

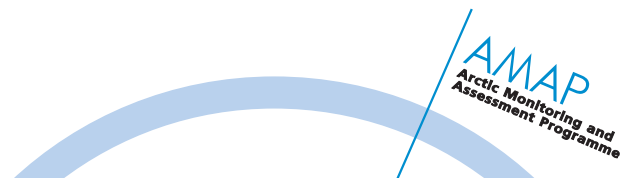
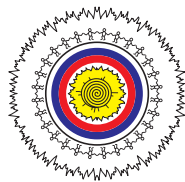


**Global Environment Facility  
United Nations Environment Programme  
Arctic Monitoring and Assessment Programme  
Russian Association of the Indigenous Peoples  
of the North, Siberia and Far East**

# **Persistent Toxic Substances, Food Security and Indigenous Peoples of the Russian North**

# **Final Report**

**Oslo, 2004**



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and Indigenous Peoples of the Russian North. Final Report.

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## Preface

The project "Persistent Toxic Substances, Food Security and Indigenous Peoples of the Russian North" has been initiated by the Indigenous Peoples Organizations – Permanent Participants of the Arctic Council and the Secretariat of the Arctic Monitoring and Assessment Programme (AMAP) as a follow-up of the conclusion of the 1st AMAP Assessment Report that some Arctic indigenous communities are among the most exposed groups of population in the World to persistent toxic substances. This initiative has been supported by the Global Environment Facility (GEF), in particular its UNEP Coordination Unit, practically all countries-members and observers of the Arctic Council, as well as by a number international organizations. Without their political, substantial financial and technical support, implementation of this exclusive work would not be feasible.

The project has been fulfilled mostly by Russian institutions and experts, with the organizational support from the relevant Russian federal governmental executive bodies and the local administrations of the regions of the Russian Federation. At the same time, active participation of a number of international experts in all stages of the project, from drafting the project proposal to the compilation of its conclusions and recommendations and development of the dissemination strategy, was important for its success. Close collaboration of the project team with the AMAP Human Health Expert Group was a necessary step for making its outcomes consistent with the circumpolar assessment work being made in all Arctic states under the auspices of AMAP.

Wide participation of the Russian Association of the Indigenous Peoples of the North, Siberia and Far East (RAIPON) and its regional branches in the project should be specifically highlighted. For the first time, the indigenous experts acted in this project not as assistants, but as equal partners of the research teams. Efficient work of the indigenous peoples coordinators, both at the central level and in the regions, and their collaboration with the local administrations and human health authorities, was one of valuable lessons learned during the project implementation. Work among the indigenous communities, particularly at the stages of the dietary and lifestyle surveys and human sampling, would not be feasible without their everyday involvement.

On behalf on the project Steering Committee, we would like to thank all experts involved in the field work, assessment of the results and drafting the final documents of the project, and people who took a hard technical work on issuing this report. Special thanks should be addressed to a large number of indigenous persons, particularly to the mothers of newborn children for their understanding of the project importance and active participation in the survey. We highly appreciate all donor countries and organizations for their generous support. The project Steering Committee expresses sincere hope that the project results will make its contribution to the improvement of the health status of the indigenous peoples of the Russian North, and will serve as an information tool for the Russian Government, local authorities, indigenous organizations and the international community.

Co-Chairs of the Project Steering Committee:

**Pavel Sulyandziga**  
*RAIPON Vice-President*

**Lars-Otto Reiersen**  
*AMAP Executive Secretary*

*August 2004*



## Chapter 1

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# Background and introduction



## 1.1. Background

In 1997, the Arctic Monitoring and Assessment Programme (AMAP) presented the report *'Arctic Pollution Issues: A State of the Arctic Environment Report'* (AMAP, 1997) to the Fourth Ministerial Meeting of the Arctic countries (Alta, Norway). This first AMAP assessment was supported by a substantial scientific background document, the *'AMAP Assessment Report: Arctic Pollution Issues'* (AMAP, 1998), which was submitted to the First Ministerial Conference of the Arctic Council (Iqaluit, Canada) in 1998. Both of these reports clearly documented the fact that persistent toxic substances (PTS) are transported to, and accumulate in, the Arctic region.

The explanation for this lies in the physical and chemical properties of PTS, which promote their long-range transport by atmospheric, oceanic, and riverine pathways to the Arctic. Due to their low solubility in water and high solubility in fat, they tend to accumulate in lipid-rich Arctic biota species, and to biomagnify in food webs, particularly in long marine food chains. As a result, the upper trophic levels of Arctic food webs are highly exposed to PTS, and certain Arctic indigenous populations, whose lifestyle is based on the consumption of traditional country foods, are subject to some of the highest exposure levels to PTS of any population groups on Earth.

The AMAP assessment provided evidence that, for example, blood levels of some PTS, such as polychlorinated biphenyls (PCBs) and mercury, can be several times higher in residents of Arctic Canada and Greenland than levels measured in residents of industrialized areas of North America. In some cases, PTS intake exceeded World Health Organization (WHO) guidelines, and attained levels comparable to those associated with the potential to cause negative impacts on human health in areas such as neurological development, reproductive health, immuno-suppression, and cancer, etc. Due to the ability of some PTS to cross the placenta, and also to accumulate in breast milk, this raises concerns regarding the potential of PTS to affect the growing foetus and young children, during the most critical periods of human development.

At the same time, it is important to note the benefits that traditional diets provide. For many indigenous peoples, the traditional diet is not only a vital source of nourishment, but also an integral part of their cultural and spiritual identity. Any threat to continued consumption of these foods, including chemical contamination, is not only a potential threat to the health of the individual concerned, but also to the social structures and entire cultural identity of these indigenous peoples.

Preliminary studies in the Russian Arctic have shown that, as in Arctic Canada and Greenland, levels of PTS in biota may be significantly elevated as a result of long-

range transport of contaminants, and that in some areas this is compounded by local pollution occurring as a result of the heavy industrialisation of the Russian North. Recently, as a result of economic and social changes in Russia following the break-up of the U.S.S.R., after years of declining consumption, use of traditional foods by indigenous peoples appears to be increasing again. In Chukotka, the harvesting of walrus in greater numbers, as well as the recent resumption in native hunting of bowhead whales for subsistence purposes, are examples of this trend. However, at the time of the first AMAP assessment, the situation of the Russian Arctic indigenous peoples had not been studied sufficiently to allow a clear understanding of the impact of contaminants on the overall health status of indigenous populations. This lack of information precluded a reliable assessment of the Russian situation with respect to PTS exposure within the circumpolar context. It also prevented the development of adequate measures to reduce the risks to Russian northern populations associated with exposure to PTS.

Representatives of the Arctic Indigenous Peoples Organizations (IPOs), which, at the time of the first AMAP assessment, included the Russian Association of Indigenous Peoples of the North (RAIPON), the Inuit Circumpolar Conference (ICC), the Saami Council (SC), and the Aleut International Association (AIA) are permanent participants in the Arctic Council. Deeply concerned by the findings of the AMAP assessment regarding possible impacts of PTS on the health of their peoples, particularly through contamination of traditional foods, the IPO representatives, in collaboration with the AMAP Secretariat and supported by the Arctic Council, took the initiative to launch a special project to address the deficiencies in information identified by the AMAP reports. The aims of this project were not only to assess the situation with respect to PTS impacts on the health of indigenous peoples, but also to develop recommendations to federal and local authorities, to the indigenous peoples themselves, and also to the international community on (a) measures to reduce the exposure of indigenous peoples of the Russian North to PTS, and (b) means to empower indigenous peoples to participate actively and fully in the process of PTS elimination.

It is important to note that the IPOs consider the elimination of risks to human health from PTS as a key component of their activities, and are active participants in all relevant international negotiations that are concerned with reducing use and environmental releases of these chemicals. Their role in the development and adoption of the Persistent Organic Pollutants (POPs) and Heavy Metal Protocols to the United Nations Economic Commission for Europe (UN ECE) Convention on Long-range Transboundary Air Pollution (LRTAP), and particularly in promoting the development of the United Nations Environment Programme (UNEP) global Stockholm Convention on POPs, cannot be overestimated. Due to the current



economic situation in Russia, the Russian Federation has yet to become a signatory to the above-mentioned UN ECE LRTAP Protocols, and also has still to ratify the Stockholm Convention. The proactive work of the IPOs, and of RAIPON in particular, in such processes, is vital if the major goals of these Conventions are to be realised.

The IPOs initiative, to develop and implement the project *'Persistent Toxic Substances, Food Security and Indigenous Peoples of the Russian North'*, received full support from the UNEP Global Environment Facility (GEF), the Arctic Council, and all the Arctic Countries and International Organizations. Additionally, and of vital importance for the project, it received support from all relevant Federal executive bodies of the Russian Government, the Russian Parliament (the State Duma), and the local authorities in all the pilot regions selected for project implementation. The project formally started in February 2001, although some preliminary studies had already been undertaken in the summer and autumn of 2000.

There are, today, some 30 indigenous minority peoples in Siberia, the North, and the Far East of the Russian Federation, in total numbering approximately 200000 persons. Eleven of these minorities live in the Arctic region, the combined land area of which is approximately 3.1 million km<sup>2</sup>. Together with five other northern indigenous minority peoples who live close to, or partly within, the Arctic region, the indigenous minority population within Arctic Russia numbers some 67000. Approximately 75% of the minority population within the Arctic Russia live in rural areas. In addition, the two most numerous groups of indigenous peoples (the Komi and Yakuts), which represent the majority within their territories, have lifestyles that are similar to the indigenous minorities, and hence are exposed to similar environmental risks.

Conditions for indigenous peoples in the Russian Arctic have been steadily worsening over recent years. The effects of economic changes occurring throughout Russia have been felt acutely in the Arctic, with indigenous minorities being particularly affected. According to a report by RAIPON and UNEP/GRID-Arendal, the indigenous peoples in northern Russia are on the brink of 'physical extinction' (GRID-Arendal, 1998). Health issues, particularly those related to environmental contamination, are a matter of urgent concern, with life expectancy of the indigenous peoples twenty years shorter than that of the average Russian (as low as 41-42 years for men in some regions). Infant mortality is increasing, as is the incidence of disease.

During recent years, Russian Federal authorities have taken a number of steps to address the critical economic, social and health problems affecting the indigenous peoples. In 1992, the President of the Russian Federation issued a special Decree: *'Urgent Actions on*

*Protection of Habitats and Subsistence Activities of Indigenous Minorities Of The North'*. Following from this, the Federal Law, *'Fundamentals of the State Regulation of Social and Economic Development of The Russian Federation North'*, with an Article dedicated to environmental protection and the use of natural resources, was adopted in 1996. The Federal programme *'Children Of The North 1998-2000'*, which was adopted by the Russian government in 1997, also proposed practical steps for improving the situation in the region. Unfortunately however, the critical economic situation affecting the country has meant that these measures have not received the necessary financial support, and, consequently, that they have failed to achieve the desired results. Although the adopted Federal Law *'On Guarantees of the Rights of Indigenous Minorities in The Russian Federation'* created a legislative framework for improving the existing situation, it is not able to solve problems associated with the lack of the financial resources required to implement necessary remedial actions.

The Russian Federation actively participates in circumpolar monitoring and assessment activities conducted within the framework of AMAP. In this, they provide significant contributions of data and information needed to complete the Russian component of the AMAP circumpolar assessment. Due to financial constraints, however, studies during the first phase of AMAP (1992-1997) concerning the impacts of environmental contamination on human health were restricted to a limited area of the Russian North, and were essentially lacking for the eastern part of the region. Activities under the *'Persistent Toxic Substances, Food Security and Indigenous Peoples of the Russian North'* project have contributed significantly to the assessments conducted during the second phase of AMAP (1998-2002) (AMAP, 2002, 2003a, 2004) and have assisted in the elimination of gaps previously identified with respect to geographical scope and knowledge.

## 1.2. Scope of the project

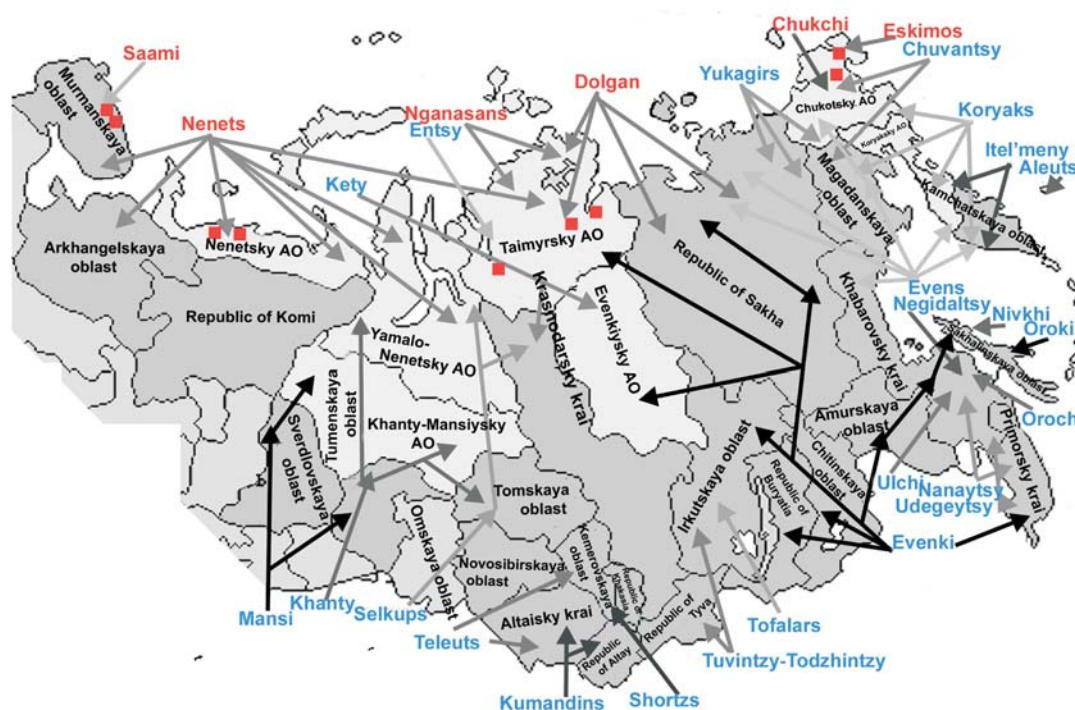
### 1.2.1. Project overall goal and objectives

The project *'Persistent Toxic Substances (PTS), Food Security and Indigenous Peoples of the Russian North'* is designed to help reduce contamination of the Arctic environment by PTS. To further this aim, the following objectives were established:

1. To assist indigenous peoples to reduce the health risks resulting from contamination of their environment and traditional food sources through the development of appropriate remedial actions.
2. To enhance the position of the Russian Federation in international negotiations concerning reduction of PTS use; and to empower indigenous peoples to participate actively and fully in these negotiations.
3. To enable the Russian Federation and the Russian Association of Indigenous Peoples of the North (RAIPON) to increase their involvement in the work of the eight-nation Arctic Council aimed at reducing emissions of PTS.

Figure 1.1.

Indigenous peoples and administrative territories of the Russian Federation. The indigenous peoples groups and the locations of the pilot study areas covered by the PTS project work are indicated by red labels and markers, respectively.



The project has been designed as an integral component of a wider strategy that addresses identified information needs regarding the extent of environmental contamination in Arctic Russia; its effects on indigenous peoples; and identification of measures to improve the situation in the region. A number of international projects and programmes, including those of the Arctic Monitoring and Assessment Programme (AMAP), provide data and information that both complement and support this project. In many respects, the project itself is envisaged as the key component in this overall strategy, providing information that would not otherwise be available.

The project has been designed to obtain the following three key outcomes:

1. Recommendations to federal and local authorities, indigenous peoples and the international community on measures to reduce exposure of indigenous peoples to PTS, including identification of priority areas where actions are needed.
2. Assessment of the significance of aquatic food chains as a pathway of exposure of indigenous peoples to PTS.
3. Assessment of the relative importance of local and distant sources, and the role of atmospheric and riverine transport of PTS.

Table 1.1.

Populations of the Russian Arctic, by the administrative territories and ethnicity (1989 census).

Indigenous peoples	Administrative territories						Russian Arctic	Russia
	Murmansk Oblast	Nenets AO	Yamalo-Nenets AO	Taymir AO	Republic of Sakha (Yakutia) Arctic area	Chukchi AO		
Saami	1615	0	0	2	0	0	1617	1835
Enets	4	0	2	103	0	0	109	198
Nenets	176	6423	20917	2446	0	10	29972	34190
Khanty	10	5	7247	3	0	4	7269	34190
Nganasan	5	0	3	849	0	0	857	1262
Dolgan	18	0	14	4939	0	4	4975	5363
Even	10	1	46	34	1793	1336	3220	17055
Evenk	20	27	78	311	1285	54	1775	29901
Chukchi	2	0	11	1	428	11914	12356	15107
Eskimo (Yupik)	3	6	7	0	0	1452	1468	1704
Yukagir	3	0	3	0	476	160	642	1112
Selkup	1	1	1530	8	0	0	1540	3564
Chuvan	9	0	0	4	0	944	957	1384
Koryak	5	1	31	16	0	95	148	8942
Ket	0	3	6	11	0	0	20	1084
Mansi	18	1	216	1	0	3	239	8279
Total indigenous	1899	6468	30111	8728	3982	15976	67164	
Total population	116458	53912	494844	55803	66632	163934	1999711	
% indigenous	0.16	12.0	6.08	15.64	5.98	9.75	3.36	

### 1.2.2. Geographic and ethnographic scope

The Russian North is populated by a variety of indigenous peoples with different cultures and traditional lifestyles (Figure 1.1, Table 1.1). Careful consideration was therefore given to selecting a study strategy capable of providing results with optimal regional and demographic significance. In order to ensure that recommendations based on surveys of the relatively limited study groups were applicable to indigenous populations throughout the Russian Arctic, the survey groups were selected to represent a range of traditional lifestyles involving use of different natural resources.

To optimise use of project resources, compatible information from other projects has been used to provide a more comprehensive information base than would otherwise be the case. The following regions, which coincide with AMAP key monitoring areas, were therefore selected as the pilot areas for implementation of the project.

- i) The Kola Peninsula (Murmansk Oblast): populated by the Saami people who rely heavily on reindeer and freshwater fish as components of their traditional diet. Pollutants affecting the area are derived from local mining activities, metallurgical industries (non-ferrous metal smelting), and long-range transport of European emissions. The area can be also affected by such a large population centre of Murmansk, with its harbour activities, including radioactive waste storage associated with Russian northern fleet operations. The pilot study area was centred on Lovozero and its surroundings, which is the main settlement for the Saami population in the region, as well as the village of Krasnoshchelye.
- ii) The lower basin of the Pechora River: the area is populated by the Nenets, whose traditional diet includes reindeer and freshwater fish. The area is subject to long-range transported pollution, and multiple local pollution sources, including sources associated with oil activities in the region.
- iii) The Taymir Peninsula, including the lower reaches of the Yenisey River: populated by the Dolgans and the Nenets whose traditional diet includes reindeer, freshwater fish and game. This area is affected by multiple pollution stresses, including the mining and metallurgical industries at Norilsk, and river-borne pollution, including radioactive contamination, from the catchment of the Yenisey River. Two areas within the region were selected for study, Dudinka (Nenets) and Khatanga (Dolgans).
- iv) The Chukotka Peninsula: populated by the Chukchi and Eskimo (Yupik) peoples, whose traditional diet includes marine mammals, fish and reindeer. The area is affected by long-range transported pollutants, particularly from sources in south-east Asia. As the traditional diet of coastal and inland indigenous people of Chukotka differs significantly, two areas within the region were selected for study: Kanchalan (inland) and Lavrentiya – Uelen (coastal).

In 1998 there were some 117 native communities recorded in the selected study areas (Table 1.2.). By national legislation, these settlements are under the administrative jurisdiction of four separate administrative territories of the Russian Federation: Murmansk Oblast; the Nenets Autonomous Okrug; the Taymir Autonomous Okrug; and the Chukotka Autonomous Okrug. It is worth noting that the number of indigenous people permanently residing in the selected areas represent approximately two-thirds of the total indigenous population of the Russian Arctic.

The present day population of most of the communities in the region is a mixture of both indigenous and non-indigenous people. The latter generally dominate in the ethnic composition (see Table 1.2), although there are a number of settlements, particularly in the eastern part of the Russian Arctic, where indigenous people still constitute the majority.

Geographical pilot area	Title of the administrative territory	Number of native communities*	Total population*	Indigenous population*
Kola Peninsula	Murmansk Oblast	9	12455	1386
Basin of Pechora River	Nenets Autonomous Okrug	36	43768	7395
Taymir Peninsula	Taymir Autonomous Okrug	28	44094	9255
Chukotka Peninsula	Chukchi Autonomous Okrug	44	32650	15533
Total		117	132967	33569

Table 1.2. Populations of the selected pilot areas.

\* data provided by the local authorities (as recorded at 01.01.1998)

Ethnic group	Number surveyed	% of survey population
Chukchi	84	35.4
Nenets	57	24.1
Dolgan	51	21.5
Komi	15	6.3
Saami	6	2.5
Eskimo (Yupik)	3	1.3
Chuvan	9	3.8
Yukaghir	3	1.3
Nganasan	4	1.7
Evenk	4	1.7
Koryak	1	0.4
Total	237	100.0

Table 1.3. Breakdown of the mother-child survey participants by ethnicity.

Under the project, both mother-child pairs and general indigenous population surveys were undertaken. Thirteen ethnic groups are represented in these surveys. (Table 1.3. and 1.4.). This represents a large proportion of the eighteen officially recognized indigenous ethnic peoples of the North (Governmental Decree No 255 dated 24.03.2000), although the main groups represented in the study were the Chukchi, Nenets, Dolgans, Komi, Saami, and Yupik (Eskimo), who together constituted about 97% of total number of survey participants.

**Table 1.4.**  
Breakdown of the general indigenous population survey participants by ethnicity.

Ethnic group	Number surveyed	% of survey population
Chukchi	554	35.2
Nenets	357	22.7
Dolgan	339	21.5
Komi	134	8.5
Saami	120	7.6
Eskimo (Yupik)	24	1.5
Chuvan	10	0.6
Yukaghir	11	0.7
Even	7	0.4
Nganasan	6	0.4
Evenk	1	0.1
Itelmen	2	0.1
Koryak	1	0.1
Other	10	0.6
Total	1576	100.0

Thus, the study areas and ethnic groups selected for the surveys are believed to adequately represent the general variety of dietary habits and other key characteristic of the traditional lifestyles of the indigenous populations in the Russian Arctic. This representative coverage has allowed the inclusion in the project of both exposed and non-exposed groups of people from different indigenous populations, demonstrating distinct dietary characteristics, as well as groups living in geographically diverse locations which are exposed to different primary sources of contaminants.

### 1.2.3. Project activities

In addition to activities targeted towards reaching specific project objectives and undertaken within a geographically defined area, the project implementation plan included a range of core activities, concerned with support of the overall project. These core activities included project coordination; administration and management activities, including organization of Steering and Coordination Group meetings; translation, provision of ongoing information on the project; progress reporting, and part of the work associated with dissemination of key results and the preparation of project reports. Additional activities included the provision of supporting information and data, such as emission inventories, meteorological input data for modelling work and associated data handling activities, required for assessing the long-range transport of pollutants (i.e. from sources not linked to any specific geographical area within the study region).

#### ***The following activities were included into the project work program:***

##### *Activity 1: Co-ordination, management, and support to the project.*

General project management and coordination was conducted by the project Steering Committee (SC). The SC comprised one representative from the Implementing Agency (UNEP); one from each of the Executing Agencies (RAIPON and the AMAP Secretariat); and one from each of the international organizations, countries, NGOs, financial institutions and foundations who contributed to the project

financing. Russian ministries and other federal executive authorities were also represented in the SC. Countries and institutions providing other types of contribution, and whose involvement was considered useful for the project implementation, could obtain SC observer status.

The AMAP Secretariat was designated as the international project coordinator and, with assistance from RAIPON, was responsible for the execution, coordination and administration of the project. In addition, RAIPON participated in project activities concerning assessments of local pollution sources; food consumption and traditional diets; assessment of the levels and effects of pollution in the indigenous population; impacts of socio-economic and demographic conditions on the lifestyle and health of the indigenous population; and information dissemination.

##### *Activity 2: Assessment of local pollution sources in the vicinity of selected indigenous communities*

The objective of this activity was to produce an inventory of PTS sources in areas populated by indigenous peoples. This work was implemented by the Centre for International Projects (CIP), Moscow, on the authorization of the Ministry of Natural Resources, and with the active participation of the local environmental protection authorities responsible for pollution control in the regions/areas concerned. The work relied to a large extent on baseline activities carried out by the Ministry of Natural Resources. Also, local indigenous organizations played an active role in obtaining the data and information needed for this part of the assessment.

Activities within the framework of the Arctic Council Plan to Eliminate Pollution of the Arctic (ACAP) also provided an important contribution to this activity. This included results from projects such as the Phase 1 of 'Multilateral Cooperative Project on the Phase-out of PCB Use and Management of PCB-contaminated Wastes in the Russian Federation' (AMAP, 2000) and the project on 'Environmentally Sound Management of Stocks of Obsolete Pesticides in the Russian Federation'. Another work being implemented in part of the project area that contributed significant data and information to the project was the NEFCO/AMAP activity 'Updating of Environmental 'Hot Spots' List in the Russian Part of the Barents Region: Proposal for Environmentally Sound Investment Projects' (AMAP, 2003b).

##### *Activity 3: Assessment of distant sources*

The objective of this activity was to assess PTS transport from distant sources to areas of northern Russia inhabited by indigenous peoples. The activity consisted of two independent components:

- i) Assessment of long-range atmospheric transport of PTS to the Russian North

Information on PTS concentrations, from measurements at background air monitoring stations operated

under the AMAP monitoring network and through bilateral and national monitoring activities, was provided by AMAP and the organizations concerned.

Modelling work required to assess the atmospheric transport of PTS from long-range sources was undertaken by the Meteorological Synthesising Centre-East (MSC-E), Moscow, the centre responsible for modelling heavy metals and persistent organic pollutants under the Co-operative Programme for Monitoring and Evaluation of the Long-range Transboundary Air Pollution in Europe (EMEP). In addition to work directly associated with the project, other EMEP activities undertaken within the European part of the Russian North constituted contributions to the project by the UN ECE. Meteorological data needed for the modelling of long-range atmospheric transport was provided by the Russian Federal Service for Hydrometeorology and Environmental Monitoring as part of its in-kind contribution.

The modelling work was based on preparatory activities such as the AMAP *Workshop on Long-range Transport Modelling and Source-Related Activities* (Bergen, June 1999) where a number of relevant issues were addressed, in particular the need for global inventories of PTS and the development of global/hemispheric transport models.

ii) Preliminary assessment of riverine fluxes as a source of PTS to Arctic Russia

Riverine fluxes of PTS have been assessed for the Pechora and Yenisey Rivers. Assessments were made using data collected at the most downstream sampling sites of the Russian Federation's national freshwater monitoring network, and additional cross-sections further downstream located in areas inhabited by indigenous peoples. Sampling, together with simultaneous hydrological observations, was conducted during four typical hydrological phases of the year. This work was carried out by the Regional Centre 'Monitoring of the Arctic' (RCMA, St. Petersburg). Long-term hydrological data for the rivers concerned was provided by the Russian Federal Service for Hydrometeorology and Environmental Monitoring as part of its in-kind contribution.

*Activity 4: Study of biomagnification in Arctic food chains*

This activity considered marine, freshwater and terrestrial food webs, the upper trophic levels of which are used as traditional food sources by the local indigenous population. Samples were taken of key species (and, where relevant, abiotic media) from the food chains leading to the main food sources identified. The selection of primary food items was made according to the geographical location and consumption patterns of the indigenous peoples concerned, and therefore depends to a large extent on the results of the dietary survey (Activity 5). However, in order not to miss the field season in the Arctic and to get timely data, it was decided to use expert and traditional knowledge to design the field missions under this

activity, without awaiting the outcome of the dietary surveys. In general, this approach has subsequently proved to be valid, with some limited exceptions for which adjustments were been made during the later stages of project implementation.

Field sampling, pre-treatment and conservation of samples was conducted by qualified personnel from the Regional Center 'Monitoring of the Arctic'. Field work was strongly supported by the local indigenous communities. It should be noted that a number of specific biota samples could not have been collected without active involvement of local hunters; particularly since only indigenous communities are licensed to hunt certain species. Standardized and prescribed sampling, pre-treatment, storage and transportation procedures were used to ensure that contamination was avoided, necessary measurements at the time of sampling (e.g., location, age and sex of organism, etc.) were correctly carried out; and samples were appropriately packaged and transported to the laboratory.

Samples were analysed for PTS in the analytical laboratory of the Regional Center 'Monitoring of the Arctic' which was selected by the Steering Committee following a tender for the work. All work was performed according to internationally acknowledged methodology and strict Quality Assurance/Quality Control (QA/QC) procedures. Since the RCMA laboratory is not certified for analytical determination of dioxins/furans, this work was undertaken by the Bashkortostan Analytical Center (Ufa). As an additional quality assurance measure, fifty of the environmental samples were split for duplicate analysis; these were conducted by Unilab Analyse (Tromsø, Norway).

*Activity 5: Dietary surveys of selected indigenous communities*

The work under this activity was performed by the North-Western Public Health Research Centre, St. Petersburg, with active participation of medical personnel from local hospitals and regional branches of RAIPON.

Prior to surveys being undertaken, guidelines for dietary surveys were developed and a detailed questionnaire, compatible with that used in the AMAP Human Health Circumpolar Programme, was compiled. Practical survey activities were anticipated by special workshops arranged under Activity 8 (Capacity building) of the project, at which local medical personnel and RAIPON coordinators were given instruction on ethical and professional aspects of dietary surveys, filling in questionnaires, and for medical personnel, procedures for blood sampling and sample conservation.

A detailed questionnaire was used for individuals that participated in the study of PTS levels in humans. The purpose of the questionnaire was to establish the nutritional adequacy of their diet; to evaluate the dietary importance of the various food items; and also to reveal

any dietary differences among the ethnic groups. Lifestyle factors, e.g. alcohol consumption, smoking habits, socio-economic conditions, etc., were also included. In addition to pregnant women, who were the main target of the study, the survey was extended to represent other groups within the indigenous population (males, different age groups, etc.) to ensure coverage of the overall indigenous population in the selected communities.

Information obtained from the dietary surveys and data on PTS levels in humans (see Activity 6) were compiled in a data base specifically designed for the project needs.

*Activity 6: Monitoring of PTS levels in humans*

The fetal period is regarded as the most vulnerable time for exposure to toxic substances, so pregnant women and their newborn children constituted the primary study group for the project. Key information for this activity is therefore provided by sampling maternal and cord blood of delivering women for analysis for PTS. The sampling strategy needed to take into account the fact that the study covered small population groups living in small communities. A minimum sample size of 30 mother/child pairs at each location was established, representing sample numbers that provided a compromise between achieving a desirable level of statistical validity for the study, and a realistic work programme. In addition, during the dietary surveys, a considerable number of blood samples were collected from various other groups within the general indigenous population to provide additional background data.

The activities were based on the sampling of indigenous people attending hospitals located in regional centres, with possible visits to more isolated communities where necessary or feasible. To increase capacity of these hospitals to arrange sampling and sample storage, the work plan included installation of necessary equipment for sample storage (freezers, liquid nitrogen supplies, etc.) and for registration at these centres. Special storage of samples of maternal and cord blood (at  $-70^{\circ}\text{C}$ ) for later analysis of additional selected parameters was also arranged.

Analytical work was carried out at the Centre for Environmental Chemistry 'SPA Typhoon' (Obninsk). The Centre was selected by the Steering Committee following a tender for the work and taking account of the results of the circumpolar ring-test on analyses of human blood samples organized by AMAP. Analytical work was conducted using internationally acknowledged methodology and QA/QC procedures. A number of the human blood samples were also analyzed in the laboratory of the Norwegian Institute for Air Research (NILU, Norway), and at the Institut National de Santé Publique du Québec (INSPQ, Québec, Canada) to ensure data quality and comparability with other circumpolar blood analyses.

Provisional results of the dietary surveys and blood sample analysis indicated that PTS levels in the blood of some indigenous families could not be explained by consumption of contaminated traditional food alone. To substantiate conclusions and recommendations of the project, the Steering Committee requested the North-Western Public Health Research Centre to arrange an additional targeted survey of selected indigenous families with the highest and lowest PTS levels in blood. This survey covered the sampling and analysis of not only human blood from the given family members and foodstuff consumed by them, but also their indoor and occupational environments. Due to the short time frame available for conducting this additional activity, it was decided to divide the resulting samples between the Regional Centre 'Monitoring of the Arctic' and 'SPA Typhoon' laboratories.

After completion of the analytical work, the AMAP Secretariat convened a special international expert meeting to evaluate the validity of the data, with participation by all of the analytical laboratories involved in the project. This meeting made a significant contribution to ensuring the reliability of data and information used in the assessment process and in the development of conclusions and recommendations.

*Activity 7: Assessment of the role of pollution on health, and development of recommendations*

This activity is considered as a keystone of the whole project. Its objectives are to assess the exposure of indigenous peoples to PTS including the means by which PTS are acquired, the effects on health, and the risks associated with PTS; and to develop recommendations for federal and local authorities, indigenous peoples, and the international community concerning measures to reduce exposure of indigenous peoples to PTS.

The assessment process and development of recommendations was directed by an Assessment Group, established by the project Steering Committee. The group consisted of the lead Russian experts involved in the project implementation, as well as a number of international experts selected from relevant AMAP Expert Groups. The Russian members of the Assessment Group were responsible for the preparation of the first draft of the assessment report.

*Activity 8: Capacity building*

The major component of this activity during project implementation was the training of local personnel (representatives of the indigenous peoples and medical staff) in how to conduct dietary surveys and health related interviews. Additionally, local medical staff were trained to take human blood and breast milk samples according to internationally recognized guidelines. Equipment necessary for the sampling and storage of samples, and other expendables were also supplied to the local hospitals involved.

Local indigenous hunters and other personnel involved in environmental sampling were trained in procedures for the sampling of biota species, with assistance from project scientific field personnel. This was particularly important where hunting of species is restricted by licence to the indigenous communities.

All pregnant indigenous women, who participated in the study, received a newborn child care kit on departure from hospital, together with detailed instructions for taking care of newborn children.

It is envisaged that, following publication of the project results in Russian, special workshops will be arranged in each of the pilot regions. Besides the role of these workshops in information dissemination, they will also have a strong capacity building component, since future training of the local human health authorities and indigenous representatives will be based on activities that follow from the project recommendations.

#### *Activity 9: Dissemination*

RAIPON, the AMAP Secretariat, and the agencies of the Government of the Russian Federation are fully committed to making all research results public. All project participants in the human health survey will receive information on their individual contaminant levels, with any conclusions made regarding the risk to their health, likely sources of contamination, and recommendations on risk reduction. This commitment will be carried out in close collaboration with, and through the active participation of local health authorities, medical personnel and regional branches of RAIPON.

Although the project Steering Committee, and RAIPON in particular, has so far directed and monitored the ongoing dissemination of information and results from the project, the major phase of dissemination work will follow publication of the project final report, with its conclusions and recommendations. To improve awareness of the project and increase the effectiveness of communication, four levels of written information will be prepared

- the project Final Report (this report), in English, for wide international distribution;
- the project Executive Summary, in Russian and English;
- booklets for distribution in each of the pilot regions, containing specific conclusions and recommendations;
- recommendations to the relevant federal executive bodies and the Government of the Russian Federation.

Written material will be supported by a video film, produced by professional media bodies in consultation with project consultants representing health professionals and indigenous peoples.

However, it is the regional workshops, to be held following publication of the project results and involving the participation of local administrations, human health and environmental protection authorities, and the regional branches of RAIPON, which are considered to be the main mechanism for communication and information dissemination.

After completion of the regional workshops, a meeting in Moscow is planned as the final stage of the project, with participation by the Government of the Russian Federation, the State Duma (the lower chamber of the Russian parliament), relevant federal executive authorities, and RAIPON.

#### 1.2.4. Persistent Toxic Substances included in the project

The project covers the following Persistent Toxic Substances:

##### *Persistent Organic Pollutants (POPs):*

##### *Selected congeners from both parent compounds and metabolites of the following classes of industrial products:*

- Polychlorinated biphenyls (PCBs): (major congeners found in blood: PCB 28, 52, 99, 101, 105(132), 118, 128, 138(163), 153, 156, 170, 180, 183 and 187)
- Hexachlorobenzene
- Brominated flame-retardants (PBD, PBDEs)

##### *Selected chlorinated pesticides and their metabolites:*

- Hexachlorocyclohexanes ( $\alpha$ -HCH,  $\beta$ -HCH,  $\gamma$ -HCH)
- DDT-group (e.g. *o,p'*-DDT, *p,p'*-DDT, *o,p'*-DDE and *p,p'*-DDE)
- Toxaphenes
- Cyclodienes (e.g. *cis/trans*-chlordane, dieldrin)
- Mirex (this pesticide has not been used in Russia/former USSR but can be a good indicator of long-range transport)

##### *Combustion by-products:*

- Selected polycyclic aromatic hydrocarbons (PAHs), dioxins/furans

##### *Heavy metals:*

- Mercury, cadmium and lead

In some cases different types of samples have been analysed for different groups of contaminants, as appropriate to the geographic location and the objectives of the specific activity for which samples were collected. Selection of sampled media and contaminant combinations for which analysis was undertaken was based on AMAP guidelines, in combination with available baseline information such as likely pollution sources.