as a rule, are rather labor-intensive. Most of the northern regions are developing their own powerful, economically effective fuel and energy base (hydropower, oil, natural gas, coal), which is one of the basic conditions for the development of power-intensive metallurgical, petrochemical, and other processing industries.

In a number of regions, deposits of mineral raw materials are found in close proximity to fuel and technological materials required for their processing. For example, in the southern part of Yakutia, a large metallurgical complex is being set up on the basis of nearby deposits of iron ore and coking coal.

Transportation can also serve as a stimulus for development. For example, the Baikal-Amur railway will stimulate development of a processing industry in the nearby northern regions. Planned for this year is construction of wood-working, pulp, and paper complexes; ferrous and nonferrous metallurgy processing plants; and oil-processing plants.

Scientific and technical progress is likewise a factor contributing to on-the-spot deep processing of raw materials in the North. We may refer to the previously mentioned method of directly recovering iron from ore, precluding the blast-furnace process. This method facilitates, both technologically and economically, the creation of iron and steel metallurgy at places where ore is mined.

The validity of the thesis concerning the possibility of a deep processing of raw materials produced in the North is confirmed by the known projects for creating large-scale processing industries in Alaska and the Canadian North. We have in mind such projects as the one for building a metallurgical plant at Great Slave Lake in Canada (because of the existence there of both lead and zinc), or various projects for building copper mills at the Kobuk deposits in Alaska.\(^{16}\)

But it should be stressed that the above indicates only the general tendency of development of the economic structure of the North as we see it. Concrete technical-economic, foreign-economic and other estimates and considerations may introduce various changes. It may turn out, for example, that the interests of export may require transportation of natural gas, not in the usual, but in a liquefied state, and for this, special gas-processing plants will have to be built.

In general, the operation of the above-mentioned long-term socioeconomic and scientific-technical factors is not as simple as it might appear. The growing scale of development and deeper inroads in northern regions will not always lead to the expansion of their economic structure. For example, a railway laid to Norilsk will most probably make superfluous some types of production, such as small engineering plants for producing spare parts for a number of machines (for example, for some types of mining equipment). Their existence is at present justified only by unreliable, seasonal, and costly transportation links between Norilsk and major industrial centers of the country (air transport is expensive; the Northern sea route and the Yenisei reliably function as transport arteries only 3 to 4 months a year). A railway line operating year-round would make the delivery of those products cheaper and more regular.

### Economic Diversification

On the whole, we repeat, the general trend of development in the North shows a definite increase in the extent of its economic diversification and improvement of the economic structure. In this connection, we should point out the special concern shown in the USSR for the development of agriculture.


\(^{16}\)Another Alaskan example is the new oil refinery in North Pole, Alaska, on the outskirts of Fairbanks.
Firm settlement of the North and the creation of normal conditions for permanent or, at least, long-term residence there of millions of people implies also the creation of a local food base. As the Soviet experience has shown, the nature of the North, especially its taiga zone, makes it possible to profitably grow vegetables and potatoes and to breed cattle and poultry. Even in Norilsk, a hundred kilograms of locally grown potatoes can be purchased more cheaply than potatoes brought in from remote areas.

The USSR’s northern zone has over 600,000 hectares of sown areas and over one million head of cattle. Already, local farms in many northern regions supply 30 to 50 percent of the local demand for vegetables, potatoes, milk, and eggs. In this respect, the Soviet North is far ahead of other northern regions, such as Alaska, where local farms play an insignificant role as food suppliers.

In the future, there will arise in the North, just as in other areas of our country, more and more territorial-production complexes (combined branches of material production and the nonproduction sphere), best suited in socioeconomic terms to the natural and economic conditions of the area concerned. So far there are only a few such complexes in the North; examples are the Timan-Pechora, West-Siberian, and Bratsk-Ilimsk complexes. These complexes have a well-developed economic structure and good economic ties connecting extractive, processing, and ancillary branches of the economy; an adequate transport base; fully appointed settlements; and the entire complex of nonproduction facilities.

Thus, from the standpoint of territorial organization of productive forces (that is, their spatial distribution), the development of the North will proceed from separate sources of industry to territorial-production complexes. Such complexes are the most important feature of the economy of developed socialism. In this respect, the North is following, in the final count, the same road as other regions of the Soviet Union. True, it will evidently retain its specific features as regards the character and degree of development of territorial-production complexes. In the foreseeable future, however, the territorial organization of the economy by separate sources will retain its primary importance.

Technology for the North

Under present conditions, one of the serious problems involved in developing the North is the economical use of human labor and the raising of labor productivity. This is a crucial problem raised by the Twenty-fifth Congress of the CPSU. In the North, this problem is particularly enormous because the territory is unsettled and the cost of attracting and maintaining a labor force in the North is high.

The chief means of solving this problem is by raising the technological level of enterprises, the level of mechanization and automation. Our specialists have proved that the most up-to-date technology must be introduced in the North. This is so not only because of hard production conditions in the North. The point of the matter is—and this is, perhaps, most important—that the use of new technology in the conditions of the North yields relatively greater economic results than in developed regions. This effect depends on the extent to which a new machine, mechanism, or automatic device releases labor, reduces the volume of manual work, and raises the labor productivity of remaining workers. In the North, human labor is very costly; there is a shortage of labor; and attracting new workers costs considerably more than, say, in the central regions of the country. However, while the rate of technical progress is steadily rising in the North, we cannot thus far say that the level of mechanization and automation in absolutely all industrial and transport enterprises there is higher or even as high as it is in similar enterprises in the central regions of the country.

The problem of scientific and technical progress in the North is also compounded by the fact that the grim natural-geographical conditions of this zone require in most cases machines, mechanisms, equipment, and materials either produced specially for these conditions or strongly modified compared to standard, serial models. It is well known that at temperatures of 40 to 50 degrees below zero Centigrade, ordinary steel becomes brittle and the beams of excavators or frames of tip-up lorries (dump trucks) often break down. Lubricants used in the temperate zone thicken at such temperatures and rubber cracks.

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17 A metric unit of area equal to 2.471 acres.
In the Soviet Union, very much attention is given to developing special (regional) machinery for the North, though there is still a shortage of it. Of primary importance is the development of better cold-resistant and more reliable machines, structures, equipment, and materials. Production has already been started of cold-resistant grades of steel, fuels, lubricating oils, and technical rubber articles. Lorries of special types are manufactured for the North. Assembly of trucks for northern regions has been started at a plant in Chita. Under the auspices of the State Committee for Science and Technology of the Council of Ministers of the USSR, a Scientific Council has been set up to study the problem "Development of Machines for Operation at Low Temperatures." It coordinates all Soviet research and development in this field.

The Institute of Physical-Technical Problems of the North has been functioning for several years now in Yakutsk, in the system of the USSR Academy of Sciences. Its staff workers search for ways of solving numerous technical and technological problems in conditions of low temperatures, snow storms, and permafrost. Among the many questions being investigated by the institute are:

- What should be the characteristics of high-voltage transmission lines in the North?
- What are the specifics of drilling and other mining jobs in the North?
- How does one deal with the complex problems of laying different kinds of pipes in Arctic conditions?
- What are the methods of controlling the heat regime and thermal protection of engineering structures and communication systems in the North?
- To what extent is it advisable in the North to use synthetic materials, pneumatic structures, and also structures (roads, stores, dams) made of ice and its technical modifications (reinforced ice, foam and porous ice, ice with heightened heat resistance)?

But still much remains to be done to develop technology for the North. The importance of this task can be seen from the fact that it was discussed by the Twenty-fifth Congress of the CPSU. In some fields, we are behind Alaska and the Canadian North, for example, in development of small multi-purpose snow vehicles, which we only have in small quantity.

The problem of adapting machinery to the conditions of the North is not only one of engineering, but also one of economics. The losses incurred through inadequate adaptation are enormous. But equally considerable are expenditures on the manufacture of specially built regional machinery, especially if we take into account the fact that it has to be produced in small numbers, at least compared with the vast volume of standard machines supplied. There is also this question confronting us now: would it not be, perhaps, more advisable, as the need for machinery for cold-climate regions increases, as more and cheaper metals and other structural materials are produced, to manufacture some types of machines with such a reserve of reliability and life of engine that they would be useable in practically all climatic zones?

**Methods of Building in the North**

A special and difficult question concerns methods of building in the North. Our country is a recognized pioneer in developing methods of building premises, roadways and railways, and other projects on permafrost. Sixty years ago, Russia was the first to apply the method of laying foundations and bases with the help of piles, a method that is now widespread in all northern regions of the world.

But the problem of permafrost building becomes more complicated each year due to the appearance of new types of building projects—responsible in their function, multi-storied, heavy, and creating tremendous, earlier unknown thermal loads on the soil. This causes new "reactions" of permafrost and is a compelling factor in the search for new technological solutions. For example, new investigations are required to develop methods of laying durable oil or gas pipelines which will carry oil and gas having rather high temperatures after their extraction. Methods are also needed for laying railway beds that would hold trains several times heavier than before. These and other problems are presently being studied by a large number of research and development institutes in the Soviet Union.

A broad search is also under way for the most suitable architectural-structural and volume planning decisions in new or expanding towns and settlements. A mere enumeration of new types of dwellings developed by Soviet architects and engineers would take much space. These include houses for towns and rural areas, portable dwellings, new schemes for the most rational layout of populated centers, and new methods of providing essential amenities. There are

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many publications on these questions in the Soviet Union.\textsuperscript{22}

Questions of construction in the North are so important, it is not surprising that in this sphere we observe, perhaps, the most active cooperation, scientific and technical, in the North between the USSR and the USA and also between the USSR and Canada. The well-known American-Soviet agreement of 1972 on scientific and technical cooperation makes a special reference to these questions. In recent years, there have been exchanges of specialists and mutual consultations. As far as we know, American and especially Canadian specialists recognize the Soviet Union's large successes in the organization and technology of large-scale construction in the North. Conversely, our builders find many valuable things in Alaska and the Canadian North, notably in the laying of pipelines and in new projects for the building of towns and settlements. Noteworthy is their headway in the design of methods and techniques of urban amenity complexes in small settlements in the North, which in general, is a very complex technical-economic task.

Coordination of Research and Development

A few words now about organizational forms of controlling the research and development of the North. Coordination of and cooperation in northern development as well as the application of integral forms of control to such development have long been practiced in our country. We may recall the work of the Committee for the North under the All-Russia Central Executive Committee of the 1920's and the Chief Board of the Northern Sea Route of a later period.

The experience of the last few decades has demonstrated that decentralized, narrowly parochial control is one of the reasons for possible imbalances in economic development. The implementation of such large national economic programs as the Bratsk-Tiumsk and Angara-Yenisei complexes or the Baikal-Amur Railway project requires single, strictly coordinated guidance.

For each of these programs there is a general contractor who coordinates plans and designs of projects, their volume and time-schedules. Research work is coordinated, too. Thus, under the auspices of the USSR Academy of Sciences there is a special commission for general scientific-methodological guidance and coordination of the study of problems related to the development of the zone of the Baikal-Amur Railway, which is headed by Academician A.G. Aganbegyan, an eminent economist. The role of the head research institution coordinating basic research for the entire region of the North is played by the Central Economic Research Institute under the State Planning Commission of the Russian Federation.

THE ECONOMY AND THE PROTECTION OF THE ENVIRONMENT

Let us now take a look at a problem that has arisen quite recently, but the importance of which is hard to overestimate. We refer to the problem of the rational use and protection of the environment, which is very complex and at the same time little studied. Let us examine it in some detail.

This problem is due first of all to the great vulnerability of the natural ecological systems of the North. Thus, a particular scale of economic activity will disturb the natural balance in the North considerably faster than in the moderate zone. Because of low temperatures and low biological productivity, the capacity of the air and waters of the North for self-purification is not great, and they quickly get polluted. In addition, the presence of permafrost contributes to the destruction by transport and other technology of the soil and vegetation cover of the tundra and forest tundra, leading to swamping and erosion of slopes. The nature of the North requires an exceptionally cautious approach.

All this is well known. And still, in the Soviet North and, as far as we know from literature, also in northern regions of other countries, including Alaska, there are noticeable and, in places, very serious examples of the disturbance of the natural balance and pollution of the air, waters, and soil. The growing scale of economic development and settlement of the North and, especially, the development of the oil and gas industry, which is a particularly dangerous enemy of nature, lend urgency to the need for study, rational use, and protection of the environment in the North.\textsuperscript{23}

This problem is complex and many-sided, and solving it requires the efforts of contiguous sciences. As far as the North is concerned, this problem has not

\textsuperscript{22}L.K. Panov, ed. (Forecasts of the Settlement and Planning of New Towns of the Extreme North), 1974.

\textsuperscript{23}V.V. Kryuchkov, Krainy Severa: problemy racionlizirovannogo ispol'zovaniya prirodnikh resursov [The Extreme North: Problems of the Rational Use of Natural Resources] (Moscow: Myas Publishers, 1973).
been studied enough, and everything is far from clear in the behavior of natural (ecological) systems of northern regions when they are affected by man and technology. And, most important, the ecologically permissible limits of economic loads on the nature of the North have not yet been established. The absence of such ecological-economic norms creates the danger of overburdening the natural environment when an industrial enterprise appears. For example, due to the specific features of its ecosystems, a river in the North with the same values of cross-section, water discharge, and velocity of current could not handle as large a pulp and paper mill as could a river in the regions of the middle latitudes.

Another aspect of the problem is ecological-economic, meaning the economics involved in the use of nature, and this aspect is particularly complex. To begin with, the Soviet Union is taking active measures to improve the economic use of nature to establish a system of economic levers which would compel industrial, transport, and other economic enterprises to take a more creative and committed approach to the use, protection, and restoration of nature.

We feel it very important to demonstrate to the population the need for environmental protection and for educational, moral, and ethical measures in this field. But the decisive role here must belong to administrative powers, especially those economic measures required to influence economic enterprises. Scientists are currently elaborating a more perfect system of contributions to be paid by enterprises for the use of natural resources—water, soil, and minerals. Other contemplated measures include fines imposed for the wasteful use of these resources and bonuses for steps taken to conserve and restore nature. The main aspect of these economic measures is that they are designed to become an integral part of the entire economic system of production, an element of cost accounting, so that they will act directly on the costs of production.

This economic approach to the use of nature is based on the estimated value of natural resources and evaluation of outlays that will be required to protect and restore nature. Different estimates must be made for each individual area, and will differ, depending on physical-geographical and economic-geographical conditions. The need for such differentiation hardly needs to be demonstrated, for it is evident that the value of particular natural resources and expenditure on environmental protection cannot be the same everywhere.

The task of defining these elements either scientifically or methodologically is not an easy one. It is particularly complex for the unsettled northern regions.\textsuperscript{24}

In general, estimates of the value of natural resources proceed from their present-day social and practical usefulness, their shortage in a given region, and the prices charged for them when they are brought in from some other region or are produced locally. To make this estimate, it is necessary to take into account direct and indirect losses incurred through changes in nature due to man's activity. An attempt may also be made to calculate outlays for the restoration of the environment (reforestation, supply of fertile soil, etc.)

All this can be done in principle for developed regions where we deal with long-used natural boons whose practical, consumer value is sufficiently evident. But in the conditions of the North, the task becomes enormously difficult.

Let us show this more concretely. Suppose a new mining enterprise is established in the tundra, forest tundra, or the northern taiga. It upsets the water and thermal regime of soils, destroys the moss and lichen cover, leads to the erosion of slopes, and leaves in its wake heaps of barren rock. How is it possible to define the cash value of these losses in nature? Much of what has been spoiled can still be used only by wild animals. Yet to consider only losses sustained by hunting would be an obvious underestimation of the damage, as we shall later show.

The question then arises as to the methods of regional comparisons of specific (per unit of surface, weight of mined raw materials, or final output) outlays for the protection and restoration of the environment. Since, as we have already said, these outlays are now to become part of the economics of production, it may well happen that they will become a very important, if not the most important, factor in solving the task of industrial distribution. One of our Soviet specialists compared these outlays in open-pit mining of the iron ore deposits of the Kursk Magnetic Anomaly to deposits in the Northern Urals and Karelia. It turned out that despite the Kursk deposits being richer than those in the North and the exploitation of northern deposits being more expensive in view of the complex physical-geographical and economic-geographical conditions, the currently very low outlays on the environmental protection and restoration of the

\textsuperscript{24}A.A. Agranat, “Ekologo-geograficheskiye aspekt i ekonomiki priradopozovaniya” (na primere Severa) [Ecological-Geographical Aspects of the Use of Nature Through the Example of the North] Izvestiya AN SSSR, Geographical series, No. 3, 1976.
northern sites result in a high positive national-economic balance derived from developing the deposits of the North.25

This conclusion, holding out the promise of economic advantages for the North, is, in our view, very dangerous in the ecological sense and is not irrefutable from the scientific and methodological standpoint. Indeed, in such richly endowed and densely populated regions as the forest-steppe Kursk region, expenditures required for the restoration of nature following mining activity is higher than in the sparsely settled forest tundra of the northern Urals and Karelia. In the North, there are no black-earth soils that first have to be removed and then deposited anew. There is no valuable forest vegetation, or very little of it, that has to be recultivated; there are no large settlements for the sake of which the regime of water supply has to be rigidly observed.

At first glance, this is all indeed so. However, in our view, a far-sighted, broad approach as opposed to a narrowly practical, consumer approach to problems of nature requires consideration of a number of factors that are very substantial but which defy strict quantitative evaluation. Among these factors there is first of all the global ecological significance of the northern outskirts of the planet. Well known is the great role of this region, especially its taiga areas, as a supplier of oxygen and as an agent that purifies the circulating streams of polluted air in the atmosphere. Its role is even more important in maintaining the water balance of a large part of the Northern Hemisphere.

In our country, ideas are developed to improve the natural conditions in the North with the aim of intensifying its global ecological role. Academician S.S. Shvarts, a well-known Soviet ecologist (1975),26 believes that one of crucial scientific-practical tasks is to raise the biological productivity of tundra regions in order to enhance their role in the general biochemical balance of the biosphere. In his opinion, this can be done by supplanting mosses with grasses. A number of other Soviet scholars have demonstrated the feasibility of measures to move grass and forest vegetation to the tundra and their resulting great importance for the national economy.

In scientific terms, the North is the largest territory on earth which on the whole is still little affected by human activity. The North is a unique testing ground for observing the influence of the anthropogenic factor on the environment in conditions not complicated by the multilayer history of interaction between man and nature in the past. In the North, all the facets of this complicated socio-biological problem can be seen more clearly and distinctly than in regions developed long ago.

The following analogy may be drawn here. Many biologists and ecologists admit that the study of "young" arctic and sub-arctic natural ecosystems with simplified trophic and other bonds makes it easier to understand nature and the mechanism of more complex ecosystems of the middle latitudes and other zones. In the same way, the study of the interrelationship of man and nature in the North, simple in its structure, due to its "youth," would help us to better understand the more complex interrelationships of the more settled territories.

The ecological features pointed out above lend great importance to the need for monitoring of the unsettled regions of the North and the establishment of a unified international system for continuous observation of the state of the natural environment on the globe and the development of methods for its control. Observations in such a "pure" and extensive experimental field as the North may prove very valuable for understanding the character and depth of changes taking place in nature under human impact. The North is particularly essential for investigations on the highest, so-called biospheric level, which require extensive territories—territories in which man's impacts on nature are kept to a minimum.

Incidentally, this is one of the reasons we must extend preserves and other types of protected territories in the North. Recently, a large preserve was set up on the Taimyr Peninsula, and there are plans for creating new preserves and national parks similar to the national parks of the USA and Canada. The expediency of these measures is confirmed by the experience of Alaska where, as we know, there is already a rather broad network of protected territories, and plans exist for extending this network still farther.

When evaluating the natural resources of the North, account must be taken in one way or another of all that has been said about the global ecological and scientific-geographical role of this zone. Consideration must be given also to the possibilities of social and economic utilization of those natural resources whose social usefulness cannot yet be


estimated in terms of money. This refers to:

- The industrial use of those resources which will become essential with the progress of science and technology.
- Growing requirements for industrial raw materials, water, and fuel.
- The recreation resources of the North.
- Possible future revision of the distribution schemes of productive forces, from the ecological standpoint, with some of the industrial loads of industrial, urbanized regions being assumed by "free lands" of the North.
- The possibility of a more dense settlement of northern regions resulting from a growing shortage of land and also from the improvement of the quality of life in northern regions.

Solutions

Each of these problems calls for a special study, and some of them can be solved so far only hypothetically. But what is undeniable is the need to take into account the factors indicated above in evaluating the natural resources of the North.

The solution to this task poses scientific and methodological difficulties similar to those encountered in solving the already described task of determining the economic effectiveness of long-term investments in the development of the North. It appears that methods used in both cases must be similar. In either case, use must be made of the qualitative and quantitative methods of systems analysis. There is no other way to account for and to define the value of the factors characterizing the economic and other functions of the natural resources in the North.

A still more formidable task is the search for methods of defining direct outlays on the restoration of the natural environment. These outlays may serve as a direct basis for regional (relative) comparisons of unit expenditures on the protection of the environment (leaving aside the absolute value of natural resources). However, as regards the North, this is a very difficult matter due to the insufficient study of local ecosystems and the absence of adequate practice and experience in nature restoration.

But already now we can say that the specific features of the northern nature will be sharply manifested in the economics of nature restoration measures. These features include, for example:

- Extremely low rates of plant growth.
- A generally low level of biological productivity.
- Low capacity of the air and water for self-purification.
- Instability of the thermal and hydroregime of permafrost soils.
- Fragility of trophic bonds in ecosystems.

Such features will evidently require more time and effort in nature restoration and, consequently, more investments and longer periods for their recoupment. Nor is it ruled out that the restoration of separate elements of nature and natural complexes of the tundra, forest tundra, or taiga will prove in general impracticable at the present stage of science and technology.

The Role of Geographical Science

It appears to us that a particularly important role in elaborating and solving problems of northern development belongs to geographical science. There are several reasons for this. First, as we have already seen, the geographical factor plays a particularly important role in the development of the North. Second, the problem of the development of the North (a pioneering and many-faceted one), saliently reveals the need for combining different scientific approaches—for example, natural-historical, economic, social, ecological, and technical. And geographical science, as recently demonstrated by Academician I.P. Gerasimov, is an "integration" science, combining in its methods all these approaches in their regional manifestations. The example of the North is a good illustration of the special importance of "regionalizing" those approaches.

CONCLUSION

In conclusion, we would like to emphasize that the elaboration of the problems of northern development is one of the most gratifying subjects of scientific and technical cooperation between the USSR and the USA. Questions related to this problem (for example, methods and techniques of building on permafrost and protection of the environment) have been incorporated in the American-Soviet intergovernmental agreement on scientific and technical cooperation signed in 1972.

The expediency of the cooperation of Soviet and American scientists in the study of economic and geographical problems of the North has been confirmed in the letters exchanged by F. Handle, President of the U.S. National Academy of Science, and M.V. Keldysh, President of the USSR Academy of Sciences, in the beginning of 1975. (These letters referred to the cooperation of the Institute of Social and Economic Research of the University of Alaska and the Institute of Geography of the USSR Academy of Sciences.) We take this opportunity to point out the diverse and rather interesting, scientifically and methodologically, works of the Institute of Social and Economic Research, especially under the socioeconomic studies program entitled "Man in the Arctic."

We believe that further expansion of scientific and technical cooperation between Soviet and American scientists in the development of the North will be to the mutual advantage and benefit of both countries.28

28 The author has already had an opportunity to inform U.S. readers about this in Soviet Life, No. 16, 1975, published by the Soviet Embassy in the USA.

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CASE STUDY OF FISH AND WILDLIFE PROTECTION IN THE PLANNING AND CONSTRUCTION OF THE TRANS-ALASKA OIL PIPELINE—RESEARCH PROJECT SUMMARY

By Linda E. Leask

During the years between 1968, when oil was discovered at Prudhoe Bay on Alaska's North Slope, and 1974, when Alyeska Pipeline Service Company began work on the trans-Alaska pipeline system, there was much public discussion about possible effects of the proposed 800-mile line on the state's lands as well as on particular fish and wildlife populations. In the early 1970s, federal and state agencies responsible for protecting Alaska's natural resources established environmental protection standards that Alyeska and its contractors were to meet during construction and operation of the system.

To enforce these environmental standards, as well as technical construction requirements, while the pipeline was being built, the federal and state governments established separate surveillance organizations. These two special surveillance organizations were to concentrate, as much as possible, the combined authorities of various government agencies within the two new agencies and thereby increase efficiency of government surveillance.

Included in the environmental standards established by the state and federal governments were certain requirements for protection of fish and wildlife. To help enforce these provisions, the federal and state governments signed a cooperative agreement calling for a joint effort to protect fish and wildlife along the route running from the Arctic Ocean to Prudhoe Bay. Thus, in addition to the federal Alaska Pipeline Office and the state Pipeline Coordinator's Office, there was established in mid-1974, the Joint Fish and Wildlife Advisory Team (JFWAT), made up of biologists from several federal and state agencies. JFWAT biologists advised the Alaska Pipeline Office and the Pipeline Coordinator's Office on matters pertaining to fish and wildlife protection during construction. The Alaska Pipeline Office and the Pipeline Coordinator's Office in turn decided whether the pipeline builders should be directed to take action regarding protection of various fish or wildlife populations; JFWAT was an advisory group only.

But because it was made up of federal and state biologists who brought with them the benefits and often authority of their several home agencies, JFWAT had a degree of independence from the surveillance organizations it advised. This was particularly true of the JFWAT members drawn from the Alaska Department of Fish and Game, who held authority to enforce provisions of Alaska Statute 16, for the protection of anadromous fish streams. Thus, because of its unique joint structure and semi-independence from the separate federal and state surveillance organizations, JFWAT created much controversy within the government surveillance system during pipeline construction.

ISER Contract Study

Under a contract with the U.S. Fish and Wildlife
Service, the Institute of Social and Economic Research began in March 1977, an eight-month study of government environmental surveillance policy, organization, and process, focusing on the fish and wildlife aspects of pipeline planning and surveillance between 1969 and 1977. Principal investigator was Thomas A. Morehouse, professor of political science. Completed in November 1977, the study was not an assessment of the environmental impacts of the trans-Alaska pipeline, or even of its effects on fish and wildlife; it was rather an assessment of the planning and decision-making by government agencies that established the framework and set the rules for environmental surveillance, emphasizing its fish and wildlife aspects.

Institute researchers reviewed files of the Alaska Pipeline Office, Pipeline Coordinator's Office, JFWAT and other government agencies, and interviewed approximately seventy persons involved in government planning for or surveillance of pipeline construction. Reports prepared by the surveillance organizations as well as evaluations of the monitoring system by other government agencies were also studied.

The ISER study concluded that government environmental planning and surveillance were influenced largely by:

1. State and federal policies that placed priority on getting Prudhoe Bay oil to U.S. markets as quickly as possible.
2. The fact that early in planning it became apparent that serious technical-engineering problems had to be solved before the pipeline could be built, and thus technical-engineering concerns (and agencies able to deal with these concerns) became dominant during government pipeline planning; this dominance carried over into pipeline construction.

But the major finding of the study was that despite government priority on quick construction and dominance of technical-engineering aspects, the various state and federal fish and wildlife protection agencies were able to influence pipeline planning and surveillance more than might otherwise have been the case, because they retained a degree of independent agency and statutory authority and autonomy from the Alaska Pipeline Office and Pipeline Coordinator's Office. Despite the efficiency to be gained by concentrating government surveillance authorities within a single agency, there are benefits—particularly for those agencies representing non-dominant interests, as did the fish and wildlife agencies in this case—in retaining independent authority.

Researchers concluded the study with a series of recommendations for strengthening fish and wildlife protection organizations for future large construction projects. They found that, with some modifications, a joint federal-state advisory group similar to JFWAT should be established to advise state and federal surveillance authorities in future development projects affecting federal and state environmental protection interests.

**BOOK REVIEWS**


This is the first compilation of its kind ever attempted for Northern North America, and it has been organized by a scholar of considerable reputation for careful work. This volume supports that reputation.

The work includes information concerning ethnographic research in the North of North America from 1972 to 1977, a period of rapid expansion of such research. Burch provides population estimates of different groups (Eskimo, Athabascan, and Algonquian), surveys the research by regional area and provides (1) a list of publications concerned with such research, (2) location of the research, and (3) a "current events" framework. He divides his assessment into two broad themes, "pure" research and "applied" research. In addition, he provides names and addresses of research institutes and universities most involved in such work.

Overall, Burch lists some 640 bibliographic entries and cross-indexes these entries 113 different ways; no mean undertaking.

There is no question that this book is a necessary addition to the library of any social science researcher concerned with northern North America. It is commendable and very useful. In recent years, until publication of this ethnography, it has been extremely difficult to maintain a literature review of the ethnographic work performed in this part of the country. Burch's fine scholarship provides a welcome relief from that burden.

Arthur E. Hippler


Aleuts have inhabited the Aleutian Islands and adjacent Alaska Peninsula for at least 8,000 years, living at water's edge and securing their livelihood primarily from the sea. In 1741 they got their first look at Europeans: Russian explorers, followed shortly by their countrymen seeking wealth, territory, and converts. The Europeans soon overcame determined Aleut resistance by force of arms and alien diseases, reducing the population from well over 12,000 to less than 1,500 by the year 1875, converting the remaining population to Russian Orthodoxy, and conscripting most of the male population as hunters in their relentless pursuit of fur-bearing mammals, notably sea otter. This quest took Aleuts as far away as Fort Ross, in California (where they comprised fully half of the population), and even to San Francisco Bay. In the process, Aleut family and community life was altered and their system of cooperative economic activity, combined with self-reliance, was severely damaged. When Alaska proved to be an economic liability, the Russians sold the territory, including the Aleutian Islands, to the United States, in 1867. Although the sale proved ultimately profitable to U.S. economic interests, it was no blessing to the Aleuts: economic dependency increased with the introduction of unreliable wage labor and a market economy; outside political and social control was increased; Aleut traditions and life-ways were undermined through alien education, administration and entrepreneurial activity; poverty, ill health and social disorganization became the devastating rule.

In the late 1960's, Dr. Jones, social worker, social scientist and resident of the region, lived and did research in two of the thirteen extant Aleut villages (whose total population numbers about 1,650). The result has been this concise study of the processes and effects of economic exploitation, political domination and social subordination visited upon the Aleuts by white American society in recent years. The study is comparative, emphasizing differences in conditions, experiences and effects in the two villages. Both are economically dominated by Whites, although Aleuts are a numerical majority. "Tiliako," an ancient Aleut village that became an administrative headquarters and center for White exploitation of the region, is now dominated by five crab-processing plants which rely on fishermen from outside for their catch and on workers from outside as their labor force. The 170 local Aleuts (and 20 additional "natives") are employed, if at all, almost exclusively as unskilled, temporary laborers; the 108 Whites are employed in administrative and skilled jobs in the plants, they run bars and stores, are government employees, teachers and the like. The other village, "New Harbor," was settled in 1911 as a fishing and processing site. Its 277 Aleuts and other Native Americans are the labor force for the local fish processing plant, and as boat owners and fishermen, are the primary source of fish for the plant. The 28 local Whites run the industry but are dependent upon the local Aleuts for labor, fish and as the participants in local self-government. In Tiliako, Whites control the community, White racism is pervasive and blatant, Aleuts are poor, disorganized and demoralized; in New Harbor, Aleuts dominate the community and its government, White racism is relatively inconspicuous, Aleuts wield economic power, they are reasonably well off, self-confident and they derive evident satisfaction from their lives. Dr. Jones describes the differential degree of control over sources of livelihood—over production and consumption—as the crucial difference for Aleuts between Tiliako and New Harbor, reflected in differential susceptibility to the power and self-interest of Whites, and consequent differences in use of community funds and other resources for programs which could contribute to the well-being of Aleuts.

The Aleuts' experience is, as Dr. Jones puts it, that of "a racial minority in a racist society" (p. 89), doubly stigmatized as both a racial minority and a cultural minority. On both of these grounds they have been systematically denied access to the rewards of American society which has denigrated, destroyed, and largely replaced traditional Aleut society. Her analysis suggests that only where Aleuts have wielded countervailing power, as in New Harbor where they are economically indispensable, have they been able to mitigate the devastating effects of racist exploitation.

It would be interesting and instructive to contrast these two villages with Aleut communities (of which there are several), having neither industry nor significant numbers of Whites. It would also be illuminating to contrast any or all of the thirteen American Aleut villages with the two Soviet Aleut villages (unmentioned in this study), made up of people removed from the Aleutian Islands to the Commander Islands by the Russians in the late 1700's. From available evidence, the Soviet Aleuts
appear to be incomparably better off, both socially and economically, than most of their American counterparts.

With implementation of the Alaska Native Claims Settlement Act of 1971, a byproduct of the Alaska oil pipeline and Native American militance, "for the first time since white contact, the potential now exists for solving the terrible problems of poverty, powerlessness and exclusion assailing [the Aleuts and] most natives of Alaska" (p. 99). This potential is created by the unprecedented possibility of using resources generated by that Act for the Aleuts: to capitalize Aleut economic development in order to meet Aleut needs as defined by the Aleut people themselves. Heretofore, the resources of the Aleutian Islands, and of Alaska generally, have been extracted for the benefit of alien profiteers.

We are indebted to Dr. Jones for providing the opportunity to read an anthropologically informed account of a colonized people within America, which combines empathy for the people, straightforward description of their lives, and tough-minded analysis of the causes and possible cures for the oppressive economic, political and social situation that has been imposed upon them. Too often anthropological accounts are devoted to debating esoteric scientific points (as have been most of the publications resulting from the surprisingly extensive anthropological research which has been carried out in the Aleutian Islands), chronicling the passing of exotic peoples and their cultures as the inevitable consequence of acculturation and progress, or bemoaning those peoples' inability to adapt to changing circumstances so as to reap the benefits of Western culture. As Dr. Jones makes clear, the nature and consequence of acculturation among the Aleuts is not a matter of adaptability but of the opportunity "to influence and control events in their lives" (p. 87). Her book will give little comfort to romantics, but it will give direction to anyone seeking to understand or belatedly redress this little-known but authentic atrocity of White racism in North America. It is good that the book has appeared while some of the victims of that atrocity—the Aleuts—are still around to benefit from redress.

Gerald D. Berreman

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Published for the

Institute of Social and Economic Research

University of Alaska

For copies of Aleuts in Transition, write:

University of Washington Press
Seattle, Washington 98195
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