

NORSK  ENERGI

Study on Environmental Hot Spots and Cleaner Production in the Russian Barents Region



Prepared for NEFCO's
Barents Hot Spots
Facility

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Front cover photo: the picture of Archangelsk Heat and Power Plant

1. Acknowledgements

This report follows the structure and terminology suggested by NEFCO and it is ultimately intended to contribute to the NEFCO's work in the Russian Barents region, in particular concerning changing ecological status of the environmental "hot spots".

The report presents various observations and finding which could be helpful to various international organisations and bodies with focus at environmental and energy improvements in North West Russia. Moreover, the report, in a part of its content, suggests measures to develop environmental policies in the region, which could be a valuable input to increase engagement of regional environmental authorities in North West Russia.

Information on peculiarities of Russian environmental legislation and regional environmental policies is based on desk-top studies, including official statistics of Russian authorities, but is also based on opinions of the interviewed persons. While every possible effort is being made to present this information in accurate way, the authors do not pretend to in-depth analysis, as the legislation is rapidly evolving, and in such cases the opinions presented may not be correct. The same holds to company survey, which has involved a small part of the companies that have participated in CP education programmes.

This report has been written with the help and important contributions by a group of individuals, organisations and companies, both from Russia and Norway.

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- Norwegian Association of Chartered Engineers (TEKNA);
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2. Conclusions and Recommendations

The report presents a detailed study of possibilities of using CP measures to improve the ecological status on relevant environmental hot spots and, based on that, recommendations on how to link work with CP and environmental hot spots within the future Barents environmental co-operation. This section aims to provide a summary of the findings of the study in order to address the fundamental aim of the study, which is:

- to contribute to the timely exclusion of the 'Hot Spots' concerned from the official list of 'Barents Environmental Hot Spots'.

2.1 Conclusions

Applicability of the CP Methodology to the 'Hot Spots'

- CP is applicable to the production processes, long-term, discrete and continual.
- Companies often seek business benefits with CP projects, not just environmental improvements, although CP projects may catalyze management's and workforce's interest to environment.
- Proper documentation of CP project results is required to linking the process improvements and environmental effects.
- The CP improvements cannot be implemented in isolation; they must be underpinned by environmental management systems.
- The CP is managerial, rather than technical concept. It does not involve a clear-cut set of generic technologies.
- It is often at the start, companies concentrate on simple low cost options, however, 70-80% of the potential for improvements is with measures related process and equipment upgrade, which may be costly and require another approach.
- In private industry it is usual to calculate only direct costs and results. Avoided costs and avoided future liabilities, social aspects are often forgotten.
- Governments have to play a key role in supporting the CP. Transition to CP may evolve only within an enabling institutional framework.

Institutional Framework for Cleaner Production and Hot Spots in North West Russia

- There is no legislation, neither federal, nor regional (NW regions), which fosters pollution prevention at the source. The Legislation is focused at pollution control, end-of-pipe technologies.
- Stringent requirements for pollution control and use of natural resources often are confronted with weak enforcement, as regional authorities would avoid closing-down of the companies.
- Russian Law does not restrict number and overall time period a company may enjoy Temporary Agreed Releases, when the targets for environmental emissions may not be met. They may be set regardless of the national norms and standards and may be granted several times.
- One of the main disincentives to implementation of CP projects is still relatively low tariffs for use natural resources and environmental fees. For a "polluter" it could be cheaper to pay environmental fees, than to invest into environmental measures.
- However, the costs of natural resources, environmental payments, etc., are gradually increasing and have reached levels that represent a considerable part of the total production costs. Russian projections of utility costs foresee further growth.
- Environmental payments are disbursed to the federal, oblast and municipal budgets, without being allocated to special purpose funds. Only a small part of the collected

payments are reverted into the environmental protection. Therefore, these payments could not be considered as an effective instrument for financing of CP activities.

- Meetings with environmental authorities suggested that the 'Hot Spots' are not high at their agenda. Regional environmental authorities are, in general, interested in the CP promotion, but this is not a part of their duties and they have no time and capacity for this.
- Only half of respondents from environmental authorities have mentioned that they heard about the CP concept and the CP Programmes carried out in NW Russia.
- Currently, regional environmental authorities do not possess enough knowledge about European concept of integrated pollution prevention and control.
- According to the latest, un-verified news, Russian Ministry of Natural Resources and Environment plans to introduce a system of integrated permits, superseding current system of limits and permits.
- Most of the companies interviewed consider their environmental situation acceptable, as meeting corresponding norms and requirements of the Russian legislation.
- Some of the interviewed companies knew that they were included in Hot Spots list, while others did not. In general, the impression is that this issue is not of high importance to them. Regardless the companies know or not about them being a 'Hot Spot', their first priority is to meet environmental requirement of the Russian environmental legislation.
- In international context, North-West Russia is a part of international co-operation programme within Barents Euro-Arctic Region (BEAR). An active and multi-directional framework of environmental co-operation in NW Russia obviously is a solid platform for pushing and pulling CP and 'Hot Spots' activities in the region.

Basic Analysis of the Hot Spots in 2003 AMAP/NEFCO report

- There are 42 'Hot Spots' of which:
 - 19 'Hot Spots' are fully applicable to the CP, as 'Hot Spots' result from production processes.
 - 8 'Hot Spots' are partially applicable, as there are information gaps in Hot Spots description.
 - 15 'Hot Spots' are not related to any process. The CP is hardly applicable.
- Next to all 'Hot Spots' suffer from unclear definition of a problem, sources of pollution, boundaries, scope of a mitigation activity and criteria for their elimination.
- Some of the Hot spots are far too generic in their description and shall be specified. Especially, the managerial actions, like 'Organization of waste management system'.
- Description of environmental effects is often fragmental and quantitative ('large emissions'?). Most of the Hot Spots refer to gross quantities of emissions, waste waters etc. With this approach, large companies would always top the list of the 'Hot Spots'.
- Companies often do not know that they are seen as a 'Hot Spot', or argue this.
- Legal status of a 'company – 'Hot Spot' is not determined. Therefore it is difficult to apply any coercion to such a company. It is not clear who is responsible from the Russian side for the 'Hot Spots' elimination.

Analysis and Evaluation of Implemented CP Educational Programmes

- Up to now, 97 Programmes were conducted and more than 1,650 engineers successfully completed the CP Programmes. Of them 1,252 people were from the companies located in the NW Russia.
- In the period 2003-2009, 40 CP Education Programmes (CP Programmes) were conducted, while 22 of them could be related to 'Hot Spots'.
- When looking at the list of companies-participants, a conclusion could be drawn that a range of the companies-participants is very broad. The share of companies and institutions, which are not typical production companies, is at 20-25%. Hence, the actual choice of the

participants did not fully adhere to the initially defined approach (engineers from production companies).

- 1522 projects were identified; if implemented they would have initiated 246 mln USD of investments and economic saving of 156 mln USD per year.
- 85% of the identified measures are low cost measures, 15% - expensive measures with payback more than 3 years. Many of the low-cost measures are implemented immediately.
- Most of the respondents are happy with the CP Programmes, their methodology and hand-outs. The template for the CP reports is easy-to-understand, but cannot be used as a basis for business plans. This is a drawback according to many respondents. In addition, most of the respondents have failed to prove how the methodological materials are used.
- Companies continue to develop low- and no-cost measures, and many of them consider this as a work duty. Most of the projects of a category C remain 'on paper' due to different reasons, such as: (-) technology upgrade is prioritized more than CP projects; (-) lack of financial resources; (-) lack of capacity to develop large-scale projects.
- It is clear that the methodology of the CP Programmes is not well suited for developing large-scale projects, as the CP Programmes suggest little information about bank procedures and business planning, as well as on preparation of feasibility studies.
- Most of respondents complain about no follow-up after the end of the Programmes (methodological and information updates, CP Forum or Club?).
- In addition, the CP Programme reports provide, to our mind, too brief evaluation of results and lessons learnt.
- All CP companies interviewed have claimed that they observed reduction of emissions and waste water generation by 10% - 50% compared to 2003. A lack of documentation of project results makes it very difficult to relate the changes to the specific projects
- CP Programmes were designed for education but the experience suggests that it is possible to combine education with real projects development.
- In general, most interested to participate in CP Programmes amongst the 'Hot Spots' companies could be the companies, which face claims of environmental authorities, plan upgrade of equipment and improvement of the process efficiency.

Compilation and Analysis of CP Projects in Relation to the 'Hot Spots'

- While 22 CP Programmes have been performed at the 'Hot Spots' locations, only 18 measures are reportedly implemented at 10 'Hot Spots'.
- Practically all the projects implemented are of category A, which don't need additional or external financing. Some of the projects required significant investments and they were implemented after the end of the CP Programmes, but still using own funds of the CP companies
- No documentation of the projects results is available (as 'too small size', 'it was 3-6 years ago'...). The analysis show that none, but 1 could have substantial influence at Hot Spots.
- An inventory of other measures that were identified at these 22 CP Programmes, but not implemented, suggested a list of 63 projects targeted at 17 'Hot Spots'.
- The CP projects identified for 11 out of 17 'Hot Spots' could considerably, if not totally, eliminate the problem, if implemented.
- For other 6 'Hot Spots', the proposed CP projects may enable certain improvements, but not elimination, due to the origin of the 'Hot Spots'.
- Out of these 63, only for 36 projects the participants put a date for implementation. However, most of the CP projects were not brought to implementation and are not on near agenda for the companies.
- The companies prioritize implementation of modern equipment and technologies. They believe that implementation of environmentally cleaner technologies could be a part of major technology upgrade and production modernization programmes. Therefore, the companies often do not opt implementation of what they believe are 'stand alone' CP measures.

- Most of the representatives of large private companies have confirmed that their companies have the required skills and capacities for the projects development. SMEs mostly have confirmed that they lack capacity to develop sound project documentation and loan applications, which makes financing of these projects difficult.
- Technical specialists at CP companies usually are not motivated by their companies to develop further CP projects, or to incorporate the CP into operational and maintenance routines of companies.

Options for Financing and Funding of CP projects

- Companies' survey has unveiled that one of the most common reasons for not implementing the developed CP measures is a lack of financing. This is a strong barrier for CP projects implementation, as noticed by almost all companies. The situation became even worse due to the financial crisis.
- Most of local companies are not seeking to finance their CP projects by loans from Russian commercial banks. Large companies often are of an opinion that their credits portfolio is too large already to take additional loans for environmental projects, because of the liquidity considerations. Local banks, in turn, underestimate demand for energy efficiency and cleaner production investments.
- NEFCO and IFC are one of few options for the companies to obtain financing of their CP projects at a reasonable cost.
- However, only 2 out of 20 companies surveyed are experienced in working with NEFCO and none with IFC. Most of the companies even have not tried to send applications to NEFCO or another IFI, as they don't not know them well, or they are not confident about their ability to develop good loan applications. None of the respondents knew the NEFCO's specific terms and conditions for financing.
- Large companies believe that NEFCO offers too small in size loans, however, they are not aware of possibilities for de-bundling of their large projects. These companies often have little decision making power to be solid counterparts for NEFCO or similar IFIs, as the issues of external financing are often up to headquarters of their holdings or concerns.
- These companies opt to take loans for the technology and process upgrade, rather than for separate environmental projects.
- Our survey has unveiled a serious gap in communication between regional environmental authorities and international technical assistance programmes. Basically most of our respondents from the environmental authorities are not informed on possibilities and conditions of international technical assistance and funding.
- Similarly, regional environmental authorities are not informed on possibilities and conditions of international financing due to the fact that IFIs do not establish contacts with regions and do not offer their services.
- At present, there is no Russian financial programme or facility offering directly financial and technical services specifically for environmental, energy efficiency or renewable energy projects.
- In general, most of environmental investments by public authorities are forwarded into water utilities to improve water supply and waste water services. Possibilities for a private company for obtaining co-financing of their CP projects, including educational programmes, feasibility studies, business plans at the private companies are very limited, unless the projects are considered as 'socially important'.
- Some of the economic instruments provided for by the Russian legislation are used to a very limited extent and their possibilities in relation to the CP projects shall be eyed, including investment tax credit for environmental research and development, higher rates of depreciation for environmental assets, etc.
- There are theoretical possibilities to obtain cost-sharing to 'Hot Spots' projects dealing with drinking and wastewaters from federal targeted programmes, such as Housing Sector

Reform and Modernization subprogram and 'Clean Water'. However, obtaining federal assistance is a long and bureaucratic process.

Linking CP to Other Initiatives and Efforts in the Region

- In general, one of effective strategies to promote CP projects implementation at 'Hot Spots' is to facilitate a wider application of the available technical and funding services at 'Hot Spots' locations.
- This co-operation could be done in two parallel activities(-) Co-operation with the related International initiatives; (-) Engaging regional environmental authorities.
- Brief review of the available technical assistance programmes points out Northern Dimension Environmental Partnership, NPA-Arctics and Scandinavian Technical Assistance, as most suitable partners for co-operation.
- By teaming up with larger credit facilities, NEFCO's may promote implementation of CP projects at large companies, which may plan the technology and equipment upgrade.
- So far, the large credit facilities had no projects in North West Russia. NEFCO may help the CP companies to get in touch with these credit facilities. Most suitable credit lines in this respect could be IFC Russia Cleaner Production Programme and EBRD's RUSEFF Programme. NEFCO could contribute with information resources and regional experience; both of them are not existent so far with the credit lines.
- It is important to keep the regional environmental authorities informed (at meetings, seminars, etc.), because they could pass this information down to the companies, establish contacts, etc. In other words, this type of co-operation could one of the options for engaging regional environmental authorities into the work on 'Hot Spots'

Integrating CP to the Hot Spots Procedures and Criteria

- The CP educational programmes, in their current format and focus at education, rather than at projects development are not considered as an option for optimizing the Hot Spots.

An Overview of Spin-off Possibilities for the CP to Broader Markets

- A spin-off of the CP to a broader market in Russia requires co-ordinated actions on various elements of market development, including the regulatory framework conditions, removal of barriers and introduction of institutional and economic incentives.
- Development of an integrated CP policy, which will address these barriers and which will ensure further recognition of the CP concept by Russian legislation would give a major impetus to CP at all levels of authorities and companies.
- In Ukraine and Belorussia the overall situation is quite similar with regards to CP: there has not been established an integrated CP policy. Thus, similar barriers and opportunities are observed. In these countries, however, there is stronger political will to reduce energy consumption; hence the initial preconditions are better.
- In all three countries, there is quite limited awareness on CP. Awareness raising, capacity building and training are needed to facilitate the market development. The assistance is required on various levels: both national and regional authorities would need an awareness raising and policy development assistance, while production companies would need an assistance to develop the needed skills and capacities to initiate, prepare, arrange financing and implement CP projects.

2.2 Recommendations

Linking CP to 'Hot Spot's Activities:

- Make immediate adjustments in the current format of CP activities in order to perform 'Thematic' CP Programmes at 'Hot Spots'.

- Company management shall get a clear message on the 'thematic' focus of the CP Programme. Working Groups shall necessarily include specialists responsible for the processes related to the 'thematic focuses. Introduce more cases, description of best available technologies, low-cost typical measures, etc to make the CP Programme practical.
- The content of educational materials shall get a stronger focus at economic benefits of CP projects, validity of economic calculations, shall introduce financial projections (cashflow) based on standard loan conditions foreseen.
- Evaluation of the CP Programme results and lessons learnt shall be included as a separate component of the CP Programme. Current templates for CP projects report, as well agreements for participation in the CP Programme shall be amended accordingly.
- Include a half day seminar/meeting for top managers at the beginning of CP programme in order to introduce the CP Programme and select the priority environmental projects. The second meeting shall be arranged at the end of the CP programme in order to present the developed projects and further discuss possibilities for their financing and implementation.
- Prepare educational materials and launch, as soon as possible, separate CP Programmes combining training and projects development for SMEs and combined training and projects development programmes for large companies on 'Financial Engineering' and 'Environmental Management System'. They shall supersede 'Thematic' CP Programmes.
- Perform thorough analysis of feasibility, consultations and preparations for launching a tailored support to CP projects development.
- If outcomes of the analysis, consultations and preparations are positive, launch the tailored support to CP projects development. This option may include establishment of a consultancy unit or programme for the projects identification, high profile CP audits, assistance to business planning and promotion of the CP projects towards the IFIs.
- Continue implementation of the CP Programmes combining training and projects development for SMEs. Review the necessity to continue combined training and projects development programmes on 'Financial Engineering' and 'Environmental Management System' for large companies.
- This work may take 1,5 – 2 years. Afterthat, an effectiveness of proposed strategy shall be evaluated.

Possibilities to promote implementation of the CP projects:

- NEFCO shall discuss with the CP companies, possibilities to implement and provide financial services to the CP projects related to the 'Hot Spots' earlier developed at the CP programmes; company-by-company, project-by-project (63 projects). This could be done in a form of a seminar for 'alumni' from the CP companies;
- Better coordinate CP activities with marketing activities by the IFIs. Information about NEFCO's financial products can be included in the hand-outs, while NEFCO or other IFIs representatives can be invited on project presentations.
- It is important to identify information channels to keep CP companies informed about available funding, to provide them with regularly updates on the terms and conditions, inform on announcements of project calls, establishment of new funds and programmes; assist them in selecting projects meeting criteria of IFIs; helping SME to develop project documentation of a good quality, etc.
- Related to this, it is recommended to maintain follow-up assistance and communication with the participants after the end of the CP Programmes. One of the options is to establish on-line CP Forum or Club for the participants.
- NEFCO is proposed to initiate discussion with IFIs, international technical assistance programmes, regional targeted programmes to review possibilities for joint actions for elimination of the 'Hot Spots'.

Improving framework conditions for the 'Hot Spots' Elimination

- NEFCO shall strengthen communication with regional/republican environmental authorities, on the issues related elimination of 'Hot Spots' and promoting CP improvements. They shall get a clear message that one of the main pre-requisites of the success is pro-active position and attitude of the authorities. 'Hot Spots' are first of all a problem for Russia.
- All 'Hot Spots' need a critical review, clarification of description, update of information on environmental impacts, setting up benchmarks and clear criteria for elimination. To avoid any disputes, criteria of the Hot Spots shall be further specified and take also into account specific quantities, e.g., pollutant loads, technology efficiency, etc.
- All 'Hot Spots' are recommended to be supplemented with the 'source' analysis. First of all this work shall be done at the 'Hot Spots' which were related to the Group 2 'fully applicable by the CP methodology' and Group 3 'Hot Spots partially targetable by the CP projects'.
- It is recommended to allocate some efforts and means to the tailored support to 'Hot Spots' definition and analysis by external experts. Targeted support to regional environmental authorities may facilitate the overall process the 'Hot Spots' definition, including their at source analysis, compliance to Russian legislation, as well as definition of the 'Hot Spot's' boundary of pollution and preparation of the action plan.
- Duties and scope of responsibilities of regional environmental authorities shall be established in relation to each of the 'Hot Spots'.
- Regional environmental authorities shall appoint a responsible person or body for the status control and reporting. A periodical reporting on the status and improvements at the 'Hot Spot' may speed up the progress.
- Regional environmental authorities are advised to supply companies or municipalities, located at 'Hot Spots', with Barents Environmental Hot Spots list/report. They shall explain the companies/municipalities why they got a status of a 'Hot Spot'.
- Legal status of the 'Hot Spots' shall be officially established to prevent occurrence of situations when companies- 'Hot Spot' do not recognize this status and, do not take corrective environmental actions.
- A reference to the related regional or federal targeted programmes, if any, shall be enclosed into the 'Hot Spot' description.
- It is proposed to discuss with regional environmental authorities possibilities of turning focus of the regional targeted programmes, among others, at 'Hot Spots' and asses possibilities for closer co-ordination of the work done under these programmes with the 'Hot Spots' activities of NEFCO.
- As soon as possible, it is recommended to initiate information awareness activities and capacity building for regional environmental authorities. This could be provided in the form of informational seminars and tailored technical assistance.

3. Introduction

In 1995, the first list identifying Environmental 'Hot Spots' in the Russian part of the Barents Region was prepared. 10 years later, an updated report was released by NEFCO in collaboration with the Arctic Monitoring and Assessment Programme (AMAP) lists 42 "Hot Spots", and proposals for 52 investment projects to mitigate the environmental impact of these Barents Environmental Hot Spots. The Russian federal and regional environmental administrations adopted the updated hot spot report and its recommendations. To promote elimination of the hot spots, a special financial instrument, the Barents Hot Spots Facility (BHSF), was established as a with funding from the Governments of Finland, Iceland, Norway and Sweden. The Facility's main task is to provide grants to finance technical assistance.

Cleaner Production (CP) activities are considered to be an important component of the work with defined hot spots, as underlined in the official communications and statements of the Barents Council. Over the years, a number of educational programmes at Russian enterprises and institutions have been carried out. Actual CP projects have been identified, elaborated and implemented through the ranks of thus educated engineers and experts, including at certain environmental hot spot locations. NEFCO admitted that there remains a lack of a general systematic approach as to application of the CP instrument in relation to the hot spots.

NEFCO has therefore assigned Norsk Energi with the overall objectives to provide analyses and make recommendations on the relevance of using CP measures to improve the ecological status on relevant environmental hot spots and, based on that, to work out recommendations on how the joint work with CP and environmental hot spots should be structured within the future Barents environmental co-operation.

The ultimate aim of this work is to thereby contribute to the timely final exclusion of the hot spots concerned from the official list of Barents environmental hot spots.

The report is divided in 4 main sections. Following the section 1 – Executive Summary and section 2 - Introduction, the section 3 presents the desktop review of the background issues, related to general CP methodology, Institutional framework and the analysis of 2003 NEFCO's/AMAP report. Next Section suggest analysis and evaluation of the implemented CP educational programmes and CP projects developed at the hot spots locations, as well as analysis of various instruments to promote CP in the regions and options for integrating the CP activities in hot spots procedures and criteria. Last section present conclusions and recommendation for the joining the work done in relation to the CP and hot spots.

3.1 Study methodology

The Study was undertaken through a combination of data gathering, desk-top analysis of previous studies and/or projects, through the survey of the CP companies, interviews of environmental authorities, potential borrowers of NEFCO, relevant stakeholders in Norway and other actors.

Desk-top Analysis of Background Issues

Detailed review of Russian Environmental legislation, AMAP/NEFCO report (2003) and Cleaner Production Methodology has been conducted from literature searches.

The following studies and reports on the legislation shall be acknowledged:

- Environmental Policy and Regulations in Russia. The Implementation challenge. OECD, 2006;
- Mobilising Financial Resources for the Environment in Russia, OECD, 2007;

- Approximation of Russian Environmental Policy with EU's Integrated Pollution Prevention and Control policies. Ecologic, 2007;
- Environmental legislation as a factor (instrument) for development of innovative economy. Proceeds of the Conference 'Environmental projects of Russian Corporations', 2007;
- Analysis of legislation gaps in Russia in relation to application of IPPC and integrated environmental permitting procedures. GTZ, 2009.

It is apparent, however, that there are some discrepancies in these reports caused by dynamic change of the legislation. Therefore, this information collected had to be verified from trustworthy sources, i.e., regional environmental authorities.

Analysis of the Cleaner Production Methodology has been conducted using international publication, as well as proceedings of the Tacis 'Cleaner Production in the Selected Countries of the NIS'.

Evaluation of Cleaner Production Education Programmes and Projects Developed

Consultants have collected a massive array of facts from the Cleaner Production Programmes, since 2003. Many of the company reports are fragmented and often only available as hardcopies, which are badly suitable for a systematic analysis.

Therefore, the project made an effort to collect, collate and digitize as many as possible initial company reports. This has been a very laborious work. Within the limited scope and timeframe, only certain aspects of information could have been analyzed, such as the number of participants, measures developed and relevance to the 'Hot Spots'. This analysis led to further conclusions with regards to applicability of current education programmes (CP Programmes) to the 'Hot Spots' and, practically, it provided an inventory of the companies participated in CP Programmes. This inventory was the basis to identifying a list of the companies to be visited.

It is apparent that these reports present unique input information for any other related research. Due to large volume, the collection of the digitized reports prepared by the project team is handed over as a separate hand-out.

Survey Protocols

In order to conduct an effective assessment of on-going CP activities at the companies, where the CP Programmes were performed, the project methodology has included field surveys and interviews.

Survey protocol was prepared for the field survey. It included:

- Inventory of the companies and authorities to be visited;
- Procedure for the interviews (initial phone call, mail shot, site visits);
- Question list for the survey.

Following criteria were established to select the companies to be visited:

- CP program held during last 3-4 years;
- Typical enterprises regional;
- Relation to Hot Spots:
- Projects of "C" category are present in the company reports;
- Situated in/near place where the Consultant is located.

The Consultants have distributed letters addressed for directors of all selected enterprises. Letters were sent without questionnaire and most of enterprises answered promptly that they are ready to meet. Some enterprises did not fully understand the purpose of the meeting and were not sure that this meeting was necessary for them. In such cases this matter was discussed during telephone

meeting with enterprise specialists responsible for the meeting and in addition questionnaires were sent to these enterprises.

The actual interviews were based on the question lists prepared in advance. Most of the companies have sent the completed questionnaires after the meetings. In some cases it was necessary to phone enterprises several times. However, as many as 6 companies have declined to fill in a questionnaire. All questionnaires are presented in a separate folder. An example of the completed question list is given in Annex 11.

In parallel to protocols of the company survey, the project team has prepared a method for assessment of the results, based on the tasks outlined by the ToR.

Performing survey and interviews

Interviews of environmental authorities and companies participated in the CP Programms in all main regions of the Russian Barents region: the Republics of Komi and Karelia, Murmansk and Arkhangelsk regions. It shall be noted that not all enterprises from preliminary selected list were interviewed because of changing of managing directors or environmental managers which participated in CP or having generally little interest to meet. Some enterprises appointed meetings within 2 weeks but there were also enterprises where the meetings were arranged in a month or more.

The survey was based on face-to-face interviews at the company premises with relevant company representatives. Where possible, visits to the “factory floor” were also undertaken.

The interviews were held mainly with environmental and engineering managers. Initially it was intended to meet with managing directors of the companies, as they often are the only decision makers and have comprehensive information on company activities and plans. However, it was not possible to get confirmation on interview with directors of large enterprises, as they referred on tight working schedule. Only 3 directors of large enterprises, Subdivision of OAO Petrozavodsk Communal Systems – Vodokanal, Subdivision of OAO Petrozavodsk Communal Systems - Heating Systems, and OOO Vorkutacement, agreed to meet. An assumption could be drawn that the managing directors did not want to spend time for interviews, which in their opinion, would not bring any tangible results. One of the respondents from a large enterprise has suggested that managing directors are very busy and that have more urgent issues to handle. One shall admit that it was easier to get hold of managing directors at small and medium companies (SMEs).

Additional telephone consultations were held with the enterprises in cases when necessary information was not collected during the meetings by the reason of its absence or necessity to give a more precise definition.

Apart of the CP companies, the interviews were arranged with the relevant stakeholders in Russia, like regional environmental committees and Ministries, Rosprirodnadzor, Rostekhnadzor, etc. The project has also interviewed relevant Norwegian stakeholders, including the Norwegian Ministry of Environment, TEKNA, the Norwegian Fritjof Nansen Institute.

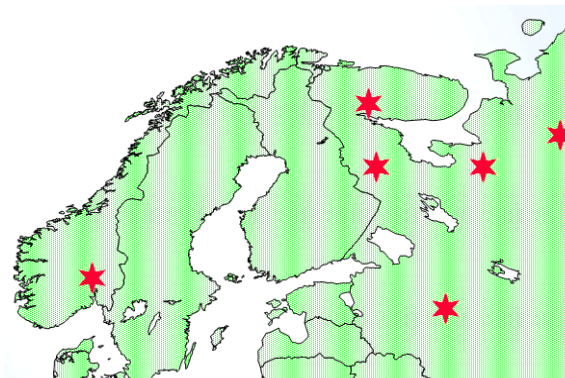



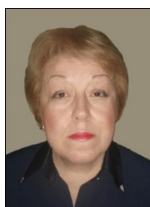
Figure 1: Geography of the project work included
Arkhangelsk Oslo, Moscow, Murmansk and Syktyvkar

3.2 Project organization

For this project, Norsk Energi has partnered with OOO Ramboll Storvik (Murmansk) and Olga Viktorova, a freelance consultant of the Russian Cleaner Production and Sustainable Development Centre based in Moscow. This team brought about a unique combination of international expertise on CP, in-depth knowledge of local conditions and access to all major regions of Northwest Russia.

NORSK  ENERGI is a leading Norwegian consultancy with a thorough expertise in thermal energy, environment and safety. For 15 years Norsk Energi has been involved in the industrial and municipal projects development in North-West Russia. Norsk Energi was responsible for the overall project management, quality assurance, formulation of conclusions and recommendations, as well as Norwegian sources of information.

RAMBOLL Established in 1993, OOO Ramboll Storvik, is a Russian subsidiary of the Danish consultancy company Rambøll. The company has specialised in business development consulting in Northwest Russia. It has 24 employees and company offices in Murmansk, Arkhangelsk, and Syktyvkar, main centres of Northwest Russia. Main tasks within the project comprised company survey, contacts with local authorities and analysis of results.



Olga Viktorova is a senior consultant with many years of experience working as a head of department for industrial ecology management at polar division of Norilsk Nickel. Currently, she is working close with Russian Cleaner Production and Sustainable Development Centre and has in-depth insight in Russian environmental policy and CP Programmes. Her main tasks were desk-top analysis of institutional framework, collection and analysis of CP projects, as well as CP Programmes.

4. Review of Cleaner Production Methodology with Respect to Environmental Hot Spots

Most of Russian production companies were constructed yet in Soviet times, hence most of the technologies currently used by the companies could not be considered as up-to-date. Production processes therefore are typically far from being efficient with regards to energy, water and resource conservation, which leads to over consumption of resources and over production of wastes and polluting emissions.

Cleaner Production is one of few effective tools for 'greening' of Russian economy, for simultaneously addressing the financial, environmental and social consequences of economic transition. Annex 1 presents brief description of the Cleaner Production methodology.

If we look back on efforts to reduce the environmental burden of production and consumption in Russia and other countries, it becomes clear that Cleaner Production concept is rather new. The main alternative to the cleaner production concept are the pollution control and disposal strategies (the so-call 'end-of-pipe'). The following pollution control strategies are usually considered as 'end-of-pipe':

- Off-site recycling
- Transferring wastes
- Waste treatment
- Concentrating hazardous or toxic constituents to reduce volume
- Diluting constituents to reduce hazard or toxicity

End-of-pipe:	Cleaner Production:
Pollutants are controlled by filters and waste treatment methods	Pollutants are prevented at their sources through integrated measures.
Pollution control is evaluated when processes and products have been developed and when environmental impacts occur	Pollution prevention is an integrated part of product and process development
Pollution controls and environmental improvements are always considered cost factors for the company	Pollutants and waste are considered to be potential resources and may be transformed into useful product and by-products
Environmental challenges are to be addressed by environmental experts such as waste managers	Responsibility over environmental problems belongs to people throughout the company, including workers, engineers and managers
Environmental improvements are to be accomplished with techniques and technology	Environmental improvements include non technical and technical approaches
Environmental improvement measures should fulfill standards set by the authorities	Environmental improvement measures should be a process of working continuously to achieve higher standards

Table 1: Comparison of the alternative waste control strategies (Adapted from Husingh Environmental Consultants Inc., 1994)

End of pipe technologies in a first approximation leave production- and consumption processes unchanged. Central to such technologies is the treatment of wastes, such as solid wastes and emissions into water and air. Applications of end-of-pipe technologies include wastewater treatment plants, electrostatic dust precipitators, catalytic converters for exhausts of motorcars, flue-gas scrubbers, incinerators for industrial and household wastes and controlled landfills.

It is important to realize that end-of-pipe solutions are generally proven technologies, readily available from suppliers as 'off the shelf solutions'. They are often reasonably quick to apply and may not require any process modification, redesign or replacement, in contrast can be a lengthy and complex project requiring considerable testing and experimentation with unproven alternatives. A table below shows principal differences between cleaner production and 'end-of-pipe' strategies:

Cleaner production projects cannot be implemented in isolation, as many end-of-pipe technologies for pollution control could. They must be supported by environmental management systems, which comprise a set of techniques that facilitate assessments of environmental impacts of processes and products, projects identification and documentation of environmental results (often they could be observed outside the targeted process). Hence, the cleaner production relies ultimately not just on a technological development, but also on managerial tools and measures.

Important Considerations to Further Analysis

The above analysis leads us to considerations on the extent the CP projects by their origin are suitable to resolve environmental concerns. These considerations are an important element of the further analysis by the Study:

- CP projects are applicable to the production processes, discrete and continual; they may therefore be targeted at specific processes, not at regional environmental concerns;
- The CP is a concept integrating environmental improvements and business strategies; the companies often are driven by business benefits, when the implementing CP projects. Profitable process improvements through the CP projects may catalyze management's and workforce's interest to environment. This may be expected if the management and workforce are capable to document the results of their projects;
- CP leads to improvements at a source of environmental concerns, not at effect. Therefore it requires a careful environmental impact assessment to link the process improvements upstream and environmental effects downstream;
- CP does not involve a clear-cut set of generic technologies: its technical components could be also be a part of end-of-pipe projects. The common feature is not technological but managerial - a way of looking afresh and structurally at products and processes in order to see how their environmental impacts can be reduced and, if possible, prevented;
- The Cleaner Production improvements cannot be implemented in isolation, as many end-of-pipe technologies for pollution control could be. They must be underpinned by environmental management systems to achieve long-term and sustainable improvements;
- It is often, when starting out cleaner production, companies look at no- or low cost options ("low-hanging" fruits) at first hand; these projects may deliver about 20-30% of the total potential for savings at relatively low cost and with high return to investments. Such measures are most often implemented using equity capital;

- To enjoy more radical improvements, other 70-80% of the total potential for the savings, the companies should perform assessment of production processes, products and management systems. This assessment needs to be comprehensive, step-by-step and methodologically tailored. It might require both specific and multi-disciplinary competence and time. The Norwegian methodology for conducting external cleaner production and environmental audits, called 'teknisk miljø analyse' is a good example of such assessment;
- In contrast, the end-of-pipe solutions are often specific and could be promptly implemented;
- In private industry it is a common practice to calculate only private costs. Avoided costs, avoided future liabilities, social aspects are often forgotten, which may reduce the merits of the CP projects to the company management and environmental authorities;
- Governments have a key role to play in supporting the development of CP. Transition to CP will evolve if corresponding institutional framework is provided by authorities.

5. Institutional Framework for Cleaner Production and Hot Spots in North West Russia

As mentioned above, the CP activities may only be successful and sustainable provided an enabling institutional framework is established. Important elements of this framework are:

- Environmental Legislation;
- Suitable Economic Framework;
- Interested parties and stakeholders.

This section provides brief evaluation of existing legislation and interactions between regional authorities, production companies and the related international initiatives in relation to the CP and 'Hot Spots'.

5.1 Legislative Basis for Environmental Activities

All industrial companies, having activities leading to negative environmental impacts (contaminants emissions/discharges into the atmosphere and bodies of water, production and consumption waste generation) are a subject to various requirements and regulations, as set by the existing legislation of the Russian Federation. The legislative basis consists mainly of the federal laws and many "under-law" legislative acts (directives, regulations, etc.), which have indirect relation to CP activities. Basic laws regulating environmental relationship in the RF are listed in the Register of Legislative Acts and Other Requirements (Annex 2).

The existing system reflects rather conventional approach for establishing standards and maximum threshold quantities for discharges, emissions, and disposal of waste. The main elements of the system include assessment, monitoring and control of the industrial pollution. With this approach, Russian industrial companies are pushed to deal with pollution control (consequence of pollution), rather than at-source improvements.

For each type of exposure to environment, such as water, air, and waste disposal, a separate permit shall to be obtained. Each company shall receive special permits, called Emission Limits Values (ELVs), which are calculated to ensure that a company meets MAC (maximum allowable concentrations). Procedure for obtaining these permits addresses first of all pollution control practice, along with dilution and diffusion.

At the same time, this approach maintains "polluter pay" principle by requiring payments for pollution (environmental fees, fines, compensation for environmental damage). It also includes environmental compliance control of working facilities, and administrative fees and penalties for the non-compliance.

Russian legislation determines that 214 agents of air pollution, 197 agents of water contamination, as well as disposal (storage and disposal) of hazardous waste are subjects to pay. As for the mobile sources of pollution, the payments for pollution are collected only for the vehicles, belonging to the companies. Main environmental regulations, as well as directives setting the structure and volume of environmental payments for the natural resources use and for emissions, discharges and waste disposal are listed in Annex 2.

A common opinion is that the ELVs often do not have solid scientific grounds and do not consider monitoring or analytical requirements, abnormal operating conditions or a consideration of Best Available Technologies. The MACs are regularly reviewed and toughened both in quantities and money terms. Often the MACs are set so strictly that enterprises find it impossible to establish ELVs

that will comply with these MACs. Application of modern end-of-pipe technologies is often seen by the companies as a cost-burden. As a result, Temporary Agreed Releases (TAR) become a common practice.

TARs are inscribed for a period necessary for gradual achievement of ELVs by a company and may last for a period not longer than one year. When issuing permits for TARs, the federal authorities approve plans for phasing out of pollution. Drafts of TAR and plans for phasing out of pollution are prepared by the companies themselves. The Law does not restrict number and overall time period a company may enjoy such TARs. It may mean that they may be set at any level irrespective of the acting MACs and may be granted to one company many times subsequently.

Priorities for national environmental policy, environmental management and security are set up by the Environmental Doctrine of the Russian Federation, approved by Decree of the Government of the Russian Federation as of August 31, 2002, No. 1225-r, is a gradual bringing of standards and requirements to international standards.

Environmental Doctrine of the Russian Federation (RF) of 2002 has identified specific targets for Russian Environmental Policy, such as elimination of environmental hot spots of the past years, encouragement of environmentally friendly territorial planning, reduction of industrial resource and energy efficiency, "greening" of economy to improve competitiveness of Russian products on international markets; and conservation and restoration of territories in critical state. Goals could be achieved by reforming the environmental quality standards and maximum permissible emissions/discharge and improving procedures for environmental assessment of enterprises, staged establishment of standards for technological processes (best available technologies), putting economic incentives to improve the environmental performance of industrial technologies, etc.

The Law on Environmental Protection 2002 refers to the concept of Best Available Technologies (BATs). However the concept is not recognized by the legislation. The concept is included neither in the Water Code, nor in the Law on Air Protection. There have been no measures taken so far, either by regulations or otherwise, implementing BATs.

The Program of Social and Economic Development of the Russian Federation for the medium term (2006-2008) includes the following priorities for environmental protection: reform of environmental regulation framework of protected areas, environmental quality standards, system of permits and environmental impact assessment, compliance with the requirements and penalties, resource support for mechanisms aimed at the promotion of resource utilization efficiency and renewable energy), and introduction of economic instruments (including compensation for damage).

These documents are supposed to provide new impetus for transition to modern environmental management systems, adapting environmental legislation to new social and economic realities.

Perspectives for Integrating CP principles in Environmental Legislation of Russia

The desk-top review and comments by representatives of environmental authorities in North West Russia confirm that there is virtually no legislation, both planned and developed, promoting CP activities at either at federal, or the regional/republican levels.

The reason for this is an essential absence of federal policy, even any definition of CP activities, while the regional authorities could not set regional plans and strategies without a clear reference to the relevant federal policies.

In addition to that, enforcement of legislation is not strong and economic imperatives sometimes prevail. Local authorities believe that current economical conditions do not provide room for increasing the payments up to the "stimulating" level, as this would have led to suspension of

work of the majority of Russian enterprises. Thus, the existing pollution control approach doesn't effectively promote and lead to pollution prevention.

In spite of general gap in legislation, in relation to the CP, few positive policy developments have been observed since recently.

On opinion of the EU – Russia Cooperation Programme for Harmonisation of Environmental Standards (HES) II 'the future of BAT may be connected with the Law "On Technical Regulation" that is designed to establish safety requirements to products and processes of their production, transportation, use and disposal of. Such requirements should also take into consideration the environmental safety concerns' (Interim Technical Report, 2009).

According to the latest news (<http://www.ecoindustry.ru/news/view/23539.html>), Ministry of Natural Resources of Russia (MNR) proposes to abandon setting limits on emissions and discharges of pollutants and to introduce a system of integrated permits. Thus, the Ministry has drafted a new bill on introducing a system of integrated permits, which will be eliminating limits on emissions and discharges of pollutants and establishing a system of technological standardization.

According to the document "the objects of economic activity can be divided into 3 groups: those with low exposure, moderate or significant impact on the environment. The latter group (with significant impact) is composed of environmentally hazardous facilities, which are the subject for the governmental regulation on the federal level: environmental control and accounting, environmental assessment". Instead of issuing individual permits for discharges and emissions for small and medium-sized "polluters", the bill proposes a system of declaration. System of integrated permits is stipulated for hazardous objects. Moreover, it is expected to reduce the list of regulated pollutants.

The bill introduces a new term: the best available (existing) technology (BAT). It is envisaged to create the BAT registry and disseminate information on these technologies. A registry of BATs is requested to be developed on the first phase of transition to the new standardization system from 2011 until 2016. During this period it is planned to eliminate the current system of limits, increase payments for excess exposure (in 2011 - five times in 2014 – 20 times) and introduce economic incentives.

Stimulating coefficients are set for payment calculations. At the first stage of the reform an additional factor of 25 will apply to the excessive discharge, and a factor of 100 at the second stage. Additional factor of 0.5 is set for enterprises adopting BAT. The second phase will last from 2016 to 2020 and provides introduction of technological standardization at all facilities related to the fields of BATs use.

Tax benefits and subsidies will be provided for enterprises modernizing production. Economic incentives are introduced during implementation of BAT, construction of sewage treatment plants and recycling water systems, use of waste and application of renewable forms of energy.

Moreover Russian Government is undertaking other measures for improvement of environmental legislation which also could have indirect effect on CP activity in the country. On 17.12.2009 Climate Doctrine of Russian Federation was approved by the President Mr. Medvedev (Annex 13). The Doctrine was developed according to commission of the President of RF and Government of RF and also in the frameworks of fulfilment of undertaken obligations by Russia according to U.N.O. Frame Convention on Climate Change. It supposes adaptation of Russian economy to existing and expecting climate change. In the framework of Kyoto protocol activity in October 2009 Government of RF approved regulations of chapter 6 of Kyoto Protocol according to which Saving Bank of Russia was appointed as operator of carbon units. The bank is responsible to provide tenders and further expertise of the applications.

Further step forward was made on November 23, 2009 when the Federal Law No 261-FZ on “Energy Saving and Increase of Energy Efficiency” was adopted. The goal of the law is creation of legal, economic and organizational basics to stimulate energy saving and increase of energy efficiency.

Thereby one may expect an increase of CP activity in Russia in coming years.

5.2 Gradual Rise of Costs and Payments

Industries in North West Russia now face costs that were previously very small; higher costs of raw materials, higher fuel costs, higher utilities costs, environmental taxes and often new costs for waste disposal and pollution. All these cost elements are gradually increasing and have reached levels that represent a considerable part of the total production costs. These prices will continue to increase in the future. In order to ensure a sustainable level of production, it is becoming clear that companies have to keep these costs under control.

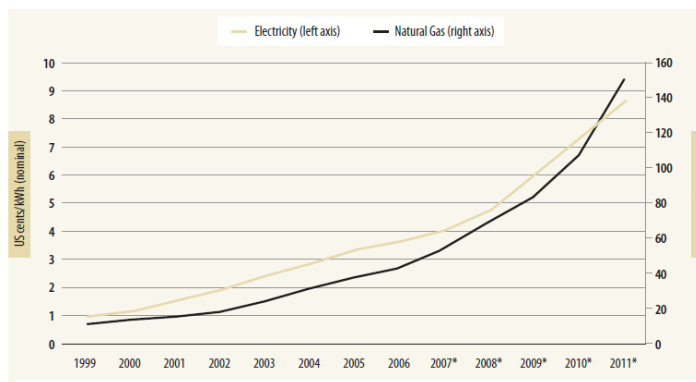


Figure 2: Rising Electricity and Gas prices (Source: Center for Macroeconomic Analysis and Short-term Planning.)

Current and Forecasted Tariffs

According to IFC, Russia's energy intensity has direct costs to the industries driving the Russian economy. Profits will decrease by at least 15 percent for Russian companies and industries that fail to mitigate the impact of tariff increases by improving their energy efficiency. Russian companies currently share in one of the world's largest energy subsidies, equal to roughly \$40 billion per year. The Russian government recognizes the need to raise domestic electricity and gas prices to reflect the actual long run cost of meeting demand, maintaining reliability, and operating and maintaining those assets. The government has been gradually increasing natural gas and electricity tariffs, and plans to continue to do.

Russian Ministry of Economic Development has prepared a forecast for rising of energy prices for 2010-2012. As regards to electricity, the accident at Sayano-Shushenskay HPP may lead to rapidly rising tariffs, 10% per year in average. The Government has approved a plan for liberalization of electricity market. It is expected that any governmental subsidies for the industry will be discontinued by 2011.

Gas prices will also rapidly rise in the coming period. Initially it was foreseen that in the years to come the average adjustment of gas prices will be at the level of 15%. However, this estimate was recently reconsidered: in 2010 the price increase for the industry will be - 26,5 %, while 2011 - 2012 years - 15%. However, the Ministry reminds that local gas prices will still be essentially lower than prices for Russian gas available to foreign consumers. Rise of prices for district heating will heavily be regulated, as the share of payments for heating is in average more than 50% of the total costs for communal and housing services. In 2010, the regulated prices for heating will increase by 10-15% in average, while in 2011 the tariffs will grow by 12-14% and in 2012 – by 9-11%. As admitted, the rise of costs for communal and housing services leads to severe social consequences. Every year, both federal and local governments make efforts to find a balance between the needs of public utilities and population. In average, costs for these services would grow up by 15% in Russia. The main tool for regulating the tariffs for communal and housing services is a system of the tariffs approval in accordance to the federal law from 30.12.2004 №

210-Φ3 (edition from 27.12.2009) on 'On outlines of regulating the tariffs of public utilities'. Herewith, it shall be noted that despite the law requires information transparency, as regards to financial results, costs structure, investments, etc., the absolute majority of public utilities and water supply companies do not have web-sites and do not publish financial reports publically.

Growth in energy tariffs will increase costs and reduce the profitability of industrial enterprises. Companies will either accept a decline in profitability – some of them possibly going out of business – or compensate it with

an increase in prices for their goods and services. Both options have an adverse effect on their competitive position. Estimates from the Center for Macroeconomic Analysis and Short-term Planning indicate that growth in energy costs in 2007-2010 will be at 15% percent (3-7% on an annual basis) reduction in profits. For certain industries, profits may decline by more than 25%. Estimated annual impact by sector is presented below. Negative values demonstrate a reduction of profits in the respective sectors, driven by rising energy tariffs, and the positive values indicate how much enterprises will need to increase prices to compensate for rising energy costs and still maintain their current profitability.

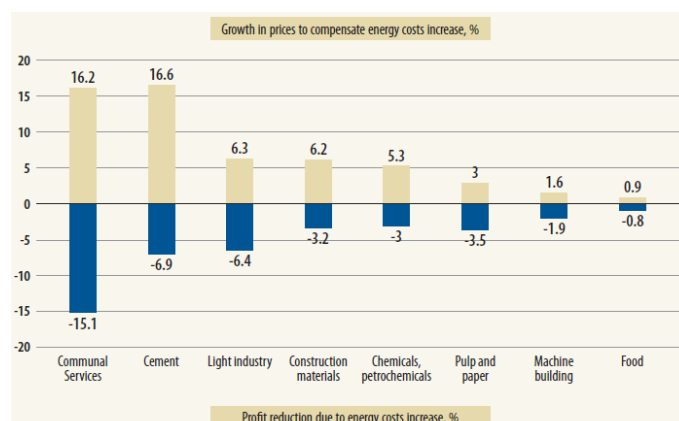


Figure 3: Impact of gas and electricity cost increases on profits (Source: Center for Macroeconomic Analysis and Short-term Planning.)

Environmental Payments

In 2000, responsibility for collection of environmental payments was transferred from the environmental to the federal tax authorities. As of 2004, the enforcement of pollution charges was assigned to the newly-created Federal Environmental, Industrial, and Nuclear Supervision Service (*Rostekhnadzor*), which has the task of detecting non-payers more thoroughly and imposing penalties. A general opinion is that this had a positive impact on the collection rate.

Pollution Level	Charge calculation	Source
ELV	Base rate (N)	Operating costs
TAR	5 x N	Income
In excess of TAR	25 x N	

Table 2: Calculation principles and sources of pollution charge payments

The main principle of Russian pollution payment system is described by the Table 2. The basic rate of payments for a particular polluting agent is applied to emissions/discharges, which are within the limits of intended ELV/MAC. Environmental payments for an exposure which is above the ELV/MAC, but staying within the TAR, are charged at the rate 5 times of the basic rate. For those pollutants, increasing in amount the temporary limits and for emissions and discharges made without permission, the payment rate is 25 times higher the basic. Thus, pollution payments are used as administrative instrument making polluting companies to follow the requirement on timely passing the procedure of granting the permissions.

Non-execution and improper fulfillment of the environmental legislation leads to penalties for environmental violations, claims for compensation to environmental damage, and disciplinary, criminal and civil liability. In case of non-compliance to the approved ELV or MAC, even short-term excess of emissions/discharges of pollutants, the activities of the company could be limited, suspended or

stopped (claims for cessation of activities for individual enterprisers shall be delivered to court or arbitration).

Fees for atmosphere emissions of pollutants by stationary and mobile sources, pollutants discharge to the surface and subsurface water bodies, industrial and consumption waste disposal are approved by Decree of the Government of the Russian Federation No. 344 as of 12.06.2003. Several revisions of this Decree have been published since 2003, but despite this, no significant changes in the payment fee were introduced.

Environmental payments are an income for federal, regional and local budgets. They are disbursed by a single down-payment, in accordance with RF Budget Code No.145-FZ as of 31.07.1998. The structure of the payment distribution is as follows: 20% goes to the federal budget, 40% to the regional budgets and 40% to the budgets of the municipal and city districts. Article 35 of the Russian Federation's Budget Code stipulates the total (aggregate) compensation principle. According to this principle, all budgetary expenses shall be covered by the total amount of the budget revenues and incomes. Thus, budget revenues cannot be allocated to specific budget expenses, except the revenues from specially allocated budget funds.

Importantly, environmental payments received by the budget of various levels are mixed up with outer budget incomes. Therefore, they cannot be accumulated by regional or municipal authorities to solve the local environmental problems.

Only a part of the collected money is spent for environmental protection activities, including environmental compliance by environmental authorities. For example, in the period of 2005-2009, only 10-20% of the collected environmental payments into the budget of Arkhangelsk region were invested back into environmental programmes/measures. This is an indication of the residual principle of funding of the environmental activity.

All budget lines, including environmental expenses, should be approved. This, in its turn, will not guarantee that all environmental payments received will be allocated for implementation of environmental protection measures, in the same volume. Therefore, environmental payments cannot be considered as a significant funding source for the local environmental projects.

5.3 Position of Regional Environmental Authorities

Table 3 outlines main environmental authorities in the region as well as their major functions.

Stakeholders	Functions	Relation to CP process
Environmental Committee/Ministry of Natural Resources	Development and implementation of environmental policies, monitoring of environmental situation, delegation of rights for the use of natural resources.	<ul style="list-style-type: none"> • A duty to control environmental impact of industrial companies; • Education.
Rosprirodnadzor	Surveillance of compliance to environmental legislation in relation to environmental protection	
Rostehnadzor	Environmental permits, as well payments for the use of natural resources and negative environmental effects of industrial activities	

Table 3: Main functions of Environmental authorities in the Republics of Komi and Karelia, Murmansk and Arkhangelsk regions and their relation to CP activities

According to our interviews, Environmental Authorities have limited authority over production companies. They could trace environmental situation at production companies by reviewing environmental reports, submitted once a years. These reports are summarized in each oblast in relation to environmental impact assessment (emissions, discharges, waste generation). Environmental status reports summarizing this assessment are published in hard copies and made also available on the Internet.

Regional environmental authorities may influence knowledge, awareness and environmental consciousness of production companies by means of environmental meetings, seminars and other information events. On opinion of local companies, Ministry of Natural Resources and Environmental Protection of the Komi Republic is active in promoting CP activities in the Republic. A special Working Group is established at the Ministry to keep companies informed about international and other projects on environmental protection and to assist the companies in participating in the projects. At the same time the Ministry is monitoring the activity of the 'Hot Spot' companies.

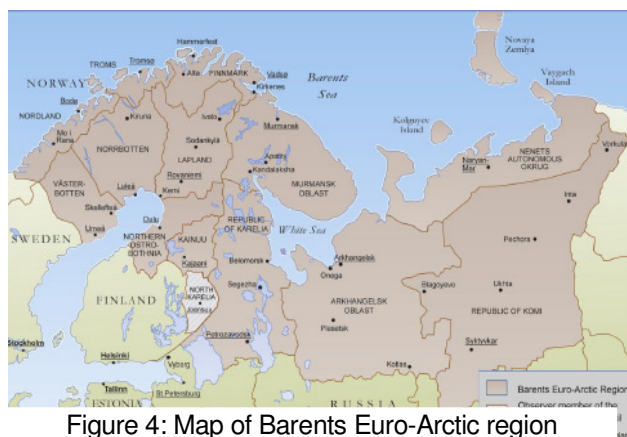


Figure 4: Map of Barents Euro-Arctic region

Only half of respondents from environmental authorities have mentioned that they heard about Cleaner Production and the CP Programmes carried out by Norway and their awareness on the content of these CP Programmes was poor.

Our interviews and discussions suggest that environmental authorities are interested in promotion and implementation of CP activities in the region. However, it is, in general, not a part of their duties according to the legislation and they have too few policy instruments to promote the CP towards the companies. Current regional environmental legislation and policy acts by the regional authorities do not establish any goals for the development and improvement of CP activities in the Barents region. In the opinion of regional environmental authorities, it is necessary to develop CP legislation on the federal level at first hand. This reflects a firm top-down bureaucratic culture in Russia.

5.4 Environmental Management at Companies and their Attitude to the 'Hot Spots'

Most of the companies interviewed consider their environmental situation at acceptable level, as meeting the related norms and requirements of the Russian legislation. They also affirm that they operated under environmental permits and they do not have any official environmental claims from regulatory authorities.

However, most of the companies have acknowledged that they face environmental challenges and the necessity to improve environmental situation. The reasons are worn-out, obsolete equipment, lack of money, necessity in full re-equipment of productions line/cycle. Another reason is frequently changing requirements. For example, Arkhangelsk PPM fulfilled in 2009 requirements on waste management and sent documents for the approval. During the process of approval, new regulations were enforced by the governmental, which had new requirements relevant to the same issue. At woodworking enterprises of Komi, such problems are connected with the materials recovery, while at OOO Vorkutacement there is a problem with cement dust emissions.

Large companies have environmental programmes, but their rate of utilization differs from company to company, depending on their financial situation. For instance, some companies implement their programmes ahead the schedule; while others have pended their actions until funding is available. OOO Vorkutacement has postponed implementation of the programme due to a very difficult financial status making the enterprise shut down its operations for some periods.

The main concern of the companies with regards to their environmental performance is to comply to Russian environmental requirements and allocate available funds for solving environmental problems. Annual environmental reports and environmental audit of industrial sites are the main elements of environmental management at the companies. Companies could show annual figures for environmental impacts. However, comparison of figures for 2003 and 2009 will not give a real picture, since there may have been changes in production cycle, the production rate may have decreased/increased, fuel may have been changed, etc. It is worth mentioning that in spite of the fact that comparison of figures cannot give a realistic picture, all the companies have claimed that they observed reduction of emissions and waste water generation by 10% - 50% compared to 2003. The waste volumes cannot be compared since there have been changes in the legislation that led to change of assessment approach.

Projects developed at the CP Programmes are often implemented within the environmental programmes but their share is normally very small. In general, these programmes comprise the projects initiated by the companies' management with the focus at upgrading production processes. This situation makes it difficult to analyze economic results of the CP projects, as, for example, it may be a part of the production upgrade at one of the workshops, while entire project is related to the whole workshop, not to its single part.

Some respondents knew that they were included in Hot Spots list, while others did not. In general, the impression is that this issue is not of high priority for them. Regardless the companies know or do not know about them being a 'Hot Spot', their first priority is to fulfill Russian environmental legislation.

Some respondents do not understand why they were included in the list because, for example, '40% harmful emissions to atmosphere of all regional emissions is not a criteria if enterprise permanently implement environmental measures and fulfill Russian environmental regulations'. If a company is large it will always have larger contribution of emissions then the rest smaller companies.

Arkhangelsk pulp and paper mill do not understand why they are included in the 'Hot Spots' list. They consider that they are not a 'Hot Spot', because they implemented a number of environmental measures and rates of harmful effect on environment correspond to Russian norms and standards.

OOO Vorkutacement is included to the 'Hot Spots' list under several items and it started the project aimed at the decrease of the dust emissions to the atmosphere – installation of electric filters at chimneys of the enterprise. There is an intention at OOO Vorkutacement to implement environmental projects but the situation is complicated: the enterprise is in hard financial state, and the change of management takes place very often over the past few years.

To summarize, being on the 'Hot Spot' list, is not an incentive for actions yet because Russian environmental regulations do not call for environment improvements at 'Hot Spots'. This shall be the task for environmental authorities which have to follow up the situation at the 'Hot Spots' and develop action plans for their improvements.

5.5 The Framework of International Co-operation in Russian Barents region

North West Russia is a part of international co-operation programme within Barents Euro-Arctic Region (BEAR). This co-operation was launched in 1993 when all five Nordic Countries, the Russian Federation and the EU Commission signed a Declaration establishing the Barents Euro-Arctic Council (BEAC) at a Foreign Minister's Conference in Kirkenes, Norway.

The Barents Regional Council consists of the Heads of the 13 counties, regions or similar sub-national entities. The Russian member regions are Arkhangelsk, Republics of Karelia and Komi, Murmansk and Nenets Autonomous Okrug.

In October 2009, the BEAC chairmanship was rotated to Sweden. The number one priority of the Swedish Chairmanship is to strengthen cooperation by interlinking challenges of economic growth, climate change and sustainable use of natural resources towards an eco-efficient economy. Activities will focus on:

- Revitalize work on climate change through policy, concrete cross sector activities and innovations;
- Increase the opportunities and facilitate for small and medium-sized enterprises to do business in the Barents region;
- Intensify cooperation in the fields of renewable energy and energy efficiency and build networks for and raise awareness of sustainable production and consumption in the Barents region;
- Promote activities to exclude „hot spots“ from the Barents environmental „hot spots“-list, in close cooperation with the Arctic Council. Environmental issues will be its number one priority.

The Barents cooperation framework has developed in various fields and it combines experts and specialists from various sectors. The main tools for implementing policies of both BEAC and BRC are the 16 working groups and task-forces some of which are based on joint national and regional representation, some only on national and some only on regional representation.

The Working Group on Environment (WGE) gives particular attention to CP, elimination of environmental "Hot Spots" in the Russian part of the Barents region, and the conservation of biological diversity and sustainable forest management. In 2008, an Ad-hoc Task Force on elaboration of procedures and criteria on excluding the "Hot Spots" from the Barents environmental "hot spots" list was set up. A fund earmarked for eliminating environmental "hot-spots" has been created in cooperation with The Nordic Environmental Financing Corporation (NEFCO) and some projects are now being implemented.

Following up on the ministers' decision from 2007, in spring 2008 three subgroups were established under the Working Group on Environment in order to enhance development of joint projects. The subgroups consist of appointed representatives from Finland, Norway, Russia and Sweden:

- Cleaner production and environmentally sound consumption;
- Nature Protection;
- Water issues and trans-boundary cooperation.

Climate change is a major concern for the Barents region and the issue has been on the WGE agenda since 2004. The Norwegian Ministry of Environment initiated the conference "Climate Change in the Barents Region", September 1-3, 2009, in Vadsø, Norway. The aim of the conference was to create an opportunity to exchange information and ideas on how to mitigate and adapt to climate change, and explore possibilities of cooperation within this field.

The most recent overview of the WGE activities in NW Russia could be found in the 2008-2009 Report of the Barents Euro-Arctic Council (BEAC), Working Group on Environment (WGE) and the Regional Working Group on Environment (RWGE) to the 9th Meeting of the Ministers of the Environment, Tromsø, 17 February 2010

Environmental projects in Northwest Russia are also supported through bilateral programme of cooperation between Russia and Finland (Ministry of Environment), Norway (Ministry of Environment) and Sweden (Swedish Environmental Protection Agency).

An active and multi-directional framework of environmental co-operation in NW Russia is a solid platform for pushing and pulling CP and Hot Spots activities in the region.

6. Basic Analysis of the Hot Spots in 2003 AMAP/NEFCO report

The Report on Updating of Environmental “Hot Spots” List in the Russian Part of the Barents Region (here below referred to as “The Report”) was prepared by NEFCO in co-operation with the AMAP Secretariat to fulfill the Declaration of the Kirkenes Summit of the Barents Region, devoted to the 10th anniversary of the Barents Euro-Arctic Council (Norway, Kirkenes, January 10-13, 2003). This work aimed to review and add a List of Environmentally Sound Projects, which could make a considerable contribution to improvement of environment situation in the region.

The Report provides a detailed review of the NEFCO Programme (1995), with an evaluation of lessons learned and determination of organizational framework and methodology for the environmental hot spots selection.

A part of the Report is a review of the main environmental and the related concerns in Russian Barents Region. It includes assessment of the status of industrial pollution, data on air emissions, discharges of sewage into watercourses, information on the state of freshwater resources and sources drinking water, review of industrial and domestic waste flows, stocks of obsolete pesticides, contamination of marine environment and oil spills. The Report also contains information on demographic and basic economic trends. Information is presented for each of the regions: Republic of Karelia, Archangelsk Oblast, Nenets Autonomous Okrug (NAO), and Republic of Komi, in the period of 1995 – 2002.

6.1 Methodological Grounds for the “Hot Spots”

The revised list of the ‘Hot Spots’ includes 42 Hot Spots and proposals for 57 investment projects aimed at mitigating their environmental impact.

Methodological principle for the ‘Hot Spots’ identification are based on the choice of a city or area, which is the largest contributor to the overall pollution, according to 1995-2002 data. The main sources of pollution (companies) were identified in the selected areas by evaluation of:

- Overall contribution to the pollution;
- Specific agents of pollution;
- Trends of changing (increase) the amount of pollution since the previous NEFCO/AMAP Report (1995).

In addition, poor quality of drinking water is considered to be a common problem for all the oblasts of Barents region. The reasons are:

- Under-exploited underground drinking water resources;
- Water scarcity and poor water quality of surface sources of drinking water, because of:
 - dumping of municipal and industrial waste water, including untreated water into springs and rivers;
 - infiltration of pollutants into water bodies from surface runoff from waste disposal sites, including liquid waste of livestock farms;
 - Absence or low efficiency of drinking water purification works;
 - Poor condition of water supply system, including the high degree of deterioration of water mains, and, consequent secondary contamination of water, supplied to consumers.

According to the Report, an absence of Solid Toxic Waste Management Systems is by the time of reporting a common regional problem, including:

- Several illegal dumps;
- Shortage (absence) of facilities for hazardous waste treatment;

- Inadequate management of oily waste;
- Lack of recycling of mercury-containing waste;
- Poor collection and recycling of used motor oil.

Analysis of the identified Hot Spots suggests their division in following groups:

Industrial/production facilities (12 “Hot Spots”, 17 projects):

(M-1) JSC “KMMC “PechengaNickel”; (M-1) JSC “KMMC “SeveroNickel”; (M3-1, M3-2) JSC “Apatit”; (M5) Kovdor Mining and Processing Combine; (K1) Kondopoga PPM; (K2) Nadvoitsy Aluminum Smelter; (A1-1, A1-2) Solombala PPM, Archangelsk; (A4-1, A4-2) Archangelsk PPM, Novodvinsk; (A5-1, A5) Kotlas PPM, Koryazhma; (Ko2-1) Vorkuta Cement Plant; (Ko3-1, Ko3-2) Neusiedler PPM, Syktyvkar; (Ko1) Coal mines of Vorkuta basin, utilization of methane from the mines.

Heat and energy production objects, reduction of air emissions (5 “Hot Spots”, 7 projects):

(M4) Apatity HPP; (A2) Archangelsk HPP; (A3) HPP–1, HPP–2, Severodvinsk; (Ko2-2) Vorkuta HPP–1; (K7-1) Boiler house of Petrozavodskchimmash, boiler PTVM-30 conversion from oil to natural gas; (K7-2) Conversion of HPPs in Olonets and Muezersky from traditional fuel to timber waste; (K7-3). Construction of heat and power station in Suojarvi (Kaipa) utilizing timber waste as fuel.

Poor quality of drinking water and problems with drinking water supply. (6 “Hot Spots”, 8 projects):

(M6-3) Construction of ozone treatment facility at the water intake station of “Murmanskvodocanal”; (M7) Drinking water supply of Zelenoborsky-1 settlement; (K4) Reconstruction of drinking water treatment facilities in Petrozavodsk; (K3-1, K3-2, K3-3) Drinking water supply in the cities and settlements of the Republic of Karelia, including Improvement of drinking water supply in Loukhi settlement, Olonets, and Sortavala town; (N2) Improvement of drinking water quality in Velikosochnoe settlement; (Ko5) Development of the general plan for water supply of the Komi Republic.

Water bodies’ protection, discharge of waste water (5 “Hot Spots”, 9 projects):

(M6-1) Protection of Kola river water quality from negative impact of “Murmanskaya” poultry farm effluents; (M6-2) Elimination of the manure collector of the “Prigorodnaya” pig farm; (M6-4) Elimination of Bolshoe Lake water influence on drinking water quality in Murmansk; (K5) Onega Lake pollution, modernization of waste water treatment system in Petrozavodsk is required; (K6-2, K6-1) Absence of communal sewage treatment facilities in the cities of Medvezhjegorsk and Pudozh; (N3-1) Discharge of Naryan-Mar sewage in Pechora River; (N3-1) Reconstruction of waste water treatment facility in Naryan-Mar; (N3-2) Construction of treatment unit for processing of ballast water and other oily waste waters; (Ko4) Municipal sewage discharge. Construction of municipal sewage treatment unit in the settlement of Izhma.

Hazardous industrial and household waste (10 “hot spots”, 11 projects):

(M8) Modernization of equipment of JSC “ECORD” Ltd. (Kirovsk) for treatment of mercury containing waste is required; (M10) Oil containing waste management. Construction of site for biological neutralization of oil sludge (Murmansk Oblast); (K8-1) Waste Management System development in Karelia. (K8-2) Construction of hazardous waste treatment plant; (K9) Localization of negative impact of former city dumping ground to Logmozero and Onega Lakes; (A6) Development of Solid Waste Management system in the city of Archangelsk and Archangelsk Oblast; (A8) Development of used motor oils management system, Archangelsk; (N4) Construction of unit for treatment of used luminescent lamps; (Ko6) Creation of Waste Management System in the Komi Republic; (Ko7) Fuel bricks production of wood waste; (Ko8) Coal waste treatment into coal bricks.

Other environmental aspects (6 “Hot Spots”, 8 projects)

(M9) Scrap ships in Kola Fjord; (K10) Stocks of obsolete pesticides, Sortavala, Karelia (according to available information they have been taken away and destructed in Finland); (A10) Stocks of obsolete pesticides, Archangelsk Oblast; (A7-1) Sites of former and current military defense objects, including rehabilitation of Letneozersky military reservation territory from oil spill, (A7-2) survey and preparation proposals on Frantz Jozef Land rehabilitation; (A9) Pulp and Paper Mills as sources of dioxin pollution, survey and rehabilitation of the Onega Timber Processing Plant; (N1) Accident at the Pit No 9 of the Kuzminsky Deposit.

6.2 Comments to the Identified “Hot Spots”

Large industrial enterprises and power generating facilities are the major sources of emissions and discharges of waste water in the described region. They often are the only large and correspondingly the core enterprises of a city or district. Information on the volumes of wastewater discharges by these companies typically includes a quantity of municipal wastewater from neighboring settlements.

For all types of environmental impacts, the Report gives gross figures from statistical reports, but it does not seem to provide corresponding data on specific emissions (discharges) per unit of production, comparison of actual emissions (discharges) with the approved maximum allowable emissions, discharges, or the best available techniques.

Taking this into account, it could be assumed that, even if these large companies manage to reduce emissions, discharges and waste to meet the acting regulations (ELV/MAC), they will still lead the “Hot Spots” List. It is therefore necessary to clarify the criteria for “Hot Spots”, in particular, to account both gross and specific quantities of pollution.

Problems of drinking water supply and protection of water bodies are closely interrelated. Without improving wastewater collection and treatment systems to the levels, which do not adversely impact on water quality of watercourses, there always be a need to build expensive drinking water purification plants. In this case, the problem of water pollution will only rise, because the pollution would accumulate, including heavy metals, inflows of oxidation prone compounds with sewage, thus leading to further worsening the water quality. All the “Hot Spots” in this group can be tentatively divided into two sub-groups:

- “Hot Spots” originated by a poor performance of equipment of wastewater treatment and purification plants, worn-out lines for supply of drinking water, as well as sewage collection and draining lines. Improvements could be achieved with optimization of existing treatment processes, better quality of treatment and increase of the productivity of existing treatment facilities, by means of application of modern technologies of water purification and sludge treatment, upgrading the equipment of treatment facilities, rehabilitation of existing networks.
- “Hot Spots”, which require first of all management decisions: organization of the surveys, formulating of action lists, appointment of implementers, detailed planning for a full range of works to be conducted, including design and survey, project work, coordination in the prescribed manner, construction of a new facility, put into operation, monitoring of quality.

Group of hazardous industrial and household waste can be divided into 4 sub-groups:

- “Hot Spot” represents a specific company JSC Ekord Ltd. (Kirovsk), which carries out processing of mercury-containing wastes. Upgrading of the equipment is required.

- “Hot Spots”, where particular environmental concerns shall be resolved: processing of used motor oil, recycling of waste wood or processing of coal waste. These problems could be done at existing enterprises of the region or city.
- “Hot Spots” related to the negative environmental impact of the closed-down at present time waste disposal sites (former dumps).
- Creation or organization of waste management system – a “Hot Spot”, which initially requires formulation of a priority list of goals and objectives, selection or appointment of authorized person, etc.

“Hot Spots”, which are in the group of ‘Other Environmental Aspects’ can be divided into 3 three sub-groups:

- Stocks of obsolete pesticides. According to the available information the procedure of solving this issue is defined.
- “Hot Spots” caused by the need to eliminate or localize sites, where the accidents of various kinds took place.
- Scrap ships in Kola Fjord.

One general and very important observation shall be pointed out: almost all “Hot Spots” suffer from insufficient definition of their boundaries (boundary of a problem), analysis of sources of environmental pollution and criteria for their elimination. The format of the ‘Hot Spots’ presentation is complicated and its needs to be simplified and improved. One ‘Hot Spot’ could have several projects (e.g., K 17 (7) having several mitigation projects (K7-1, K7-2, K7-3). One project, if succeeded, is still not capable to eliminate the ‘Hot Spot’, but there is no reference if 3 projects are enough.

To illustrate:

- It is stated that “in Karelia, there are 206 landfills, including 157 landfills of municipal solid waste, that do not meet regulations and are of high risk to the environment”. All the 206 landfills are included in the list of “Hot Spots”, but it is unclear till which extent the suggested K8-2 project of building hazardous waste treatment plant and the K8-1 project of establishing of the waste management system would solve the problem?
- The Report provides information about outbreaks of dysentery among the population, due to poor quality of drinking water. However, it is not clear from the text what has caused the deterioration of water quality: lack of treatment facilities, poor performance of the system for disinfection of water at the treatment plant or secondary contamination in the water distribution system. Projects K3-2 and K3-3 include “Improving the supply of drinking water in the cities of Olonec and Sortavala”. The content of these projects is unclear: is it construction of new facilities or modernization of existing water treatment systems, or improvement of water disinfection?
- The “Hot Spot” Ko1, “Greenhouse gases emission to the atmosphere in the Vorkuta Coal Field”. The Report states that “the major pollutants of the atmosphere are: JSC “Severgazprom” (Ukhta and Sosnogorsk cities), mines in Vorkuta: “Severnaya”, “Vorkutinskaya”, “Vorgashorskaya”, as well as “Neusiedler Syktyvkar” PPM. However, analysis of the data from Table 5.5 of the Report shows that the mine “Komsomolskaya”, the greatest source of hydrocarbon emissions, is not included in the list of the biggest polluters. “Neusiedler Syktyvkar” PPM is isolated in a separate “Hot Spot” Ko3-1. JSC “Severgazprom” (Ukhta and Sosnogorsk cities) is not included in the “Hot Spots” list at all, despite the fact that its emissions are 6 times higher than the emissions from “Neusiedler Syktyvkar” PPM and 2,4 times higher than that of any of the mines in Vorkuta.

In addition, titles of the ‘Hot Spots’ shall be fine-tuned. Titles, like household waste management systems (K8-1, A6, Ko6), shall be avoided. According to the federal law RF 89-F3 «On production and consumption waste», each oblast has a special body responsible for the waste management, Rostekhnadzor issues permits for waste disposal and supervises their abidance. Therefore, an ordinary head of oblast would assume that management system is in place. A focus shall in turn be given to specific issues and projects, rather than to general intentions.

In essence, a CP context could be added to the initial 2003 AMAP/NEFCO inventory by developing clear environmental criteria for the ‘Hot Spots’ elimination, e.g., minimum acceptable process efficiency, and by supplementing the current description with ‘Environmental Hot Spot source’ analyses.

6.3 Ranking of “Hot Spots” in relation to the Hot Spots

Earlier assessment of the CP methodology suggests that a ‘Hot Spot’ should have the following features in order to be targeted by CP measures:

- To be related to production processes, being long-term and repetitive;
- Not to be related to one-off hazardous accidents;
- Not to be related to historic contamination and pollution;

In light of this conclusion, 3 groups of the “Hot Spots” could be distinguished upon applicability of CP projects for changing ecological status of “Hot Spots”:

Group 1 – the “Hot Spots” that are not suitable to be addressed by the Cleaner Production projects

The ‘Hot Spots’ represent a description of the problem (pollution, lack of system, lack of facilities ...), or managerial strategies (development plan, creation of systems, construction of buildings, and elimination of the consequences):

- (M6-1) Protection of Kola river water quality from negative impact of the effluents of the “Murmanskaya” poultry farm; (M6-2) Elimination of the manure collector of the “Prigorodnaya” pig farm; (M6-4) Elimination of influence of the water quality of Bolshoe lake on the Murmansk drinking water safety;
- (M9) Scrap ships in Kola Fjord;
- Absence of municipal sewage treatment facilities, construction of sewage treatment facilities in the cities of Medvezhjegorsk (K6-1), and Pudozh (K6-2) is required;
- (K8-1) Organization of Waste Management System in Karelia, (K8-2) Construction of Hazardous Waste Treatment Plant;
- (K9) Localization of negative effect of former dumping site on ecosystems of Logmozero and Onega lakes;
- (K10) Stocks of obsolete pesticides in Karelia, Sortavala – according to the obtained information they have been transported to Finland and destructed;
- (A6) Creation of Solid Waste Management Systems in the city of Archangelsk and Archangelsk Oblast;
- (A7-1) Sites of former and current military defense objects, rehabilitation of Letneozersky military reservation territory from oil spill (A7-1), survey and preparation proposals on Frantz Jozef Land rehabilitation (A7-2);
- (A8) Development of used motor oils management system, Archangelsk;
- (A10) Stocks of obsolete pesticides, Archangelsk Oblast, elimination;
- (N1) Accident at the Pit No9 of the Kuzminsky Deposit;
- (N3-2) Construction of treatment unit for processing of ballast water and other oily waste waters;

- (N4) Construction of unit for treatment of used luminescent lamps;
- (Ko4) Municipal sewage discharge. Construction of municipal sewage treatment unit in the settlement of Izhma;
- (Ko5) Development of the general plan for water supply of the Komi Republic;
- (Ko6) Creation of Waste Management System in the Komi Republic.

Group 2 – represents the “Hot Spots” where the CP projects are mostly applicable

The “Hot Spots” are mainly represented by production and energy companies, heat and where technological processes can be clearly traced. Reduction of the negative impact of production activities at these “Hot Spots” can be achieved by optimization of existing processes or introduction of best available techniques, modernization of equipment, implementation of measures, including those developed by the Norwegian CP Education programmes:

- (M-1) JSC “KMMC “Pechenganickel”;
- (M-1) JSC “KMMC “Severonickel”;
- (M3-1, M3-2) JSC “Apatit”;
- (M5) Kovdor Mining and Processing Combine;
- (M4) Apatit HPP;
- (M8) JSC “Ecord” Ltd. dealing with recycling of mercury-containing waste, modernization of equipment is required, Kirovsk;
- (K1) Kondopoga PPM;
- (K2) Nadvoitsy Aluminum Smelter;
- (K3-3) Drinking water supply of the city of Sortavala;
- (K4) Reconstruction of drinking water supply plant in Petrozavodsk;
- (K5) Onega Lake pollution, modernization of the Petrozavodsk city system for sewage water treatment is required;
- (K7-1) Petrozavodskmash boiler house, conversion of the PTVM-30 boiler from oil to natural gas;
- (K7-2) Conversion of heat and energy stations in Olonets and Myezersky from traditional fuel to wood waste;
- 13. (A1-1, A1-2) Solombala PPM, Archangelsk;
- 14. (A2) Archangelsk HPP;
- 15. (A3) HPP – 1, HPP – 2, Severodvinsk;
- 16. (A4-1, A4-2) Archangelsk PPM, Novodvinsk;
- 17. (A5-1, A5-2) Kotlas PPM, Koryazhma;
- 18. (N3-1) Naryan-Mar sewage discharge into Pechora river. Reconstruction of sewage treatment unit in Naryan-Mar;
- (Ko1) Coal mines of Vorkuta basin. Mine methane utilization;
- (Ko2-1) Vorkuta Cement Plant;
- (Ko2-2) Vorkuta HPP – 1;
- (Ko3-1, Ko3-2) “Neusiedler” PPM, Syktyvkar.

Group 3 – group of the ‘Hot Spots’ partially targetable by the CP projects.

In general, the CP methodology is applicable, but current description of the sources of pollution and their geographical boundaries are not clear, as well as elimination criteria and procedure. For instance, the CP improvements could be applied to geographically disperse ‘Hot Spots’, but further work is required to specify the main sites and facilities responsible for the environmental deviations within the ‘Hot Spot’. Besides, in situation, when most of the companies do not have a systematic environmental monitoring system (documentation of environmental impacts before and after a CP measure is implemented), it may be quite difficult to document their real exposure to Environmental ‘Hot Spots’. This group includes:

- (M7) Drinking water supply of Zelenoborsky-1 settlement;

- (M6-3) Ozonation station construction at the water intake of “Murmanskvodokanal”;
- (M10) Handling of oil-containing waste. Construction of site for biological neutralization of oil-containing slams, Murmansk Oblast;
- (K3-1, K3-2) Improvement of drinking water supply in the cities and settlements of the Republic of Karelia, including the city of Olonets and the settlement of Loukhi;
- (K7-3) Heat and Power Production station construction in Suojarvi (Kaypa) which utilizes wood waste as fuel;
- PPM companies as sources of dioxin pollution, survey and rehabilitation of the Onega Timber Processing Combine territory;
- (N2) Improving the drinking water quality in the settlement of Velikosochnoe;
- (Ko7) Arrangements for recycling of wood waste into pellets;
- (Ko8) Recycling of coal waste into coal bricks.

7. Analysis and Evaluation of Implemented CP Educational Programmes

CP Education Programmes (CP Programmes) started in Russia in 1994 with participation of experts from Norway. Initially, in accordance with the intergovernmental agreement between Russia and Norway, the CP Programmes were conducted in Arkhangelsk, Murmansk and the Republic of Karelia. Later on, the focus was extended to other oblasts of the NW Russia, as well as to central oblasts of European part of Russia.

To ensure continuous and wider dissemination of the CP Programmes in Russia, the CPSD Centre was established in Moscow in 1994. Later on, a chain of regional CP Centers was organized in most of the regions of NW Russia

The main objective of the CP Programmes is to disseminate the CP methodology to engineers and technical staff of industrial companies, so that they can use this knowledge in their future production activities. The methodology of CP Programmes is described in details by the Annex 3.

Up to now, 97 Programmes were conducted, more than 1,650 engineers successfully completed the CP Programme. Of them, 1,252 people were from the companies in the NW Russia.

Region	Number of Programmes	Number of participants obtained certificated
Archangelsk oblast	22	424
Murmansk oblast	19	307
Republic of Karelia	22	371
Republic of Komi	8	150
Total:	68	1 252

Table 4: Inventory of CP Educational Programmes in NW Russia

7.1 Desk-top Analysis of the CP Programmes

By now, the CP Programmes are undertaken for 17 years. Information about the CP Programmes conducted in the course of 1990s is fragmented, while some of the results are apparently outdated. Therefore, the analysis covers the most recent period, since 2003, and the CP Programmes which could be related to the 'Hot Spots'. The following information was collected and analysed:

- Lists of participants of the CP Programmes;
- Summary of CP Programmes results;
- Summary CP Reports prepared by the companies, which were presented by the end of CP Programmes;
- Description of projects developed during CP Programmes at 'Hot Spots' locations.

In the period 2003-2009, as many as 40 CP Programmes were conducted, while 22 had any direct or indirect relation to 'Hot Spots'. 403 participants have successfully passed through the training and presented their own CP reports at these 22 CP Programmes. In total, there have been identified and proposed 1 522 CP projects, including 745 (49%) – category A projects, which do not require significant investments; 550 (36%) – category B projects, which will require investments until 350 000 USD and 227 (15%) – category C projects, with the investments over 350 000 USD and payback period more than 3 years. Total investments required to implement these CP projects are 246 187 000 USD. If these investments are realized they would have initiated considerable environmental improvements, including: (-) reduction of air emissions by 74 000 ton/year; (-) reduced waste water generation by 63 471 000 m³/year; (-) reduced drinking water use by 69 182 000 m³/year; (-) reduction of solid waste generation by 717 000 t/year; (-) less electricity use by 6063679 KWh/year; (-) reduced use of fossil fuels by 208 873 tons of oil equivalent. The CP

measures identified would have also brought significant economic savings, 155 801 000 USD/year. That means every 1 USD invested in CP measures may have initiated 0,65 USD/year in savings, which proves that the CP is a very profitable activity for the companies.

Annex 5 presents detailed breakdown of the CP programmes results in 2003-2009.

All experience from implementation of CP Programmes suggests that several category A projects would be implemented immediately, i.e., in the course of CP Programmes. Category A measures are usually small-scale and do not require in-depth analysis. Many of them could actually be considered as good housekeeping and operation and maintenance measures. They are often rather typical than specific for a certain process. They may be identified by a fresh look at production processes, but may not necessarily require a thorough analysis. It is also possible to assume that many of these A-category of projects are implemented at other companies without CP Programmes. Therefore, one could assume that the identified and implemented A-category of projects, at least their significant part would have also been implemented at the companies in the absence of the CP Programme, but later on and slower. The role of the CP Programme therefore is to educate, facilitate and speed-up the process of the CP projects identification and implementation.



Figure 5: Places where CP Programmes were conducted in the period 2003 – now (marked by red circles)

As it could be seen in the Annex 4, as many as 240 companies took part in the CP Programmes. This seems to be a very good penetration rate for the NW Russia. Most of the 'Hot Spots' companies went through the CP Programmes. In theory, this could have offered a unique opportunity to address and possibly influence the status of the 'Hot Spots' within by the CP Programmes.

When looking at the list of companies-participants, a conclusion could be drawn that a range of the companies-participants is very broad. Along with industrial companies, the list includes utility companies, building stock operating enterprises, design and engineering companies, Universities, geological and geophysical companies, stevedoring and waste handling companies, representatives of municipal authorities, transport and roads companies, health care organisations, agricultural and forestry enterprises. The share of companies and institutions, which are not typical production companies, is at 20-25%. Hence, the actual choice of the participants did not fully adhere to the initially defined by the methodology target group (engineers from production companies).

This fact requires further elaboration. If one of the purposes was to raise awareness on the CP with a broader spectrum of experts, not just engineers (civil servants, University professors, economists, etc.), than the initial model of CP Programmes should have been tailored, while its major principle, from 'Engineer-to-Engineer' - adjusted. This may have been done, but the CP Programme reports provide no evidence about amendments, which means that they were more like ad-hoc, if any. Alternatively, the presence of non-production companies and organisations could merely highlight certain challenges in signing up new production companies in the regions,

where next to all large production companies have already been covered by the CP Programmes. If so, a logical step forward would also be to accommodate the initial model of the CP Programmes to new type of participants.

The methodology of CP Programmes includes various forms, templates, mass balance sheets that the participants are supposed to use in the analysis of their production processes and identification of CP projects. However, the Programme reports, reviewed by the Consultants, suggest just final calculations of the CP projects and summary of the total results. These reports do not reveal the necessary level of details on particular measures or projects; neither have they showed how the feasibility analysis has been performed. If so, the measures or projects generated during the CP Programmes do not provide complete or sufficient information; they would most likely be regarded as a project outline. It is questionable therefore if the proposed level project details would be sufficient for the decision-makers at production companies and would encourage them to support implementation of the CP projects.

In addition, the CP Programme reports provide, to our mind, too brief evaluation of results and lessons learnt. Apparently, this evaluation shall be an essential element of the overall assessment of CP Programme performance and planning of new CP Programmes. Therefore, it could be advised to extend the CP Programme reports, especially in the parts related to evaluation of results and lessons learnt.

The methodology of the CP Programmes does not provide enough space for the follow-up activities, i.e., monitoring of the measures and projects developed as a part of the education. Therefore, it is difficult to trace the actual economic and environmental results achieved after the end of the CP Programmes and the company's interest in implementation of the developed measure. There are no templates in the CP Programme's hand-outs for documentation of the results achieved. These issues could be further worked out.

Several of the CP Programmes are implemented directly at large industrial companies. This is obviously an effective way of education, but people working at production companies may not be expected to stay all the time with the training session. Production companies have usually limited man-power and therefore frequent (part-time) absence some of the participants could be expected. Therefore, a possibly better way is to conduct the training seminars outside the companies-participants.

7.2 Opinions on Effectiveness of CP Programmes by the Participants

According to the interviews and company surveys, most of the CP Programmes participants in the Republics of Komi and Karelia, Murmansk and Arkhangelsk regions think that the CP Programme were useful in their daily work. "It helped me to get an overview of modern technological approaches and possibilities to develop and improve production at our enterprise, make it more environmentally friendly", - commented one of respondents from Karelia, who was only one-month working at her company, when she took part in CP Programme. More experienced colleague of hers has mentioned that 'they they got a unique chance to learn more about activities and technical solutions at another companies and exchange experience'.

Most of the participants admit high qualification and enthusiastic attitude of teachers, who managed to create a motivating atmosphere, to assist in a team work and ideas generation. One of the respondents from Petrozavodsk Vodokanal noted: "During one of the "brainstorms", when we were discussing project details, I was really feeling uneasy to present my point of view. My colleagues were much more experienced than me, and my comment looked not so professional. I told about that to our supervisor and he advised me to look at it a little bit from another angle and

made some changes in my proposal. Finally, I must say, my idea became a central part of our project”.

Participants in Komi have noted that the CP methodology allowed considering environmental and economic issues from another angle and looking with a fresh perspective at their companies. All respondents have noted that implementation of the “A” category, and partially “B” category of CP projects (non- and low-cost actions) contributes to a quite significant money saving. During the meetings, the participants and managers of CP companies pointed out that their focus was at decreasing of any waste generation and converting losses into profit.

The following positive aspects of the CP Programmes were frequently mentioned:

- simple methodology;
- proper balance between theory and practice;
- fresh approach for the participants in assessment of production processes (at-source reductions vs. “end of pipe”, material- and energy balances);
- environmental and economic assessment of CP projects;
- possibility for communication between the participants; brainstorming, etc.

Opinions on Methodology and Tuition Materials

The respondents were happy with CP methodology, as it included not just plenary lectures, but also various types training exercises, company visits and practical assignments and homework in between of the sessions.

All respondents were provided with tuition materials during the course, which apparently were simple and understandable for the participants with different technical and general background. Tuition materials were well structured and helped the participants to get quickly involved into the process of their projects origination.

CP methodological materials, which were distributed to the CP companies, were not presented during the interviews. One of the explanations to this was that the meetings were held with chief engineers and chief ecologists, who have attended the CP Programmes, while the CP materials are with technical specialists in their departments, i.e., those who are responsible for technical and environmental calculations. These specialists were not interviewed during the meetings.

Only 3 enterprises confirmed that they use methodological materials in their daily work. Thus, it was told at Solombala PPM that the methodology materials are used for calculations but it was not clarified by whom and when they are used. Respondents at OOO PolarPharm, Murmansk and ZAO Petrozavodskmash mentioned that they use these materials until now and recommend new employees at their companies to study them. It means that the educational approach “from engineer to engineer” is really working at these 2 enterprises.

Other respondents have failed to provide information on utilization of hand-outs from the CP Programme at their companies. They often assume that a particular participant of the CP programme holds the received materials at his/her private use and further distribution of the materials are questionable. Next to all companies do not trace utilization of the hand-outs. Most of the respondents have failed provide examples of a CP methodology application at their companies.

Opinions on the Projects Developed during the CP Programmes

In the course of the programmes, the majority of the projects of A-group were implemented at all surveyed companies.

Comments on the question “Would the projects have been developed and implemented by enterprises if CP programme had not been performed?” were quite different. Some respondents noted that they would still propose and develop projects themselves without participation in a CP programme. Others told that they got a very well structured approach of ideas generation and their presentation of which they did not think before.

It was noted in Komi that “A” category projects and partially “B” category projects could be implemented even without participation in CP Programme but current practices hamper the very process of ideas generation, and as a result proposals for possible actions are often disregarded.

Despite of the fact that most of the respondents were very positive to the CP Programmes, some of them have noted that it was waste of time with no essential results (though they put only positive comments in the questionnaire). One of the challenges mentioned almost by every respondent is a lack of time for in-depth analysis of production processes.

An example of a serious barrier is a lack of information in possibilities for financing of their projects. The CP Programmes is eventually providing little information to the participants with regard to the procedure of application submission. The level 2 of the Norwegian model, i.e., financial engineering programmes are apparently not known by the participants. So that, one the main arguments for not implementing the CP projects was that the companies got no financing for their projects.

However, it became clear from their comments, that they had not even tried to send an application to NEFCO or another financial institute, because they had not been sure that their projects would be appreciated by IFIs. Only two companies out of all interviewed are experienced in working with NEFCO. Projects of ZAO Zheshartsky Plywood Manufacturing Plant were started before CP training. After the first programme at Solombala PPM they were granted with a CP loan in amount of 100 000 USD.

Another reason is that there was no continuation of activity after the programme was finished. There are no financial incentives for the participants of the CP Programmes. There was an example at Zheshartsky Plywood Manufacturing Plant where all the participants, who passed the CP programme, were awarded with a bonus. Apart of this, the respondents were interested in getting updated information on CP activities at different enterprises, in exchanging of information between companies. This could be done in meetings or round-tables. This suggestion was eventually not supported by CP Programme organisers/lecturers. It was also mentioned that educational materials were not updated for a long time, according to the respondents.

7.3 Further Evaluation and Discussion

The desk-top analysis and opinions of the respondents confirm that CP Programmes are relevant and applicable to some of the ‘Hot Spots’, provided the latter has a clear description of environmental impacts, their sources and criteria for the elimination. However, the CP projects development at ‘Hot Spots’ is not the core target for the CP Programmes.

One should be aware that the CP Programmes are designed to be an educational program at first place. It is intended to assist in changing the companies’ focus from just at ‘end-of-pipe’ strategies, to break the stereotype that environmental improvements are necessarily a cost burden for production companies. The CP Programmes seek change of behaviour and ‘step-by-step and continual’ environmental improvements. TEKNA, the Norwegian Association of Chartered Engineers and the Programme manager of the CP Programmes also confirms that CP Programme concept is designed for teaching engineers in production companies. According to Mr.Borgaas,

head of International Department of TEKNA, 'the CP concept primarily is a educational program "from engineer to engineer", and thus not primarily suited for development of investment projects to eliminate environmental 'Hot Spots'. Borgaas has also underpinned that one of the merits of the CP Programmes is the pool of Russian experts that have been lecturers at the CP programs. In addition to the CPSD centre, a pool of about 15 independent CP experts may be used for future CP related tasks.

Experience with CP Programmes suggests that it is possible to combine education with real projects development. Participants of the CP education programmes conduct basic review of production processes, with general assumptions on the process input and outputs (water, energy, raw materials use and waste generation). The often give a special attention to a limited number of 'standard cleaner production measures'.

Most of the projects developed and implemented are rather small low-cost measures, which have, according to CP theory, limited exposure to a 'Hot Spot'. Implementation of some of the projects developed through the Programme (A-category and B-category) could also be seen as proper fulfilment of job duties by personnel of different levels. Such projects are also implemented by other companies, which do not participate at CP Programmes.

The methodology of the CP Programmes does not allow developing larger projects, as there is little room for the preparation of feasibility studies and business plans. As one of the respondents have mentioned, 'The distributed methodical materials are really easy-to-understand and accessible to everybody, but they cannot be used a basis for developing a business plan. However, this is not the objective of the CP Programme'.

In general, the projects of C-category remain on paper and are not implemented due to different reasons: is not priority project, lack of own financial resources; absence of well developed documentation which will allow applying to credit institutions.

A common opinion is that, CP Programs have a positive impact on environmental awareness in NW Russia. Recognition to this is an award 'Prise for International Ecological Initiatives to Implement the Norwegian Cleaner Production Methodology at Production Companies in North West Region of Russia' received by the CPSD Centre and TEKNA in 2007.

However, educational profile of the CP Programmes suggests relatively slow pace and long time horizon of environmental improvements resulting from these programmes. The 2007 evaluation report on CP Programmes, published by Fridtjof Nansen Institute does not give an exact answer on the effect that the CP programs had on the environmental situation. According to the report, there 'does not exist systematic feedback mechanisms to check if environmental measures outlined in the CP programs are implemented or not'.

Apart of that, there are external factors which reduce effectiveness of the CP Programmes.

As noted by Lars Rowe, from the Norwegian Fridtjof Nansen Institute, Russian environmental legislation is quite strict, but the law enforcement often fails. The consequence is that when CP Program participants propose environmental measures to their company management, implementation of the measures are seldom prioritized.

Financial situation and owners support is a key external factor ensuring effectiveness of CP programme. Large industrial companies in North West Russia (like Kola Mining and Metallurgical Company, etc.) have a strong power in their regions. They also have large investment budgets, where CP projects, developed during the CP Programmes play a little role and it is questionable if CP Programs may have any considerable effect on the environmental

situation at these companies. To illustrate, Kola Mining and Metallurgical Company has exceeded 73 million USD and these investments were made by the own funds of the company. Despite the unfavourable economy situation, the company intends to continue to finance environmental programmes on the Kola Peninsula. In particular, in the period from 2010 to 2014 about 48 million USD will be spent for this purpose.

Therefore, CP Programs in their current format are best applicable and can bring essential results at smaller companies and municipalities who need technical assistance and small CP loans.

Current format of the CP Programmes may be amended to strengthen the project development component. The following options could be mentioned without any in-depth analysis:

- Within the 'Hot Spots' companies, most interested in CP improvements would be the companies, which face claims of environmental authorities, plan upgrade of equipment and improvement of the process efficiency.
- If the CP Programs should be modified to better meet the 'Hot Spots' objectives, 'thematic' CP Programmes shall be conducted.
- Company management shall get a clear message on the 'thematic' focus of the CP Programme. They should select participants to the programs that deal with the relevant to 'Hot Spots' issue together with the company management. The Working Group shall necessarily include specialists responsible for the processes related to the 'thematic focus'.
- Make the CP Programmes more practical. Introduce more cases, description of best available technologies, low-cost typical measures, etc into curriculum of the CP Programme.
- One should focus more on economic benefits of CP projects. For example, more attention could be paid to ensure validity of economic calculations, to prepare financial analysis, showing how the CP savings could be used for the loan repayments.
- An option is to extend the business planning, project financing and environmental management topics in the educational program. Thus, the traditional CP Programmes could be followed or include financial engineering and environmental management workshops, as initially proposed by the CP Programme's concept.
- To facilitate specific results, it would be an advantage to coordinate the CP activities with marketing activities by the IFIs. Information about NEFCO's financial products could be included in the hand-outs, while NEFCO or other IFIs representatives could be invited on project presentations.
- Evaluation of the CP Programme results and lessons learnt should become a separate component. Therefore, a time period of a standard CP Programme shall be extended to accommodate this new component. As a first step, current templates in the distribution materials, as well agreements for participation in the CP Programme shall be amended accordingly.
- Related to this, is proposal publishing CP programme's results and develop best cases.
- It is important to maintain follow-up assistance and communication with the participants after the end of the CP Programmes, as unveiled by the survey. They would like to have a forum, where they could discuss various relevant issues with their teachers and between themselves. For instance, they would like to get updates of benchmarks, best available technologies, opportunities for financing. Thus, the follow-up assistance and monitoring of projects results shall also be an important element of the CP Programmes. One of the options is to establish on-line Forum or Club of CP participants.
- Project developed within the CP Programmes are usually developed by the representatives of middle management of the companies.
- Therefore, half a day seminar/meeting for top managers could be arranged at the beginning of CP Programme in order to introduce the programme and select priority

environmental projects. The second meeting could be held at the end of the CP programme with the purpose of developed projects presentation and further discussion on possible financial support and implementation.

- The CP Programs have to be made performed not only for engineers, but also for local authorities, Universities and other relevant stakeholders. However, current format of the CP Programmes is designed for engineers. For other stakeholders, this format is not optimal and therefore adjusted model of the CP Programme shall be developed.
- For instance, the representatives of the local environmental authorities need lower level of technical details, but they may need more information on CP policy instruments and enforcement strategies, as well as 'Success Stories'. For them, information seminars may be more applicable than the full scale CP Programmes.

8. Compilation and Analysis of CP Projects in Relation to the 'Hot Spots'

Analysis of the CP projects as applied to the "Hot Spots" was made on the basis of documents, provided by the CPSD Centre, including the "Registry of the projects developed and planned for implementation in the enterprises included in the "Hot Spots" List of the Russian part of the Barents region".

The Register has been updated by the Consultants to relate the CP projects to a specific 'Hot Spot' and to a specific CP Programme. Each of the projects was provided with details on environmental and economic benefits and on implementation date. Where possible, further remarks on the current status of the projects, their relevance to the company's management are provided, based on the company's survey. In addition, CP projects proposed at 'Hot Spots' in the course of 2009 were added to the initial Registry. Projects developed before 2002 have been excluded from the Registry, as outdated.

It should be repeated that the CP Programme does not include a follow-up monitoring of the developed projects (CP projects), their economic and environmental performance. Most of the companies have participated in this programme for 3-6 years ago or even earlier. Thus, sometimes it was a real challenge to find necessary materials on the projects status, especially if participants of the CP Programme changed their working place. Some of the company representatives could not answer the question about the documentation, just stated that they do not remember the case and it is necessary to check the papers. Sometimes, CP projects were not implemented because they were developed many years ago and are not relevant any at present time. Some of the implemented projects were a component of a larger project/programme that is why there is no explicit information the CP component.

8.1 Compilation of CP Projects Implemented at 'Hot Spots'

The information available suggests that there were implemented 18 CP projects at 10 'Hot Spots'. Annex 6 provides details on these measures.

Practically all the projects implemented are of category A, which don't need additional or external financing. Some of the projects involve significant investments and they were implemented after the end of the CP Programmes, but still using the own funds of the companies.

M 32(2) – 2 small projects at Severonickel related to reduction of dust emissions by 3,5 %, and SO₂ emission by 8.7% (initial figures are taken from the 2003 AMAP/NEFCO report). This insignificant reduction cannot lead to exclusion of this "Hot Spot" from the list. Besides, it is necessary to clarify the actual ELV for the emissions and actual volume of emissions as of 01.01.2010 to be able to judge on the current state of the 'Hot Spot'.

K1(11) – 2 middle sized projects of A-category implemented at Kondopoga Pulp and Paper Mill. Waste water reductions amount to 2.3% of the total quantities according to the report, therefore may not significantly influence the status of the 'Hot Spot'.

A1 (21) – 2 projects of a different size of A-category implemented at Solombala Pulp and Paper Mill offering in total 7% of dust emissions reduction. One of the measures is related to process improvement, another with better production managements. The scope of emission reductions may not significantly improve the status of the "Hot Spot". It is also necessary to specify the current level of emission, as well as ELV/MACs.

A4-2(24) – 1 middle size project of A-category at Archangelsk Pulp and Paper Mill. Data available do not provide enough information to judge on the effectiveness of the proposed improvements of the waste water treatment plants. Therefore, it is not possible to evaluate the effect the project has upon the 'Hot Spot'.

A5-2(25) – 4 measures of a different size; all are A-category. They offer reduction of waste water generation by 0,4 %, as well as reduction solid waste generation, at least for the period of remediation solid wastes. The measures by their extent could not change the status of the 'Hot Spot'.

A 53 (26) – 1 A-category project to reduce the quantity of solid waste generation in Severodvinsk and Novodvinsk. The projects do not solve the environmental problem, therefore may not change the status of the 'Hot Spot'.

Ko1 (35) – 1 A-category project which offers managerial solution, but it does not reduce the methane emissions directly. The "Hot Spot" can't be excluded from the list at current stage.

Ko2-2(36) - 2 A-category projects which offer managerial solution, however, it does not solve the environmental problem directly.

Our preliminary conclusion is that out of the 18 projects implemented, none of them could have brought any considerable contribution to the elimination of the 'Hot Spots', or considerably change their status. Most of these projects are related to the low-cost managerial and behavioral measures. However, all, but the measure #17 "Reduction of air emissions from a power plant during bad weather", are compliant to the CP concept.

8.2 Compilation and Analysis of CP Projects Developed at 'Hot Spots'

Annex 6 contains inventory of all CP projects developed at 'Hot Spots' locations. This Registry includes 63 projects leading to reduction of the negative impact on the environment and health of the population, of which only 36 have an indication of the planned dates for implementation.

For each measure the following information is provided: CP-Programme number, date and venue, name of the organization (company), name and title, for the period of training, of the participant, information on technical and economical parameters of the project, the required investments, environmental benefits, payback period and short comments on the projects. Comments on the projects contain information about the current status of the projects, where the survey took place.

M1(M32) The second largest source of air pollution, especially SO₂. Kola MMC JSC "Severonikel Combine", Monchegorsk. It is proposed to install an aspiration suction unit with over blow on oxygen-vertical converters KVK-30 (Project 1) and sealing the gas flues connection by means of soft asbestos seal the gasket node junction sliding and stationary vertical flues oxygen-converter (KVK -30) (Project 2). Implementation of the projects will allow to (-) significantly reduce fugitive emissions to the air of working zone and as a consequence reduce untreated emissions of untreated gases into atmosphere; to emit the additionally trapped gases through the gas-cleaning equipment; to increase the degree of utilization of sulfur dioxide; (-) to improve the ecological situation in Monchegorsk. Preliminary calculation shows the possibility of reducing harmful emissions into the atmosphere through aeration lantern by 49.5%.

K2(12) Gas emissions of Nadvoitsy Aluminum Smelter – 97% of all atmospheric emissions in Nadvoitsy. Installation of dry gas cleaning (project 3) has a high efficiency gas purification of all components (HF – 99.76%; dust – 98.8%; resinous substance – 99.0%; benzapyrene – 99.4%),

with the exception of sulfur compounds (SO_2 – 60.3%). To capture the sulfur dioxide in the hardware and technology scheme it remains wet gas cleaning, where the adsorption of sulfur dioxide is made by soda solution. Comparison of the data of NEFCO/AMAP Report (Table 2.5) regarding emissions of JSC “Nadvoitsy Aluminum Smelter” for 2002 and calculated parameters of the completed on the basis of performance in 2005 project shows that the project will lead to reduction, taking into account planned at the smelter work, SO_2 emissions – by 93.0%, CO – by 99.9%; HF – by 99.5%; solid fluorides – by 99.5%.

K3-3(13) Poor quality of drinking water poses serious health risk. To reduce the chloring content of water before the coagulation it is proposed to install a chlorinator with a remote control ADVANCE-200 brand at the water intake at the Tohmajoki River (Project 4). Implementation of the measure will improve the quality of tap water, reduce reagent consumption, reduce electricity consumption, and volume of waste as a result of water purification.

K4(14) Poor water quality in water supply network of Petrozavodsk. JSC “Petrozavodsk municipal systems” Ltd., water works department. In the proposed project, the options for the replacement of decontamination agent (liquid chlorine) by the more secure – sodium hypochlorite (Project 5) or by a solution of oxidants (AQUACHLOR – Project 6) were considered. Comparison of the technical-and-economic and environmental performances of water treatment plant with capacity of 44 000 cubic m/year upgrade was made. Implementation will improve the reliability of disinfection, improve quality of treated water and reduce the risk of formation of chloroorganic compounds.

Waterworks in the settlement of Vilga. Resumption of chemical treatment of water (Project 7), replacement of aluminum sulphate by PAX-18 (Project 8). Assemble and put into operation an electrolysis plant “EN” brand of lentic type with graphite electrodes for disinfection reagent production – sodium hypochlorite solution by means of technical sodium salt electrolysis (Project 9). As a result of implementation the bacteriological indicators will be in conformity with the requirements of SanPiN.

K7(17) Burning of oil and coal in boilers. A project for conversion of a boiler house with heat capacity of 5,150 GCal/year from liquid fuel (mazut M-100) to natural gas (Project 10) was proposed. Additionally reduction of the consumption of electricity by 16,200 kWh, and reduction of emissions into atmosphere by 41 t/year will be achieved.

K8-2(18) Hazardous solid industrial and domestic waste. Almost one third of the 206 landfills in Karelia are illegal. Sewage treatment plants in Petrozavodsk. Construction of a plant for the incineration of sludge of treatment facilities (Project 11) was proposed. The project stipulates that the plant will process 3,000 tons of sewage sludge in 144 tons of dry ash, which can be used in road and industrial construction.

A1-1(21) Industrial emissions of JSC “Solombala Pulp and Paper Mill” constitute almost 20% of all emissions in Archangelsk. It is proposed to install the Stage II of exhaust gases purification at soda-regenerating water heaters SRK-1 and SRK-2 (Project 12); to conduct the oxidation of the not clarified green liquor by atmospheric oxygen (Project 13); and perform the reconstruction of electrostatic precipitators (Project 14). Implementation of measures will reduce the gas-dust emissions of JSC SPPM by 4,675 t/year, which is equal to 45%, as compared with the emissions data presented in Table 3.7 of the NEFCO/AMAP Report 2003.

A1-2(21) Reduction of pollution of the Northern Dvina River by Archangelsk sewage. JSC “Solombala Pulp and Paper Mill”. As a result of the modernization of industrial water supply to the soda-regenerating water heater SRK-1 (Project 15), prevention of tallous products discharge with waste water by settling in the existing buffer tank (Project 16), replacement of separators of unit for decomposition of sulphate soap with “Alfa-Laval” (Sweden) separators (Project 17) will reduce the

amount of source water and wastewater by 80 thou.cub.m per year each, losses of lignin – by 2,040 t/year and 380 t/year of tallous oil with waste water due to settling.

A3(23) Severodvinsk HPP – HPP are responsible for 95% of atmospheric emissions in the city. HPP-1 requires a special attention because it is responsible for 95% of the dust emissions. The measures to optimize HPP-1 functionality were proposed, such as: replacement of two line pumps of 14D6M type with one of SE-2500-180 type (Project 18), reconstruction of feeding high pressure electric pump (Project 19) and replacement of Venturi tubes by circular emulgators (Project 20). Implementation will reduce the use of mazut by 698 t/year; reduce the emissions of pollutants into the atmosphere by 9,755 t/year, which represent 12.9% of total emissions from Severodvinsk HPP-1 according to the NEFCO/AMAP Report 2003 (Table 3.7 – 75.7 thou. t/year).

A4-1, A4-2(24) JSC “Archangelsk pulp and paper mill” (APPM), Novodvinsk. Emissions of specific contaminants and dust are of particular concern. Reduction of discharges of waste waters from APPM. The participants proposed a number of measures:

- Combustion of emissions of melt tank in recovery boiler (SRK) as tertiary draft (Project 21);
- Replacement of electric filter of recovery boiler to more effective three-field filter (Project 22);
- Introduction of new chemical – Silica Gel “Eka T3 442” at the paper producing factory No 1 (Project 23);
- Introduction of flotation save-all “Aquaflow” AFC 9.5x1.3 for clarification of circulated water from Paper production factory No1 (Project 24);
- Introduction of process of anaerobic stabilization of sludge of waste waters bio treatment (Project 25);
- Introduction of local waste water treatment after cardboard making machines CDM-1 and CDM-2 (Project 26);
- Transfer of wet sludge from conventionally clean water (CCW) tank to primary settlers of the 2nd extension of the biology treatment shop (Project 27);
- Installation of step grates on the sludge tanks for preliminary purification process in the dewatering shop (Project 28);
- Installation of local treatment unit for waste water in timber preparatory shop No 3 (Project 29);
- Modification of aeration system of aerotank on the 1st stage of biological treatment (Project 30);
- Reconstruction of water intake system of mediate sedimentation tanks of the 1st stage of the biological treatment (Project 31);
- Introduction of “Nalko” bioproduct into the activated sludge (Project 32).

Implementation of the measures developed by the participants of the Group 78 during training will result in reduction of emissions of 560 t of dust, primary water consumption by 7,762.7 mil. cub m, waste water discharge by 7,763.0 mil. cub m and impurities in them, including suspended solids in amount of 9,246.0 t, BOD – 6,518 t.

According to the NEFCO/AMAP Report 2003 (Table 3.10) discharge of untreated waste waters at JSC APPM in 2002 was 4.1 mil. cub m. Implementation of the measures will cease discharge of untreated waste waters.

A5-2 (25) JSC “Kotlas pulp and paper mill” (KPPM), Koryazhma. KPPM is the largest waste water discharger in Oblast (almost 50%). To reduce discharge of organic matter and suspended solids with waste water the following measures were proposed:

- Delivery of flocculent to preliminary sedimentation tanks of I-II stages (Project 33);
- Utilization of attached microflora during biological treatment of waste water (Project 34);
- Delivery of mechanically treated water after oil coolers of turbogenerators to circulated water station (Project 35);

- Installation of control valves on pipelines for supply of mechanically treated water of heat exchangers for cooling oil of fluid couplings of smoke exhausters SRK-5 of the TES-2 boiler shop (Project 36);
- Utilization of mechanically treated water instead of filtrated water in heat exchangers in section for utilization of hexose sugars (Project 37);
- Modification of air supply scheme in yeast production unit No 4 (Project 38);
- Construction of local waste water treatment system at "Cardboard" business-line (Project 39);
- Return of cooling water after heat exchangers of chlorate electrolyzers to the circulated water station (Project 40).

Implementation of the above listed measures at KPPM will reduce water consumption by 10,479.4 thou.cub.m, waste water discharge by 10,317.7 thou.cub.m and impurities in them, including suspended solids in amount of 2,180.9 t, BOD – 316.4 t, and reduce fiber loss with waste waters by 9,936 t/year.

According to the NEFCO/AMAP Report 2003 (Table 3.10) discharge of untreated waste waters at JSC KPPM in 2002 was 9,600 thou.cub.m and implementation of the measures will cease discharge of untreated waste waters.

A6(26) Toxic solid wastes in Archangelsk Oblast.

Participants of the Group 88 made economical and environmental estimations of the waste management measures as follows:

- Introduction of technological line for PET bottles treatment (Project 41) Introduction of technological line for used tyres treatment (Project 42) at the JSC "Archangelsk Garbage Recycling Plant" Limited;
- Treatment of medical waste from Severodvinsk (Project 43) at Archangelsk Garbage Recycling Plant;
- Creation of special city service for transportation of medical waste of Severodvinsk with its further thermal destruction (Project 44);
- Treatment of solid municipal waste from Novodvinsk at the Archangelsk Garbage Recycling Plant with introduction of separate collection of waste (Project 45);
- Arrangement of collection and treatment of bulk waste (Project 46);
- Project work and construction of waste treatment facility in Novodvinsk (Project 47);
- Installation of waste containers of two different colors for separate solid municipal waste collection in residential area;
- Purchase of waste separating complex (Project 48).

Phase-in implementation of the proposed measures will result in significant increase in volume of recycled and utilized waste. Besides, every proposed measure could be the point of departure for the Hazardous Solid Waste Management System.

A8(28) Since 1995, waste motor oil in the Oblast have not been collected nor processed. The project proposed introduction of a boiler for waste oil disposal at the JSC "Archangelsk Garbage Recycling Plant" Limited (Project 50), to organize the collection and combustion of 80 t/year of used motor oil. The heat can be used for internal heating of the plant.

Ko1(35) Emission of greenhouse gases to the atmosphere of Vorkuta Coal Basin. Excluding emissions of methane captured by vacuum-pumping station No 3 of "Vorkutinskaya" Mine by installing in the boiler-house of the mine additional micro-turbo-electro-generator "CAPSTON" C65 (Project 51). According to the NEFCO/AMAP Report 2003 (Table 5.5) emissions of hydrocarbons, including methane at "Vorkutinskaya" Mine, were 43,151 t/year. Implementation of the proposed project would eliminate the emissions of methane into the air and reduce emissions as a whole by 14.5%.

Cessation of emissions of methane captured by the vacuum pump unit “Yug” of “Komsomolskaya” Mine by introduction of gas-piston electric station “DEUTZ” TCG 2020K (Project 52). According to the NEFCO/AMAP Report 2003 (Table 5.5) emissions of hydrocarbons, including methane at “Komsomolskaya” mine constitute 50,544.9 t/year. Implementation of the proposed project would eliminate the emissions of methane into the air and reduce emissions by 10.4%.

Ko2-1(36) Reduction of dust emissions by Vorkuta Cement Plant. In order to reduce dust emissions into the atmosphere it is offered to make the preparation of raw mix with liquidifying agents (Project 53), to return fly ash back to kiln (Project 54) and perform the reconstruction of chain heat exchangers (Project 55).

According to the NEFCO/AMAP Report 2003 (Table 5.5) dust emissions of JSC “Vorkuta cement plant” Limited are 11,304 t/year, emissions of gases – 1,733.1 t/year. Implementation of the projects will cease emissions of dust and gases in the atmosphere and significantly increase the efficiency of raw materials utilization.

Ko6 (40) Generation of industrial and household waste. In order to reduce coal use for the technological needs, engineers of the JSC “Vorkuta cement plant” Ltd. suggested to organize preparation and combustion of tyres (Project 56), preparation for combustion of waste of 4-5 grade of hazard (Project 57), installation of boiler for used oil utilization for heat production for internal use at the plant (Project 58). Implementation of these measures will allow the plant to reduce use of coal in the amount of 16,142 t/year, to effect waste processing in amount of 3,100 t/year, tyres – 5,659 t/year, and used oil – 89 t/year.

Ko7(41) Waste of timber and pulp and paper industries.

Closed JSC “Zheshart Plywood Factory”. It is proposed to use fiber waste of fiberboard production at wood chipboard production (Project 59), to organize production of blocks of wood waste by high pressure pressing at the UBO-1 “Zhasko” press (Project 60). To implement a thermo-oil boiler made by BERSEY Company with capacity of 7 GCal utilizing wood waste as fuel (Project 61), transfer from the wood waste combustion to the installation utilizing gas-saw dust burners in the process of veneer drying (Project 62).

Implementation of the proposed measures will result in utilization of more than 100 thou.cub.m/year of wood waste.

Ko8(42) Numerous coal-mining wastes disposed near mines are the sources of land and atmospheric contamination and pose threat for human health. Experts of JSC “Vorkutaugol” have offered a solution and made economical and environmental evaluations of organization of coal briquettes production from the tailings – coal sludge (Project 63). There is no data in the NEFCO/AMAP Report 2003 on the amount of coal waste, so the processing within the proposed project of 33,120 t/year of coal sludge may be a first step to solve this problem.

Discussion

Based on the information collected through the desk-top analysis and interviews a number of the conclusions can be made.

First of all, it is clear that there is a large group of ‘Hot Spots’ which are relevant for the CP methodology and could be addressed by the CP projects developed during the CP Programmes. Namely, these are 11 ‘Hot Spots’: M1(M32), K2(12), K3-3(13), K4(14), K7(17), A1-1(21), A1-2(21), A3(23), A4-1 A4-2(24), A5(25), Ko1(35),Ko2-1(36). Each of the projects proposed leads to considerable environmental improvements, to elimination of their ‘Hot Spot’ and in some cases may even cease the sources of emission.

For many of these 'Hot Spots', two or more projects have been developed. This gives flexibility to the companies in planning the process of their development and implementation. The most profitable ones could be prioritized, while the savings could be allocated for the investments in other projects.

6 'Hot Spots', **K8-2(18)**, **A6(26)**, **A8(28)**, **Ko6(40)**, **Ko7(41)**, **Ko8(42)**, were related to as the "Hot Spots" that are not suitable to be addressed by the CP projects and "Hot Spots partially targetable by the CP projects" (section 6.3). The proposed projects may contribute to improvement of environmental situation, while the problem could be corrected, rather than eliminated. For example, a very typical 'Hot Spot', development of waste management system could not be eliminated within by CP Programmes; the latter may generate projects and measures which could introduce some elements of these systems.

Status of the CP projects developed during the CP Programmes was a subject of interviews during the companies' survey. This information was enclosed into the Annex 6, as regards to the 'Hot Spots'. More details about the status of the CP projects, both at the 'Hot Spots' and other CP companies surveyed are provided by the Annex 12.

Priority for Funding of CP projects

Most of the B- and C-group projects developed in the framework of CP programmes did not reach the stage of implementation.

Many of the projects developed are related to improved technology and process control and could be a part of larger projects for replacing obsolete equipment. Most of the companies operation for many years and most of the equipment being used is over 20 years old. Much of the equipment used dates from 1960s-1970s. The impact of this is that much of the equipment currently being used is not efficient when compared to modern standards. In addition to this, much of the equipment is coming to the end of, or has already exceeded, its technical lifetime and is in need of replacement. Although this results in inefficient use of energy and resources, it also represents an opportunity, as the old and worn out equipment can and will be replaced with more efficient plant.

In fact, it was clear from the interviews that in many cases, companies have implemented CP projects as part of larger technology investments or company's production modernization programme (e.g. replacing equipment with modern and therefore more efficient units). All implemented projects were financed by own means of the companies and their objectives was not always the CP improvements and cost savings alone.

The CP companies prioritize projects related to implementation of modern equipment and technologies. They believe, in most of cases, that environmentally friendly technologies would always be a part of such projects. Therefore, the companies often do not opt development and implementation of what they believe is 'stand alone' CP measures.

This is to our mind a rudiment of old 'end-of-pipe' behaviour by the company's management, which could be targeted by future CP Programmes. However, by integrating CP projects with the companies plans for renovation and technology upgrade, it may be possible to increasing implementation rate of the developed CP projects.

One of the most serious challenges for the companies in adoption of new technologies and innovations, hence in implementation of CP projects is a lack of financing both for project development (if external experts are involved) and implementation (equipment procurement, reconstruction, etc.). For instance, OOO Vorkutacement has recently started a project aimed at the decrease of the dust emissions to atmosphere – installation of electric filters at chimneys of the

enterprise, but the company is in difficult financial situation, and, because of this, the management has been replaced.

Despite the fact, that many respondents have an idea about NEFCO and some other financing organizations, almost none of them have experience in preparation of loan applications to these organisations. A company 'Zvyozdochka' received confirmation on granting of credit, but, according to our respondent, they could not take a loan from NEFCO because their credit portfolio was full. Other issue is that available financing was very small. One rather small project was implemented at Solombala PPM after the 1st CP Programme several years ago. CP projects may require rather larger financing. For example, some of respondents mentioned that their projects cost around 1 mln. USD and higher.

None of the respondents were aware of the NEFCO's specific terms and conditions for financing. Some of the respondents have proposed to go through the earlier developed CP-projects together with NEFCO. They believe that NEFCO may finance their projects related to technology and equipment upgrade, as they would normally lead to CP improvements.

Project Development and Implementation Aspects

As concluded in Chapter 7.3, current model of the CP Programmes leaves little room for a full-scale development of the projects of B- and C- categories. Such type of projects offers significant improvements, 70-80% of the total potential for the improvements, as concluded by the Chapter 4. However, a comprehensive feasibility study is usually needed to develop such projects.

During company's survey, the respondents were asked on their ability to develop large projects. The opinions of the respondents varied much.

Most of the representatives of large private companies have confirmed that their companies have the required skills and capacities for the projects development. They usually have a pull of specialists: designers, technologists, economists, etc. which can develop and manage the projects implementation themselves without external assistance. Most of these companies have experience with preparation of business plans and arranging loan financing from banks and they have also experiences with implementation of the projects by themselves. Such opinion was expressed at Arkhangelsk and Solombala PPM, and Apatity Heat and Power Plant.

It will be useful for these companies to obtain information on available international financing, IFIs, and their terms and conditions. Also enterprises will need assistance on establishment of contacts with IFIs and arranging financing. For instance, Zheshartsky Plywood Manufacturing Plant has literally asked during the interview on assistance by external consultants for the development of projects and financial documentation for IFIs.

On the contrary, small private companies and municipal utilities were of opinion that they need assistance not just in arranging international financing, but also assistance in the development of project documentation, feasibility studies and in project management.

Further project implementation depends also on financial sustainability of the companies. Large companies may have already a portfolio of loans and the liquidity considerations prevent them from taking additional credits for environmental projects. Companies opt to take loans for the technology and process upgrade, rather than on environmental projects. The loans are apparently obtained from Russian commercial banks.

Summarizing, it is important to outline a common opinion of the companies: in order to implement environmental projects it is important to keep the companies informed about available international funding, to provide regularly updates on the terms and conditions, announcements of project calls,

establishment of new funds and programmes; discuss each project with top managers of the companies; assist them to select projects meeting IFIs selection criteria; help small private and municipal enterprises to develop project documentation.

8.3 General Barriers and Disincentives to CP Projects

Based on the desk-top analysis and interview and interview of the companies the general barriers and disincentives for the CP projects implementation could be distinguished:

Weak economic incentives for the CP measures

One of the main disincentives to implementation of the CP projects are still relatively low environmental fees, as well as tariffs for water, energy and other natural resources.

The “polluter pays principle” is an approach to control environmental impacts of industrial activities in Russia. Many of the companies, including those which were interviewed, tend to stay within the established norms of environmental pollution (ELV). According to the legislation, such approach is believed to be an effective mechanism to stimulate enterprises to reduce negative impacts on environment - less pollution, less payment.

In reality, the current level of environmental fees and payments does not really bring enough incentive for environmental improvements. For the “polluter” it could be cheaper to pay all necessary fees, than to implement environmental protection measures.

Costs for energy, water and other resources, as well as environmental fees grow slower than prices for the final products. This is another disincentive to CP improvements. Besides, the companies pay to utility companies in advance for the use of energy and water, according to the consumption plans. If a company reduces energy and water consumption, its quota for usage of these resources may be reduced for the next period, with an adverse effect to production growth. These companies would have to pay a fine as well, for the un-delivered services. Therefore, many companies are interested to keep their consumption of resources stable, rather than to save them.

Most of the companies, however, were of the view that these payments would increase in future, but it was not clear for them how fast these changes may happen coming three years. This opinion is in line with the international assessments of Russian environmental legislation mentioned in Chapter 3.1.

In addition to low fees and tariffs, a further disincentive to developing of CP projects is the issue of evading from environmental fees. A precise assessment could not be made on the extent of the evasion by the companies surveyed. The evasion is facilitated by the fact that the above mentioned TARs could be prolonged unlimited time.

Weak legislative framework to support CP activities

Current federal environmental legislation in Russia has a clear focus on pollution control at the ‘end-of-pipe’. Despite lengthy discussions and plans to introduce innovative environmental legislation promoting continual and preventative strategies, the current legislation still puts main emphasis on MACs and ELV. The companies that stay within the approved levels of pollution get no impetus to further environmental improvements. Therefore, this legislation does not promote implementation of the CP projects.

Regional environmental authorities do not have real policy instruments to perform capacity building and influence companies’ environmental behaviour. Regional environmental authorities have no experiences in these activities in relation to the CP projects. Current environmental policy does not

recognize other economic incentives than the 'polluter pays principle'. It means that there is little possibility for the regional environmental authorities to encourage those who are longing to improve their environmental performance.

For example, there are no tax benefits for enterprises which implement environmental activities. Several years ago enterprises implementing environmental protection measures were exempted from up to 60% of environmental payments for pollution (according to the decision of regional subdivisions of Rostekhnadzor). However, nowadays this practice and other similar instruments (such as State and regional Environmental funds for co-financing of environmental investments and projects development are) are no longer available.

Access to financing

Lack of financial resources is a strong barrier for environmental project implementation, as noticed by almost all companies. The situation became even worse due to the financial crisis, which leads to decline in production.

Large CP projects offering ample environmental improvements may require significant investments, which local companies, especially SMEs cannot afford. Taking a bank loan seems to be not realistic for many of the surveyed companies, which are not creditworthy (they run into debts). Moreover, many of the companies are not sure if they will manage to pay off the credits, especially if it concerns Russian commercial banks, which have an interest rate of 20-22% per annum. Loan banks, in turn, underestimate demand for energy efficiency and cleaner production investments.

Loan from NEFCO or another financial institute with lower rates requires a co-financing and bank guarantee, which may be problematic for the companies, especially during the crisis. For many of the respondents, co-financing even 10% of the projects is a burden. For example, OAO Apatity heat and power plant is looking for financing for their boilers retrofit programme. Reconstruction of two boilers (and they need to renovate 10 in total in a long run) will cost 100 million roubles. The 2010 investment programme had a budget for 50 million roubles, but only 4 million roubles were earmarked. As the result, the company may not be able to find 10 million roubles, as a cost sharing for the loan for this project.

Other companies show similar examples. Thus, many of the respondents have noted that they are mostly interested in getting grants for financing/co-financing CP activities.

Large companies have a focus on production upgrade and modernization, which may also lead to environmental improvements. Many of them have a large credit portfolio and cannot take additional credits for CP projects at present, or their financial situation is not stable. That is why they also are not willing to take loans.

Lack of interest in the CP Programme from company management

Despite the fact that many of the companies declare their "environmentally consciousness", in reality they would limit themselves to compliance to environmental requirements. This means that top managers at most companies consider compliance to standards/norms to be the main objective for environmental management at their company. Once this is in place, they would allocate financial resources to other needs and purposes, which they find more urgent at present time.

Moreover, many local companies in the North West Russia are subdivisions of large industrial or communal holdings or groups, with central offices in Moscow and St. Petersburg. For example, Petrozavodsk Communal Systems with its subdivisions Vodokanal, Heating systems and Power Supply Systems are a subsidiary of OAO Russian Communal Systems, which coordinates projects

related to housing and communal services in 9 regions of Russia (according to the company report as of 2009). OAO Murmansk Heat and Power Plant and OAO Apatity Heat and Power Plant are parts of TGC-1 (Territorial Generating Company No.1) which is a regional power company operating in North-West Russia, and etc. In such large companies, decisions on significant investments in environmental management are taken on the “top of the pyramid”, while the companies themselves have a lack of power for these decisions.

Finally, frequent changes in the company management lead to changing the company’s business plans. New “company leaders” do not always know what have been done before and have no time to put much attention to previous CP activities and plans. The often think very short-term, ‘think of today’.

This barrier shows that environmental awareness and management are still weak and little priority for most of the companies.

Lack of motivation for the middle management to developing CP projects

In most cases, the generation of CP ideas, their economic and environmental assessment is not a part of daily duties of the companies’ personnel. Unfortunately, financial appreciations for such activities (bonuses) are not a common practice and depend on decision of the company management. As a consequence, implementation of CP projects is based mainly on enthusiasm of individuals. In addition, the problem of inertness of thinking existed during many years, still in place and it is difficult to change.

This problem is especially acute for SMEs and municipal companies. These companies are usually not receptive to the advice of external consultants, even if economic and environmental benefits are suggested.

Not enough capacity to develop viable projects

Despite not all CP companies accept this, a lack of technical know-how to identify and develop profitable CP projects, prepare business plan and arrange financing, implement the projects and document the savings achieved was and still is a major barrier. Most of the companies maintain no regular contacts with the CPSD Centre and other relevant experts to review efficiency the processes and identify CP projects. Many companies believe that the potential savings are not enough to justify the high projects development costs and the eventual consultancy fee.

9. Options for Financing and Funding of CP projects

In all cases reported, the companies have used their own funds to finance investments in CP projects, as summarized by the Annex 6. This is understandable given the relatively low costs of these investments.

Companies are interested in obtaining loans to improve environmental and energy performance, but, as highlighted above, the emphasis is often placed at increasing/improving production rather than at direct CP measures. The size and short term return of many CP investments means that the CP companies may seek short- and middle term financing by Russian commercial banks for their CP projects. Well structured managed financing strategies can offer ample and immediate cost savings, thus avoiding pending the CP projects until own capital or soft loans would be available. Funding can come from various sources, depending on the ownership and creditworthiness of the companies.

It shall be admitted that many companies surveyed do have some experience with obtaining loans from local commercial banks. However, these credits were short-term (1-3 years) and aimed at to replenishing their working capital. Long term finance is scarce on the Russian credit market, and lenders usually consider investments in energy and public to be high risk investments, while the environmental investments are hardly considered by them as a market. Thus, credit resources from commercial banks to CP projects have been scarce so far.

In the majority of cases, local companies surveyed still are opting to seek a soft loan, e.g., from NEFCO. Respondents were therefore keen to find out whether a loan from NEFCO could be used to invest into a new plant and to improve capacity/product quality, with environmental and energy improvements being a secondary benefit. NEFCO's terms and conditions are obviously important to the respondents; their answer to the question "Would you be prepared to take a bank loan to finance energy efficiency measures?" was often "yes, if the interest rate is low enough".

Several of the large companies did, however, stated that they were not interested in small soft loans, specifically those companies, which have to approve their loan applications at their head offices.

At present, there is no Russian financial programme or facility offering direct financial and technical services for environmental, energy efficiency or renewable energy projects. Nevertheless, there are few projects and programmes, which provide assistance and support to activities, which could indirectly be related to the CP.

As the demand for CP projects is present already and will most likely grow, some of the existing credit organisations and programmes could potentially enter the market and begin competing with NEFCO in the coming future (2-5 years).

However, nowadays options for financing and funding available to CP projects at 'Hot Spots' are basically limited to:

- Financing Assistance by Russian Authorities;
- International Initiatives to Financing Environment and Energy.

9.1 Financing Assistance by Russian Authorities

According to OECD (2009), total environmental protection expenditure in Russia has, at slightly, but increased, in constant terms in 2000s. However, Russia spends approximately 40 USD per person and per year for environment protection. This is low in both in absolute and relative terms;

OECD concludes that environment protection expenditures has not fully benefitted from the robust economic growth of Russian economy since the turn of the century.

Environmental protection expenditures could be split between investment and current expenditures. The share investments has been slightly improving since 2002, but the investments made only 26,5% of total environmental expenditure in 2007. The structure of these investments is proposed by the Figure 6.

The structure of environmental investments indicates that the wastewater investments play a dominating role. This corresponds very well with the fact that in Russia, the public sector accounts for 80% of environmental protection expenditure.

A conclusion could be drawn that most of the environmental investments are directed at public utilities to improve water supply and waste water services.

Possibilities for a private company for obtaining co-financing of their CP projects are very limited. Basically, if a private company decides to implement a CP projects, it has to be a part of its investment programme.

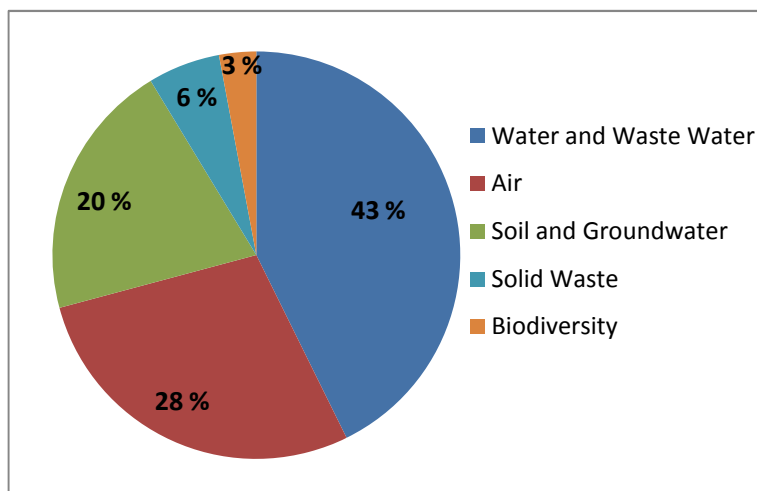


Figure 6: Structure of environmental investments in Russia.
Source: National Statistics, 2007

Regional/republican authorities have no rights and possibilities to finance CP projects (or any projects at all), including educational programmes, feasibility studies, business plans etc. at the private enterprises. Only municipal enterprises could be financed by regional or municipal budgets.

Though, conceptually, environmental funds were designed to become an autonomous source of environmental finance in addition to budgetary and producer's own environmental investments, due to the scarcity of budgetary resources and legal constraints, they became actually the only source of environmental finance for municipalities. Local environmental funds were mostly used for making grants to public manufacturing companies and utilities. Nowadays, targeted environmental funds were abandoned after adoption of new RF Budget Code.

Some of the economic instruments provided by the Russian legislation are used to a very limited extent and their possibilities in relation to the CP projects shall be eyed closer. For example, the Tax Code of the RF provides an investment tax credit for environmental research and development. In practice, tax benefits are virtually not utilized because there is no clear mechanism for their application. Higher rates of depreciation for environmental assets were earlier provided for by the Law —On Protection of Natural Environmentll of 1996 (Art. 24): however, current Law —On Environmental Protection II does not provide for accelerated depreciation of wastewater treatment plants or other environmental protection facilities.

Regional governments receive financial support from five various support funds, revised annually, as part of the federal budget:

- Federal Financial Support Fund for Federation Subjects;
- Compensation Fund;
- Social Expenditure Co-Finance Fund;
- Regional Finance Reform Fund;

- Regional Development Fund;
- National projects.

In addition, two instruments can provide federal assistance to regional initiatives:

1. Federal targeted programmes. These are a group of research, development, production, socioeconomic, business management and other actions meant to ensure efficient solution of systematic problems in state, economic, environmental, social and cultural development of the Russian Federation;

2. State capital investments into construction, modernization and retrofitting of regionally- and municipally-owned public property, as part of the Federal targeted programmes. State capital investments are a most significant component of the federal budget expenditure related to implementation of Federal targeted programmes.

Unfortunately, none of these instruments are directly applicable for the purpose of CP improvements. Acting Federal targeted programme for ecology and environmental security are directed to disarmament of chemical weapons, elimination of the environmental disasters, etc. There is information about the plans to adopt a new Federal targeted programme 'Clean Water', but this information is not verified. According to opinion of regional environmental authorities, the main instruments the federal authorities can use to support investments into development of regional and municipal social and engineering infrastructure include the Regional Development Fund (RDF) and the Federal targeted programme. Regional Development Fund provides subsidies to Russian regions to implement various large-scale activities, including infrastructure projects. Maximum share of co-financing is 50%. In the context of this report, the Housing Sector Reform and Modernization subprogramme of the Housing (Zhilische) Programme approved by the Government 31. Resolution #797 of 11/17/2001, appears to be of particular interest. Its budget for 2002 – 2010 is 18.5 billion USD¹³, including 7.6 billion USD (41.2 percent) for modernization of WSS systems and 10.9 billion USD (58.8 percent) for modernization of heating supply systems. Basically, this subprogramme is expected to be implemented by regional and local governments (as part of respective regional and local programmes of the housing and utility sector reform) and utility service producers, including extra-budgetary borrowings. From the total 18.5 billion USD only 179.3 million USD, or 1 percent, is contributed by the federal government. Federal funds are be used to support interregional projects and projects of modernization and completion of major infrastructure facilities that are of vital importance for regions and cannot be implemented without the federal government's support.

It should be admitted that obtaining any Federal Assistance is a long and bureaucratic process. To change the status of 'Hot Spots' and implement CP projects, it is advisable to approach Russian Ministry of Natural Resources and Environment and regional environmental authorities. Most likely, public financial assistance may be available to 'Hot Spots' dealing with drinking and wastewaters.

9.2 Relevant International Credit Facilities, Technical and Financial Assistance

Issues related to energy infrastructure, energy efficiency, renewable energy and climate change have been always high on agenda of international institutions and they have implemented several energy and environmental projects and programmes in Russia.

Alongwith Kazakhstan, the Russian Federation is second major recipient of bilateral and multilateral environmental assistance in CIS countries according to OECD (2009). Environmental assistance to Russia has witnessed a structural change since 2001. IFIs assistance has multiplied

by almost 2, promoting various soft loan programmes with the main focus at energy. In contrast, environmental technical assistance was in 2005 is below the level of 2001.

According to EBRD (2009), major donors in environment and energy have been the Nordic states, the European Commission and Germany. The split by domain indicates that Environmental policy and administrative management has attracted 42% of bilateral assistance since 2001; the European Commission is particularly active in this area. Water supply and sanitation, and biosphere protection are second priorities (14% of the total each). Multilateral environmental assistance is mainly focused on water supply and sanitation, power generation, energy efficiency and renewable energy production.

Unfortunately, the Consultant does not have any complete overview of the technical and financial assistance, which is available to energy and environmental projects in North-West Russia. Below is a collation of relevant information from various sources.

NEFCO Cleaner Production Facility (information from May 2009)

Financing of projects for upgrading of production processes leading to environmental improvements. Payback – max. 4 years. Loan range is within 100 000 – 350 000€. Interest rate – 6%. Cost-sharing – up to 90%. Collateral – 125% of the loan amount.

NEFCO Eco-Efficiency Facility (information from May 2009)

Financing of projects at public utilities, including district heating and water supply companies which may lead to environmental improvements, both at supply and consumption sides. Loans may be obtained by industrial companies for the waste water treatment. Payback – up to 7 years. Loan range is within 100 000 – 400 000€. Interest rate – 6%. Cost-sharing – up to 90%. Repayment – until 8 years. Collateral – 125% of the loan amount.

IFC Russia Cleaner Production Programme

Started in 2008, The Russia Cleaner Production Program (RCPP) is designed to stimulate investment in cleaner production projects and promote cleaner production best practices and policies in Russia. IFC provides dedicated financing for cleaner production investments directly to large industrial and municipal enterprises, as well as extend credit lines to local financial institutions to on-lend for cleaner production improvements at medium size entities. The program conducts scoping visits and supports cleaner production audits/improvement programs at partner companies. The program will focus its efforts on the following sectors: machine building, wood processing, agribusiness, chemical industry, and water and energy efficiency at municipalities. The program will last five years, and is expected to:

- Facilitate over \$250 million of financing in cleaner production investments;
- Provide in-depth advisory support to at least 20 partner companies (50% is covered by IFC);
- Reach more than 5,000 companies through public seminars and with information materials;
- Reduce pollution at partner companies, in particular lower CO₂ emissions.

Commercial conditions are not disclosed, but it is expected that the loans would be provided for projects worth multi-million € under the soft loan conditions. By the moment of preparation of this report, no project were financed in the region of NW Russia.

IFC's Russia Sustainable Energy Finance Program (RSEFP)

RSEFP works across Russia to encourage investments in energy efficiency projects. The project helps financial institutions and companies to assess modernization projects, and provides long-term credit to banks to enable energy efficiency loans due to the higher perceived risk and longer-term financing requirements. IFC has provided Russian financial institutions with dedicated long-term energy efficiency credit lines to promote loan generation (Centr-Invest bank and MDM bank

and 3 other Russian banks). The project also works with end-user companies, to assist in analyzing energy efficiency projects under consideration and in identifying opportunities to save energy. IFC energy efficiency financing commitments under the credit line amount to \$150 million. So far, RSEFP has enabled financing of more than 100 energy efficiency projects totaling \$100 million through targeted credit lines to partner banks and advisory on energy efficiency. Financial conditions are project specific.

EBRD's RUSEFF Programme

Started in 2009, RUSEFF is a EBRD's credit line for the Russian industrial and commercial enterprises that wish to invest in energy efficiency or renewable energy projects. The credit line was developed by the EBRD and credits are disbursed through participating partner banks, Promsvyazbank and Centr-Investbank. Each applicant company may be eligible from US\$ 500,000 for up to US\$ 6.5 million of financing under RUSEFF. Other project components may be financed by the customer himself or by the participating local bank. Projects should save more than 10% of energy. RUSEFF is supported by a comprehensive technical assistance package. Repayment of the loan up to 5 years. Interest rate is project specific. The project Implementation Team consists of international and local experts from the companies MVV decon GmbH (Germany), ICF International (UK), GFA Consulting Group (Germany) and GFA Envest GmbH (Germany). There is no information about any RUSEFF projects in North-West Russia.

NIB's Climate Change, Energy Efficiency and Renewable Energy (CLEERE) lending facility

CLEERE supports actions for combating and adapting to climate change around the world. In 2008-2009 years, the initially allocated 1 billion € was fully deployed, and, in spring 2010, the facility was extended by another EUR 1 billion. Under the CLEERE facility, NIB finances projects (-) in renewable energy; (-) in energy efficiency; (-) using cleaner production technologies that reduce greenhouse gas emissions in industries; (-) dealing with the adaptation of power networks and infrastructure to climate change, such as extreme weather conditions. There are 2 projects financed by CLEERE in Russia so far (according to the www.nib.int) at Novgorod Vodokanal (3 mln.€) Sankt-Petersburg Vodokanal (not disclosed). Financial terms and conditions are not disclosed.

Northern Dimension Environmental Partnership (NDEP)

NDEP is established to promote project financing in the Baltic and Barents Sea Regions in 2001; extension beyond 2012 is planned. The aim of the Programme is to create close cooperation with financiers, authorities and municipal enterprises. By the end of 2008, €275 million in donor funding had been committed to the NDEP by Belgium, Canada, Denmark, the European Union, Finland, France, Germany, Norway, the Netherlands, Russia, Sweden and the United Kingdom. During the year the NDEP was also instrumental in international efforts to mitigate the environmental risks caused by the legacy of nuclear-powered ships and submarines of the former Soviet fleet in Russia. Close to €125.3 million is earmarked for environmental projects mainly to improve water and wastewater treatment, energy efficiency and management of municipal and agricultural solid waste. The NDEP's environmental programme consists of 16 priority projects approved by the NDEP Assembly for co-financing from the NDEP Support Fund. The projects to improve water and wastewater infrastructure, municipal and agricultural waste management and energy efficiency are at various stages of implementation. NDEP provides non-refundable grants as an incentive to make municipal projects viable to benefit the environment in the Northern Dimension Area. NDEP grants are tied in with loan funding from the IFIs (EBRD, NIB, EIB, NEFCO) and leverage local/national funding. So far, north-west Russia is the main beneficiary of NDEP – as grants are for projects in the whole Northern Dimension Area

National Programme of Actions for the Protection of the Arctic Marine Environment (NPA-Arctic)

This is a component of the joint UNEP – GEF project, which deals with a selection of environmental investment projects (EIP) for the Russian Arctic that should lead to project funding by International or Russian sources. Several tens of investment project proposals have been reviewed by contracted consulting companies. The job resulted in a set of proposals for EIP for western, central and eastern sectors of the Russian Arctic. Main donors considered are NEFCO, EBRD, International Finance Corporation, Dutch Ministry of Economy (EVD), Barents Euro-Arctic Council, Northern Dimension Environmental Partnership (NDEP). Coordinator of the target long-term program of Murmansk region “Wastes”. Coordinator of the target program “Environmental protection and hygiene and provision of environmental safety in Murmansk region”.

EBRD’s Turn Around Management (TAM) and Business Advisory Services (BAS)

TAM/BAS Programme are designed for micro, small and medium-sized enterprises (MSMEs) to adapt to the demands of a market economy. TAM/BAS in Russia are increasingly concentrated its efforts on Energy Efficiency (EE), Renewable Energy (RE), Environmental Protection (EP), and Environmental Certification (EC). An increasing number of projects have been designed to provide cost efficiency, energy-saving opportunities, advice on reducing environmental pollution, improved environmental management and help for micro, small and medium sized enterprises (MSMEs) to comply with environmental regulation. As of June 2009, TAM/BAS Russia has undertaken a total of 825 projects with MSMEs, engaging 232 local consultants. These projects have been widely distributed throughout the three main regions where BAS operates. In addition to standard BAS projects, the Programme has also carried out market development activities by way of trainings for local consultants. Examples of these include a training programme for SME Support Centers’ staff in Small Business Counseling carried out by the BAS Kaliningrad, and a Seminar on “Energy Efficiency and Energy Saving for Industrial SMEs: Innovative Technical, Organizational, and Financial Solutions” carried out by BAS in North West Russia.

Scandinavian Technical Assistance within Barents Euro-Arctic Co-operation

Technical Assistance Programmes By Scandinavian countries. Finnish technical assistance focuses on the Republic of Karelia, the Leningrad and Murmansk oblasts and St Petersburg. In 2009 Finland, has allocated a total of EUR 18.7 million for the projects in these regions. Focus areas include wastewater treatment in St Petersburg, reductions in pollution from settlements and agriculture in the Leningrad District, oil transportation safety, the safe treatment of hazardous wastes, and nature conservation. Norwegian Russian environmental co-operation is mainly performed within the Norwegian-Russian environmental commission and BEAC Working Group on Environment. In addition, Ministry of Foreign Affairs of Norway supports projects on energy and climate mitigation. All these projects are technical assistance with some grant components frequently included. According to SIDA’s website, Sweden is phasing out its bilateral support to Russia, focussing on co-operation within BEAC Working Group on Environment.

10. Linking CP to Other Initiatives and Efforts in the Region

Probably, one of effective strategies to promote CP projects implementation at 'Hot Spots' is to facilitate a wider application of the available technical and funding services at 'Hot Spots' locations. Thus, a comprehensive package of services could be provided to the companies – owners of CP projects, and, in turn, more stakeholders could adhere to the process of changing the ecological status of 'Hot Spots'.

This co-operation could be done in two parallel activities:

- Co-operation with the related International initiatives
- Engaging regional environmental authorities.

10.1 Co-operation with the Related International initiatives

If one would take a look at the related international programmes, a conclusion could be that the current scope of NEFCO's activities in North West Russia is not exposed to any significant competition. The IFI's still do not recognize the CP as a separate market. There is no any credit facility that provides soft loan financing to the CP projects in the targeted region. Hypothetical competition may arise with the credit lines and technical assistance programmes working in the adjacent markets.

However, most of technical assistance programmes declare their objective to work together and towards with NEFCO.

In general, regional environmental authorities are not informed on possibilities and conditions of international financing. As one of the respondents told, 'the reason is that IFIs do not establish contacts with regions and do not offer their services'. It is important to keep them informed authorities, because they could pass this information to the companies and help in establishing contacts with them.

The table below compares, in a simplified form, NEFCO with other international providers of the related financial services. This table basically suggests the following interactions: (-) NEFCO → Technical Assistance Programmes; (-)NEFCO → Large Credit Lines.

Service Providers	Service	Field	Regional Focus	Relative size
NEFCO Cleaner Production Facility	Loans	Environment	Yes	SME ¹
NEFCO Eco-Efficiency Facility	Loans	Environment Energy	Yes	SME
IFC Russia Cleaner Production Production Programme	Loans TA ²	Environment Energy	NO	Large
IFC The Russia Sustainable Energy Finance Program	Loans TA	Energy	NO	Large
EBRD's RUSEFF Programme	Loans TA	Energy	NO	Large
NIB's (CLEERE)	Loans	Energy Environment	YES	Large
Northern Dimension Environmental Partnership	TA	Environment	YES	Large
NPA-Arctic	TA	Environment	YES	SME
EBRD TAM/BAS	TA	Energy Environment	NO	SME

Scandinavian TA	TA	Energy Environment	YES	SME
SME ¹ – Small and Medium Enterprises; TA ² – Technical Assistance				

Table 5: Comparison of the International Programmes

Collaborative Activities with Technical Assistance Programmes

It may be possible to gain a synergy of cooperation with Technical Assistance Programmes. For NEFCO, an added value of this co-operation could be a possibility to strengthen companies' ability to prepare CP projects of a good quality, meeting NEFCO's requirements.

This option of co-operation presumes that companies would receive technical assistance to finalize the project documentation and present their business plans. It shall be reminded that one the main reasons for not implementing the CP projects of B- and C-categories are incomplete technical documentation and lack of own financing. If the project parameters would meet internal targets to investment projects, the companies would be able to prompt implementation of profitable CP projects. Thus, the companies could avoid putting the CP projects on a 'waiting list' of the larger investment programmes. For the Technical Assistance Programmes, the focus at internationally recognized 'Hot Spots' may be an additional benefit for their activities.

Most suitable Technical Assistance Programmes in this respect could be Northern Dimension Environmental Partnership, NPA-Arctic, Scandinavian Technical Assistance, as they have already committed themselves to co-operate and complement activities of NEFCO in the region.

Linking NEFCO's CP activities to Large Credit Lines

By teaming up with larger credit facilities, NEFCO's may promote implementation of CP projects at large companies, which deal with technology and equipment upgrade. Next to all of such projects, identified during the CP Programmes, have remained 'on paper'. The companies wish to implement these projects under larger investment programmes, which go beyond the size of NEFCO's services. NEFCO's niche may be still financing of the CP components of these larger projects.

Due to size, these CP projects always need further development after the end of the CP Programmes. This challenge could be resolved by mobilizing a targeted technical assistance, which is usually available with the above mentioned credit lines.

So far, the credit facilities had no projects in North West Russia. NEFCO may share with network of contacts and experiences. Both of them are not existent so far with the credit lines, so that they could enter into a new region with their services by working together with NEFCO.

Most suitable credit lines in this respect could be IFC Russia Cleaner Production Programme and EBRD's RUSEFF Programme.

10.2 Engaging Regional Environmental Authorities

Mobilizing the available public environmental funds on implementation of CP projects, engaging the regional environmental authorities in elimination of the 'Hot Spots' are important options for intensifying future activities and opportunity to get more CP project implemented.

Regional Environmental Authorities – Turning the Focus at 'Hot Spots'

Meetings with environmental authorities suggested that the 'Hot Spots' are not high at their agenda.

Representatives of governmental bodies in the Arkhangelsk region have stated that they are familiar with the list of 'Hot Spots' and are rendering possible assistance to international organizations to eliminate them. However they could not tell who and how has proposed 'Hot Spots' for Arkhangelsk region, because they have not been at their current positions at that time. The Head of the Agency for Natural Resources and Environment of the Arkhangelsk region noted that the primary attention was paid to the elimination of pesticides and treatment of domestic waste in the territory of the region recently.

The representative of the Ministry of Natural Resources of Karelia noted that the principal attention is paid to supply of population with fresh water. Lack of necessary treatment plants at municipal water supply systems and decontaminating plants results in water supply to the population which does not meet the sanitary code. The main part of upgrade and construction is funded from the budget assets due to the poor investment appeal of the majority of water supply and waste water related projects. Financing of the projects from the federal budget is potentially possible taking into account the development by the RF Government of the targeted 'Clean Water' programme, which in turn allows gives preferences for a third party financing.

As mentioned earlier, some work on 'Hot Spots' elimination and implementation of CP Programmes is carried out in the Komi and a special Working Group is established at the local Ministry of Natural Resources and Environment.

Apparently, NEFCO, in its work on elimination of 'Hot Spots' and promoting CP improvements, shall communicate to the Regional/republican environmental authorities a clear message: one of the main pre-requisites of the success in relation to 'Hot Spots' is pro-active position and attitude of the authorities.

Our survey has unveiled a serious gap in communication between regional environmental authorities and international Technical Assistance Programmes. Basically, most of our respondents from the environmental authorities are not informed on possibilities and conditions of international technical assistance and funding. Apparently, it is one of the tapped opportunities, because this type of co-operation could one of the options for engaging regional environmental authorities into the work on 'Hot Spots'.

To summarize, regional environmental authorities they should pay more attention to coordinating activities related to 'Hot Spots', than it is now. Reversely, a pressure by environmental authorities, their close co-operation with the industries is a factor to successful implementation of CP projects in North West Russia.

This point may be illustrated by the Norwegian experience. In 80s, Norway has launched a programme on technical and environmental production analysis of industrial companies. There was strong pressure by the Norwegian authorities to push the companies to perform the technical environmental analysis, esp. at the beginning. According to opinion of Norsk Energi, which is one of the lead consultants to the programme, the programme would not be a success, the companies would not opt to perform CP reviews and adapt to CP principles without strong pressure from environmental authorities,.

Back to North West Russia, it would be useful if the authorities supply companies or municipalities, located at a 'Hot Spot', with the 2003 NEFCO/AMAP report and the Barents Environmental 'Hot Spots' list. They should also be explained about their status as a 'Hot Spot' and why this status was defined.

Each 'Hot Spot' shall also be carefully described by the authorities. Their legal status shall be officially recognized, to prevent the situation when the company- 'Hot Spot' does not know about this and, does not take therefore proper environmental actions.

It is expedient to assign a body or person within the related environmental authorities who is responsible to monitor a progress at each of the 'Hot Spot'. A periodical reporting on the status and improvements at the 'Hot Spot' may catalyze the progress. A reference to the related regional or federal targeted programmes, if any, shall necessarily be a of the 'Hot Spot' description.

Currently, regional environmental authorities do not possess enough awareness about integrated pollution prevention and control, as well as on possibilities for international financing, as follows from our interviews. Seminars for environmental authorities clarifying modern concepts, e.g., IPPC, CP, BATs, EMS may be hence effective.

A proposal is to discuss all these options with the regional environmental authorities.

Linking 'Hot Spot' and CP activities to the related regional targeted programmes

As concluded before, there are essential gaps in federal and regional legislation, which put disincentives for implementation of CP activities in the North West Russia. However, it was also concluded that regional environmental authorities have some means for environmental investments. According to Russian statistics, most of these investments are targeted at public utilities, mainly on the projects related to drinking water and waste water.

Hence, some of the acute environmental problems in the region can partially be solved in the framework of the regional targeted programmes, which are financed by the regional budgets. However, none of the respondents could have confirmed that private companies could benefit from procurement of public funds.

Among such programmes in the Murmansk region is "Water supply of the Murmansk region for the period 2008-2017" and "Waste for the period 2009-2013". CP activities such as equipment modernization, new technologies introduction cannot be directly financed in the framework by these programmes as it used to be earlier. However, representatives of environmental authorities mentioned that, depending on the scope of proposed works, some assistance can be discussed. For example, development of construction documents for reconstruction of main pipelines and water supply systems in settlements and cities in the Murmansk region was financed from the regional budget in the framework of "Water supply of the Murmansk region for the period 2008-2017".

Still it is important to take into account that regional financing is pretty limited. For example, 45.5 mln. RUR were assigned from the budget of the Murmansk region for financing of environmental protection activities (more than 13 different activities) in 2008 in the framework of "Protection of the environment and environmental safety for the period 2006-2008".

According to the Government Regulation of the Murmansk Oblast (# 352 as of 03.08.2009) "On adoption of rules in the subsidies provision from the regional budget for the financial support of the small and medium enterprises operating in the field of waste management in the period 2009-2013", expenses for improvement of the waste management at such enterprises can be partly covered within regional budget provided for long-term target program "Waste 2009-2013".

Karelian respondents have mentioned such target programs as "Pure water", "About production and consumption waste", as sources of public financing.

The Republic of Komi has by now adopted the following legal documents that can be applied to CP activities: 1) Directive of the Komi Government No. 526-r dated 31 December 2009 on approval of the Complex Plan of Actions of the Komi Government for implementation in 2010 of the Strategy for Social and Economic Development of the Komi Republic till 2020; 2) Directive of the Komi Government No. 391-r dated 27 December 2009 on approval of the Energy Efficiency Programme in the Economy of the Komi Republic for 2010 – 2012 and for the period till 2015.

In Arkhangelsk it was stated that only municipal enterprises could be financed by regional target programmes. And at present time there is only one adopted regional target programme “Environmental protection and safety of the Arkhangelsk region on 2009-2011 years”.

At present time federal and regional authorities are paying much attention to establishing of public-private partnership. But no exact financial mechanism was developed and approved in Russia yet.

It may also worthwhile to explore possibilities with regards to regional energy efficiency programmes. In view of recently adopted FZ No. 261 as of 2009 "On Energy Saving and Energy Efficiency" companies are obliged to implement the activities aimed at energy saving and energy efficiency and will have to find funds for this purpose. According to Clause 27 of this law, energy saving and energy efficiency activities can be supported by the government, for example, by applying stimulating measures stipulated by the legislation on taxes and fees, through partial reimbursement of expenses for paying interest on loans received in the Russian credit organizations for the implementation of investment activities, implementation of investment projects in energy saving and energy efficiency.

Integration of CP projects to the developed programmes on the energy efficiency is possible though problematic. The above mentioned law gives no reference to the CP, thus there is no obligation for the regional and municipal authorities to do that. A refusal from the government bodies can be expected subject to the lack of assets in the regions, as they will hardly be interested in the rise in the cost of energy efficiency programme development. Still it is expedient to discuss possibilities for incorporating the CP into regional environmental or energy efficiency programmes.

To conclude, a proposal is to discuss with the authorities possibilities for closer co-ordination of the work done under the available regional programmes with the ‘Hot Spots’ activities.

11. Integrating CP to the Hot Spots Procedures and Criteria

Based on the desk-top analysis, interviews with environmental authorities and companies, options for integrating of the CP into the Hot Spots procedures and criteria could be outlined.

This can be done in two steps:

- Evaluation of various options for improving performance of CP activities;
- Identification of suitable point of the options application within the proposed 'Hot Spots' exclusion procedures.

11.1 Options for Improving Performance of CP Activities at 'Hot Spots'

Previous chapters have reviewed various aspects of CP activities, as well as the 'Hot Spots'. Based on their analysis and evaluation, several alternative options for CP activities at the 'Hot Spots' could be originated. This section aims to provide a summary of the options. Further analysis is needed to choose the best alternatives or their combination in relation to integrating the CP and 'Hot Spots' activities.

The CP Programmes, in their current format are not considered as an option in relation to 'Hot Spots' elimination.

In interviews with TEKNA, the CP Programme manager, representatives of the CP companies as well as in many other interviews it has been confirmed that the CP Programmes primarily serve educational purposes. The CP Programmes could obviously contribute to improvement of environmental situation and "elimination of hot spot". However, it will be a long-term, step-by-step process, taking into consideration current rate of the CP projects implemented. Therefore, current model of CP Programme is not instrumental for elimination of 'Hot Spots'.

Following options could be considered:

Option 1: To conduct the 'Thematic' CP Programmes

Minor adjustments of the current format of the CP Programmes are presumed by this model, but all the major components are the same: 2 – 4 training sessions and development of CP report by the end of the programme, based on the homework done in between of the sessions. A CP Programme is conducted at a 'Hot Spot' location and an agreement with the company management shall specify the target areas, related to the 'Hot Spot'. With the reference to the target area, a working group is set up. According to our information the Moscow CPSD Centre has experience with the 'Thematic' CP Programmes.

Option 2: CP Programmes combining training and projects development

To ensure more projects being developed, it is suggested to include additional specific subjects into curriculum of education: projects development and business planning, arranging financing, monitoring of the project results, environmental management systems. Additional focus to be put at providing tools, methods and templates for the projects development, arranging financing and monitoring of results. Strong external assistance to projects development and follow-up shall be presumed. Hence, the project development shall be an important component of the proposed strategy, equally important to the capacity building.

Option 3: Combined training and projects development 'Financial Engineering and Environmental Management Systems'

Many of the 'Hot Spots' companies have already passed the CP programmes and several CP projects have been identified. Technical, institutional and financial solutions are needed to resolve

the issue of implementation of these projects. The engineers working in the CP companies know many of the technical options and projects available, as well as the companies' specific circumstances, that make these projects economically practical. However, financial and institutional options (how will the technical solution be paid for and practically organized?) are of equal importance. In the past, however, the emphasis has been placed on finding the technical solution without ensuring that the relevant financing is available to pay for it. To ensure, that all initially identified projects are developed till the stage of the business plan, a new training module shall be prepared combining training with the development of business plans and environmental management systems for a priority project(s).

The projects developed shall be presented by the end of the training programme to financiers, with the assistance of external experts. This option will require a new model of training and capacity building, and a package of educational materials shall be developed.

Option 4: Tailored support to CP projects development

This option introduces alternative model of capacity building by providing targeted support for the CP projects development for the selected 'Hot Spots'. This option may include establishment of a consultancy unit for the targeted project development assistance, including projects identification, high profile CP audits, assistance to feasibility studies preparation and business planning, promotion of the projects towards the IFIs, etc. These activities will be performed by a joint group of external experts and representatives of the companies, according to the model tested by the credit lines of EBRD and IFC. It is also important to find a workable implementation scheme, which will ensure commitment of the companies and regional authorities to work together with the external experts.

Option 5: Tailored support to 'Hot Spots' definition and elimination

This option is not purposed at CP projects development. The main objective is to facilitate the overall process the 'Hot Spots' definition and elimination, in particular, to introduce the at-source analysis at the 'Hot Spot', which is a prerequisite for application of CP concept. In addition to this, this option may provide evaluation of existing environmental situation at Hot Spot, i.e., whether it corresponds to Russian legislation requirements, as well as definition of the 'Hot Spot's' boundary of pollution and preparation of the action plan.

Option 6: Information awareness activities and tailored capacity building of regional environmental authorities

As it was mentioned earlier, regional environmental authorities shall co-ordinate the process of elimination of the 'Hot Spots'. The problem is that they often lack capacity to facilitate CP projects implementation; often they do not have enough information on modern technologies and international benchmarks. Therefore, their main focus now is at end-of-pipe strategies.

The option presumes capacity building and information awareness of regional environmental authorities. This could be provided in the form of informational seminars and tailored technical assistance.

11.2 Options Evaluation and Link to 'Hot Spots' Exclusion procedure

All options have specific advantages and limitations; none of them are universal, as described by the Table 6.

The proposed options can be integrated at different stages of the flow chart for proposed "Hot Spot" exclusion procedures. The choice of point of application will depend on specific case and evaluation of the companies and regional environmental authorities needs.

Capacity Building element	Impact at Hot Spots	Time Horizon	Target Group	Possibility to attract financing
Option 1				
Strong impact	'Hot Spots' cannot be eliminated	Environmental improvements may be quite prompt	Option is widely applicable	No direct impact
Option 2				
Strong impact	'Hot Spots' may be eliminated but not as a common case, because larger projects may still need more thorough projects development.	Environmental improvements may be quite prompt	Main target group are public utilities and SMEs	Little direct impact
Option 3				
Strong impact	Hot Spots could be eliminated	Environmental improvements may take long time	Option could be conducted at large companies	Moderate Impact
Option 4				
Little impact	Hot Spots could be eliminated, however, commitment by the companies' management is a strong risk factor	Environmental improvements may take shorter time	Option is widely applicable	Strong Impact
Option 5				
Moderate Impact	Hot Spots cannot be eliminated	Environmental improvements may take long time	Option is widely applicable	No impact
Option 6				
Strong impact	Hot Spots' may be eliminated but not as a common case	Environmental improvements may take long time	Option is widely applicable	No impact

Table 6: Evaluation of the proposed options for integrating of the CP into the 'Hot Spots'

Points of application of the proposed strategies

Table 7 provides an overview of the proposed strategies and their application points within the 'Hot Spots' exclusion procedure.

Option 1 could be included in the several stages of Hot Spot exclusion procedures: 2, 4, 6. However, the earlier analysis suggests that the 'Hot Spot' elimination may hardly be expected by the proposed strategy. The most optimal way therefore is to include the Option 1 in phase 4. This will facilitate training of the companies representatives in CP methodology and help them to draft and implement the Action Plan in an effective way.

Option 2 has similar scope for integration, but it has a stronger focus at the Hot Spots exclusion. Therefore it may be expedient to consider wider application of the Option 2 at the stages 2, 4 and 6. This will give a possibility for a comprehensive assistance, from mapping of the CP projects to arranging their financing.

Option 3 is not suitable for the CP projects origination, but it may bring to 'Hot Spots' elimination by assisting to development of the projects documentation and arranging financing. The strategy proposed may also develop capacity to project's implementation and documentation of the results at the stage of exclusion from the Barents Environmental 'Hot Spots' list. Therefore, Option 3 may be integrated into the stages 4, 6 and 7, but the main focus is at 4 and 6.

Stages 4, 6 and 8 are the most suitable phases for integration of the Option 4 into 'Hot Spot' exclusion procedures. This option does not include a CP education component, but corresponds well to proposed Hot Spot exclusion procedures. Its implementation will strongly facilitate the development and implementation of CP projects.

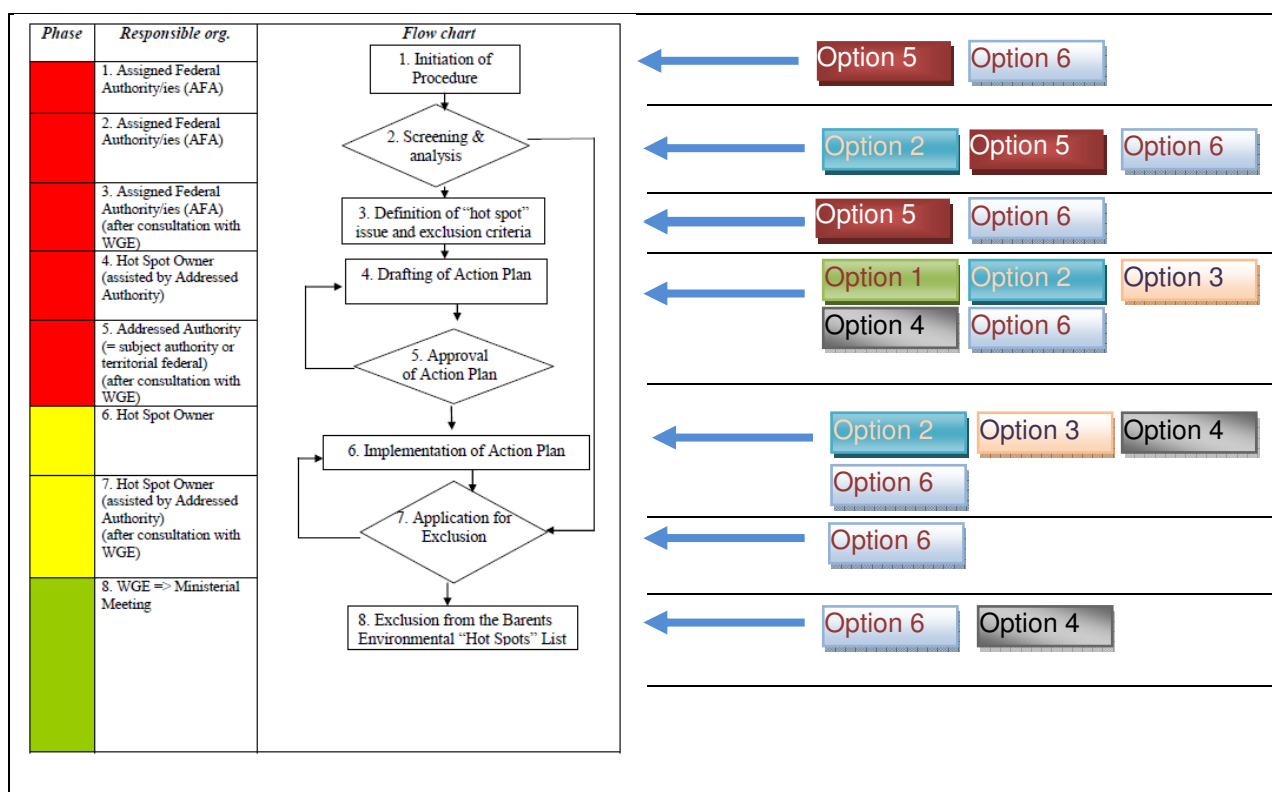


Table 7: Flow chat for integration of proposed option into Hot Spots exclusion procedures

Option 5 is suitable for various stages of the 'Hot Spots' exclusion procedure, but the best strategy possibly is to assume it for specific cases, where there is a need for assistance to the regional environmental authorities. The main challenge is to avoid that this strategy duplicates activities of the authorities or the results are not endorsed by them. In view of these considerations, it is most expedient to limit the application field for this strategy for the stages 1,2,3.

Option 6 is widely applicable and the decision on this strategy application case specific. Basically this Option may be implemented in two main variants. Reduced scope of application includes an introduction course to raise awareness of local authorities on 'Hot Spots' and help them to develop main criteria and procedures. This variant presumes 1-2 workshops, with no- or little practical work in relation to the 'Hot Spots' exclusion procedure. Alternatively, a full scale and detailed capacity building programme could be arranged aimed at development Action Plans for 7-10 'Hot Spots' (Group 2 of the "Hot Spots" where the CP projects are mostly applicable), assuming that the initial screening and mapping are available. This programme may consist of 3 training sessions, each of them lasting 2-3 days, with corresponding homework before, in-between and after, ending up at preparation of a Draft Action Plan for the exclusion of the 'Hots Spot'.

The recommended strategy for linking the CP strategies to the 'Hot Spots' exclusions procedure

Option 1 will not lead to Hot Spots elimination, but if fast actions and results are desired without any major change of current model of CP Programmes, this probably is the most suitable option.

Options 2 and 3 will require significant changes in the current model but may lead to many more projects being implemented and, in some cases 'Hot Spots' could even be eliminated. These strategies are preferable if the aim is to combine CP education and eliminate some 'Hot Spots' from the list. In this case elimination process will take longer time compared to Option 3

Option 4 will have almost zero impact at capacity building. Therefore, it could not be implemented as a stand-alone strategy. Moreover, this option would necessitate the most drastic changes and possibly long discussions with the regional environmental authorities and companies. This option could also be the most expensive and the 'mobilization' time for the option could be long. However, provided workable solutions are found to these issues, this strategy offers most prompt and lucrative results with regards to changing the status of 'Hot Spots'. It also opens possibilities to engaging other IFIs and technical assistance programmes.

Options 5 and 6 are targeted at regional environmental authorities and they are overlapping till certain degree. They could be seen as stages of a capacity building process towards the policy makers, whereas option 6 shall be the beginning of this process. It is important to ensure a focus in these strategies.

Finally, our recommendations on the strategy for linking CP and 'Hot Spots' are as follows:

- Start immediately with Options 1 and 6. In meanwhile, prepare the necessary educational modules for the Options 2 and 3;
- Introduce Options 2 and 3 as a substitute to the Option 1.
- Perform thorough analysis of feasibility, consultations and preparations for launching a tailored support to CP projects development;
- If outcomes of the analysis, consultations and preparations are positive, launch Option 4.
- Introduce Option 5, as a substitute to Option 6.
- Continue implementation of the Options 2. Review the necessity to continue Option 3.
- This work may take 1,5 – 2 years. Afterthat, an effectiveness of proposed strategy shall be evaluated.

The main essence of the recommended strategy is a shift from extensive but not specific enough capacity building activities on CP to a targeted and pragmatic combined training and projects development.

12. An Overview of Spin-off Possibilities for the CP to Broader Markets

A spin-off of the CP to a broader market in Russia requires co-ordinated actions on various elements of the market development, including the regulatory framework, removal of barriers and introduction of institutional and economic incentives.

Russian industrial sector is very heterogeneous, with many types of companies, differing in size, sector, mode of operation, conditions, level of energy consumption, potential of savings, etc. Various factors may influence successful application of CP, i.e., business interests, corporate governance, management practices and other fundamental factors typical for economies in transitions. These factors are often beyond the influence of technical assistance programmes.

On top of that, there are various technical, economic and institutional barriers. Examples of these barriers are mentioned by the Section 8.3. Development of an integrated CP policy, which will address these barriers and which will ensure further recognition of the CP concept by Russian legislation, would give a major impetus to adoption of CP at all levels of authorities and companies. This will, in turn, ensure a spin-off of CP to the rest of the country.

Technical assistance could speed up this process by raising awareness and facilitating the process of the barriers removal. Since CP activities in Russia are at early stage of development, it may be beneficial to involve various stakeholders into the policy development. In ideal situation, it shall be a collaborative effort to address all barriers at an early stage, rather than one by one. However, promoting single elements of the market development will also have a positive effect.

Options indicated in the table below represent an outline of the main barriers and realistic ways to remove or overcome them.

Barriers	Options
Weak economic incentives for the CP measures	Increase tariffs to economically recoverable rates.
	Drastically increase environmental payments (25 – 50 times, according Yana Gorbatenko from IFC), strengthen payment discipline.
	Strengthen direct regulations that environmental authorities could apply to the companies.
Weak legislative framework facilitating CP projects	Establish a legal status for the 'Hot Spots', both in North West Russia and rest of Russia.
	Evolution of environmental permitting: from ELVs/MACs, which hold companies focus at 'end-of-pipe' to integrated pollution prevention and control, which foster the preventative approach.
	Recognition of CP on political level and an integrated policy of CP promotion
	Development of Russian CP legislation on all levels, including taxation and financial instruments.
	Integration of CP imperatives into on-going energy efficiency programmes on federal, regional and municipal levels.
	Incorporation of CP into sectoral strategies and plans.
	Establish direct governmental support for companies

Access to financing	implementing environmental/CP measures (for instance, similar to the Norwegian ENOVA).
	Enable indirect economic incentives are available to CP Programmes (beneficial rate of depreciation of equipment, reduced import duty, provide securities to public utilities, etc.).
	Raise IFI's interest in CP financing
	Increase of awareness of the Russian authorities and enterprises about IFI, international programmes and funds financing CP projects in Russia and conditions of financing.
	Assist companies in preparation of bankable projects
	Training of bankers to strengthen their capacity to deliver financing services to CP companies.
Lack of interest in the CP programme/activity from enterprise management	Ensure a dialogue and pressure from regional environmental authorities at production companies in relation to CP and environmental performance.
	Regional environmental authorities to develop information campaigns in order to raise companies' awareness about environmental performance and CP. Ensure broader involvement of top-managers in CP Programmes. Inform them on potential for obtaining economic savings through CP projects.
	CP projects shall be granted by economic or regulatory incentives.
	Improvement of organizational structure, management system at enterprises in environmental sector, especially at municipal enterprises and SME
	CP projects and programmes shall be requested to be a part of the action plans approved by the authorities as a part of TARs agreements.
	Promote EMS
	Distribute best cases, benchmarks, manuals for CP; all shall be adapted to Russian situation.
	Introduction of economic motivation (bonuses) for employees who managed to develop and implement CP projects.
	Develop special certificates to the companies and managers attesting his/her outstanding role in the improvements.
	Strengthen focus at profitability of CP projects in CP report.
Limited access to CP information	Increase of information supply to the stakeholders which will allow avoiding wrong interpretation and misunderstanding of CP concept, which prevail with the authorities and enterprises
	Initiation of information programmes and CP support programmes (broader implementation thereof within the stakeholders)
	Availability of public information about CP, such as BATs, BREFs, best cases, typical approaches, calculation sheets. This shall be both information prepared in Russia

	and translations of international experience
	Establish an international portal or a forum, or CP club, where people could exchange their information and get necessary updates.
	Initiate study, R&D projects and studies on CP in Russia
	Establish a national directory of CP technologies
Lack of interest in the CP programme/activity from enterprise management	Increase of concern with regard to environmental problems within an enterprise
	Closer relationship between authorities and enterprises at regional and municipal levels in relation to environmental issues resolutions including CP
	Stimulation (legislative, economic) for enterprise management to develop and implement CP projects
	Improvement of organizational structure, management system at enterprises in environmental sector, especially at municipal enterprises and SME
	Increase of awareness of enterprise management about CP concept and benefits thereof;
	Broader involvement of managers to the CP system and CP projects; development of CP application at enterprises
Lack of capacity to develop viable projects	Make public funds available to free government-supported environmental consultation, advice, and documentation for the companies
	Develop Russian website with the related advice (similar to the UK's envirowise)
	Develop a standard toolbox of educational materials for the projects development
	Train consultants

Table 8: Various options to disseminate Cleaner Production in Russia

In Ukraine and Belorussia, the overall situation with regards to CP has similar trends: there has not been established an integrated CP policy. Thus, similar barriers and opportunities are observed.

There are however some difference. Industries in these countries face now higher, than in Russia, costs of raw materials, higher fuel costs, higher utilities costs (in particular energy and water), environmental taxes and often new costs for waste disposal and pollution. All these cost elements have reached levels that represent a considerable part of the total production costs. Hence, there are much stronger economic incentives to pollute less.

In these countries, there is stronger political will to reduce energy consumption. Transition to EU's environmental legislation is declared as a policy goal and there is a common perception that international principles of integrated pollution prevention and control will be adopted.

The concept of the Ukrainian national environmental policy until 2020 (adopted 17th October 2007 under the governmental decree No. 880-p) proclaimed a goal of approximation to European principles of environmental legislation. Several of the tasks outlined are supposed to encourage CP improvements:

- Task 5 specifies the ways of achieving the environmental safety:
 - transition to integrated permits issued through the 'one window' principle;
 - ensuring stimulation to apply environmentally safe resource and energy efficient technologies,

- ensuring environmental safety during the cease of operation or change of ownership of industrial enterprises or objects.
- Task 6 contains following requirements for "greening" of industry:
 - application of best available, energy and resource efficient technologies;
 - low waste, waste free and environmentally safe technological processes;
 - implementation of environmentally effective methods of management inside of a enterprise, principles of corporate responsibility and cleaner production.
- Tool no. 3 - development of environmental protection legislation by approximation with the relevant EU legislation and international standards.

Principle of Best Available Techniques has recently been introduced in relation to air pollution. The Ministry of environment divides all industries into three groups, according to 'Instruction for preparation of background papers to obtain air emissions permit'. The group of largest air polluters (1 group of the companies) is being obliged to compare their processes, related to air pollution, to the technologies. The BREFs have been translated into Ukrainian; however companies, on opinion of our respondents, are not comfortable to use them as a reference. Assisted by local consultants, many of them develop these benchmarks for process efficiency themselves. These companies could be one of the target groups for the CP activities.

There is an Agency for Rational Use of Energy Resources, which develops and enforces a local energy efficiency policy. Integrating CP principles into the governmental energy efficiency policy seems to be one of the real workable solutions for the spin-off of CP to Ukraine.

Though the Ukrainian legislation contains many positive ambitions and priorities, but only few of them are 'realistic' and not just 'on paper'. The Ministry of Environment of Ukraine prepared in 2008 the Ukrainian CP concept which is supposed to enable some of tasks of the National Environmental Policy. This concept has been prepared for submission to the Government as of the end of November 2008, but no further progress with its adoption so far.

An example of a realistic policy, which actively is implemented at various levels of governance, is a goal to reduce gas consumption. The CP shall become a similar 'real' policy goal, admitted by one of the Ukrainian experts.

The experts have additionally suggested that 'there is zero awareness about CP with the Ukrainian authorities'. In order to develop and implement a comprehensive and realistic policy, the authorities shall be trained in CP methodology and acknowledged on international experience with promoting and capacity building for CP. Companies shall be educated in CP methodology and projects development.

The interviewed Ukrainian experts have also provided their opinion on possibilities to develop of market of financial services to CP projects in Ukraine. Local awareness about IFIs with regards to CP, their terms and conditions, is not sufficient.

For instance, Ukrainian production companies have heard about NEFCO more often than not, but few of them would get in touch with it. The companies are not experienced in working with IFIs, they are not familiar with NEFCO's project cycle, requirements, etc. and they do not have sufficient capacity to prepare project documentation and loan applications. Tailored support to the companies and their consultants, information seminars, cases, clear project cycle, etc are needed to building companies capacity in Ukraine to be able to absorb financial services.

Belorussia has quite strong governmental control over energy and resources use. The government has adopted a decree 'on approval of national strategy for implementation of integrated

environmental permits, 2009 – 2020. This offers a solid platform for integrating CP into the current energy and environmental policies in Belorussia. BAT Centre was established in December 2009.

In both countries, there is quite limited awareness on CP. Awareness raising, capacity building and training are needed to facilitate the market development. Assistance is required on various level: both national and regional authorities would need an awareness raising and policy development assistance, while companies would need an assistance to develop the needed skills and capacities to initiate, prepare, arrange financing and implement CP projects.

Annexes

Annex 1 – Review of generic CP methodology

Governments in Russia, like in Western Europe have approached environmental protection and pollution control issues since 1950s. The long-term strategies to manage environmental consequences of industrial pollution have evolved over the time. In looking at the historical trends, one could distinguish, with some degree of simplification, the following strategies:

- ☐ Dilution of pollution (1950-60s)
 - Higher chimney
 - Better dilution of waste waters
- ☐ Filtering of pollution (end-of-pipe) (1970s)
 - Cleaning facilities
 - Waste landfilling
- ☐ Recycling and reuse (1980s)
 - Reuse of product
 - Recycling of materials
 - Recovery of energy
- ☐ Cleaner Production (1990s)
 - Waste minimisation
 - Energy Efficiency
 - On-site recycling
- ☐ Environmental Management Systems (2000s)
 - Life Cycle Analysis
 - Integrated Pollution Prevention and Control
 - Integrated environmental and energy management

Beginning of 1990s a new concept for corporate policies on the environment has emerged as the limitations of previous strategies were gradually recognized. This model acknowledges the need for an integrated approach to pollution, which includes analyzes of the overall impact of industrial processes and products on the environment and seeks environmental improvements by encouraging abatement of pollution at source and prevention of pollution in the first place.

There is no standard definition to this concept, as it has emerged almost simultaneously in various countries (USA, the Netherlands, UK, Scandinavia). In widespread use are quite various terms, like 'waste minimization', 'clean technology', 'cleaner technology', 'clean production', 'low waste technologies' and 'pollution prevention' (ACOST, 1992; Jackson, 1993). The term 'cleaner production' has however been internationally favored, because it underlines that no process or product is ever totally clean and free of environmental impact, it implies continuous improvement in reducing environmental damage, and it does not simply focus just on a 'technology'.

3 definitions of Cleaner production are hereby referred:

- ☐ The continuous application of an integrated preventive environmental strategy to processes and products and services to increase eco-efficiency and reduce risks to humans and the environment (UNEP);
- ☐ Cleaner Production reduces or prevents waste and pollution at source by implementing measures that result in a more efficient use of raw materials and energy, giving (-) higher

profit, (-) less pollution and waste, (-) better working conditions and (-) better product quality (Norwegian Energy Efficiency Group);

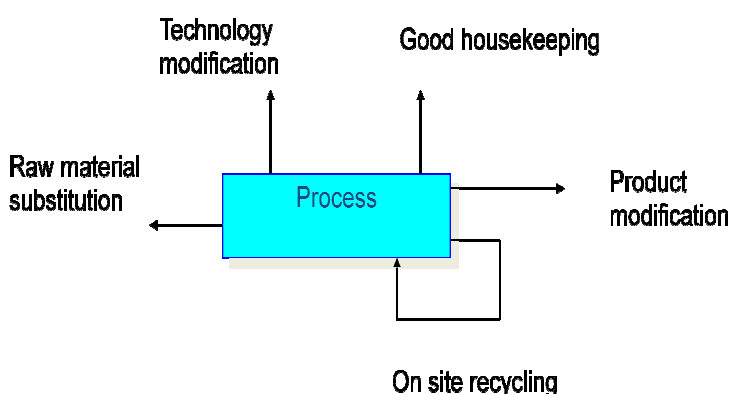
- ❑ Cleaner production systems can be defined as approaches to industrial processes and product design that allow continual progress towards waste reduction in material and energy inputs, maximization of energy efficiency, and minimization of overall environmental impact, not just within a production plant but at all stages of design, production, distribution, consumption and disposal (Jan Christie, 'Cleaner Production in Industry').

These definitions suggest that Cleaner Production focuses (-) at minimization of wastage at production processes, products and services ("Prevention is better than cure"), rather than at their consequences; (-) includes comprehensive analysis of production process and products and their impacts on the environment; (-) it involves a careful examination of possibilities for modification of products and processes, and an open-minded, thinking approach; (-) it may add a business dimension to environmental improvements, the waste minimization strategies may deliver costs savings, improved product quality and working conditions.

The Cleaner Production strategies often include the following key elements:

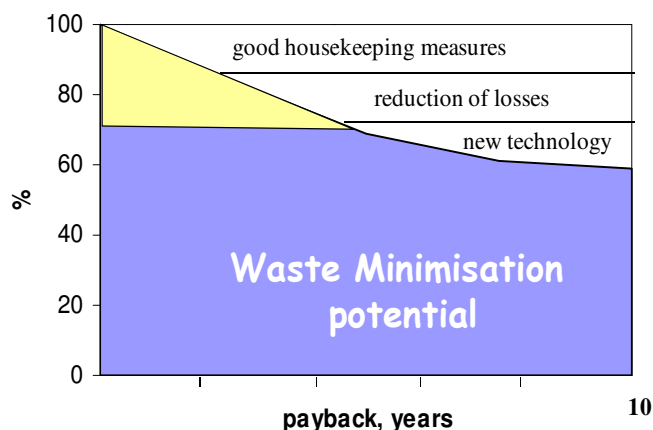
- ❑ Minimising quantity of waste generation (reduce, reuse, recycle, evaluate needs, refill, fix, maintain equipment);
- ❑ Minimising pollution loads (design, process control, procedures, emergency measures, spill control);
- ❑ Minimising use of resources (water, energy, paper, chemicals, plastics).

Apparently, there is no generic set of technologies universally labeled 'cleaner technologies', as the range of processes to which cleaner production innovations can be applied is so large. However, technologies, which often are associated with cleaner production include energy management systems, combined heat and power systems, modification and redesign of processes to minimize energy and material inputs and waste, and modification and redesign of products to reduce environmental impact and resource consumption.



However, in some setting these technologies may not be attributed to as cleaner production. Moreover, it is often underlined that Cleaner production concept is not primarily about the technical improvements and application of a readily definable set of technologies.

The concept, however, accepts that it is possible to list a general set of cleaner production techniques and approaches with which particular technologies could be associated. The set of the assessment techniques is presented to the right.



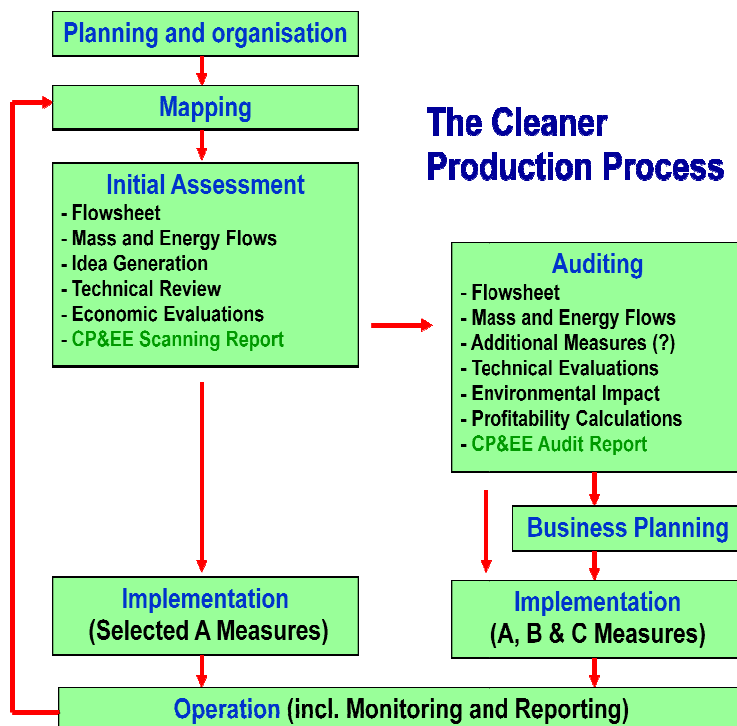
Experience of the Norwegian Energy Efficiency group suggests that contribution of various types of measures may in general differ. The cleaner production improvements can be achieved simply in many cases, low-cost good housekeeping measures for process efficiency and on standard quality control techniques. However, companies that go beyond the stage of improving their process housekeeping and minimizing process wastes, and apply more sophisticated measures, like technology and product modification may achieve much greater improvements, as illustrated below:

A cleaner production assessment includes an upstream inventory of the sources of the pollution. While every company is unique, a generic methodology for the cleaner production projects identification and development could be described as a set of the following steps:

- Planning and Organisation
 - ✓ Establishment of the project team
 - ✓ Preparation of the assessment protocols, question lists and templates
 - ✓ Review of Background issues
 - ✓ Collection of benchmarks
- Production mapping
 - ✓ Dialogue with company staff
 - ✓ Review of process information and preparation of process flow sheets
 - ✓ Collection of relevant statistics from previous years
 - ✓ Preparation of mass balances, assessment of resource use efficiency
 - ✓ Brief evaluation of waste minimisation potential
 - ✓ Evaluation of the owner's interest and possibilities for project implementing
- Initial Cleaner Production Assessment
 - ✓ Identification the main cost centres and opportunity areas
 - ✓ In-company walk-through inspection and description of the present situation
 - ✓ Generation of measures or projects
 - ✓ Technical and economic calculations
 - ✓ Brief Assessment of Environmental feasibility
 - ✓ Packaging of the prepared measures
 - ✓ Preparation of Implementation Plan
 - ✓ Presentation and discussion with decision-maker
- Cleaner Production Audit
 - ✓ Specification of existing situation at specific processes or company departments
 - ✓ Collecting of missing information and process measurements
 - ✓ Establishment of benchmarks and good practice examples
 - ✓ Detailed description of each measure, choice of technology, technical feasibility assessment
 - ✓ Evaluation of savings potential (measures, investments, savings and profit)
 - ✓ Environmental benefits
 - ✓ Time schedule for implementation
 - ✓ Financing
 - ✓ Operation and maintenance
 - ✓ Environmental management
 - ✓ Training of operation and maintenance personnel
- Business Plan preparation
 - ✓ Review of Borrower's credibility
 - ✓ Project Information
 - ✓ Assessment projects profitability

- ✓ Market
- ✓ Financing Plan
- ✓ Financing Projections
- ✓ Project Implementation
- Cleaner Project Implementation
 - ✓ Project Management
 - ✓ Design/planning
 - ✓ Procurement
 - ✓ Installation
 - ✓ Control, testing and commissioning
 - ✓ As-built documentation
 - ✓ Training of personnel
- Operation and Maintenance
 - ✓ Energy and Environmental monitoring
 - ✓ Documentation of projects results
 - ✓ Setting up new goals

The generic methodology could be illustrated in the following way:



It should be mentioned that careful data gathering in the first three steps is very important. If compared with sloppy data gathering, it results in more effective work in the next steps and leads to the identification of more waste prevention opportunities. Evaluation of environmental benefits is not a straight forward activity, as the cleaner production and environmental improvements are usually documented at opposite sides of a 'pipe'. A rather common practice is to count the number of improvement options that are implemented in the production process and to give an indication of waste reductions (both quantitatively and qualitatively) for each option implemented. These reductions can be added and compared with the waste production associated with the original process. Another possibility is the comparison of an improved process with a standard or benchmark, which refers to a good practice example. A standard may reflect all preventive options that are easily (that is at low cost) applied in existing factories (minimum standard) and all feasible improvements (maximum standard). Both methods may require quite detailed assessment of environmental benefits and, thus could be applied by the detailed cleaner production audit.

It is common opinion that over the longer term, and sometimes in the short run, cleaner production improvements are quite cost-effective. Specifically, simple good housekeeping measures can improve the efficiency of processes and reduce energy use with no- or low cost investments. The following types of cleaner production measures are usually distinguished:

- ☐ Category A:
No/negligible investments and payback. Implemented immediately
- ☐ Category B:
Return to investments 1-3 years. Own financing, or small credit
- ☐ Category C:
Larger Investments, Payback > 3 years. Requires Business Plan to be presented to a credit institution

Annex 2 – List of Russian Pollution Control Legislation and Requirements

No	Legislative guidelines	Description of legislative and other environmental requirements	Method of realization of requirements	Conformity confirmation (title of documents or requirements)	Notes
1	Constitution of the RF of 12.12.1993	Clause 42 Everyone has a right for favorable environment and reliable information on its state.	Submitting reliable information on state of the environment.	Publication of announcement in mass-media regarding proceedings on new projects.	
		Clause 58 Everyone is obliged to preserve nature and environment	Prevention of deterioration of existing nature condition природы	Programs and reports on accomplishment of environmental measures	
		Clause 72 Possession, use and disposition of land, subsoil, water and other natural resources	Nature management in accordance with the legislation	Licenses, contracts, permissions	
2	FZ on Environmental Protection of 10.01.2002 No 7-FZ (as in force of Federal laws of 22.08.2004 No 122-FZ, of 29.12.2004 No 199-FZ, of 09.05.2005 No 45- FZ, of 31.12.2005 No 199- FZ, of 18.12.2006 No 232- FZ, of 05.02.2007 No 13- FZ, of 26.06.2007 No 118- FZ, of 24.06.2008 No 93- FZ, of 14.07.2008 No 118- FZ,	Chapter IV Clause 16 Payment for negative impact on the environment as in force of FZ of 30.12.2008 of No 309-FZ	Fulfilment of payment for negative impact to the environment	Accountant document confirming fact of the payment transfer	Order of Rostekhnadzor of 08.07.2006 No 557
		Chapter V Standardization in the field of environment protection (Clauses 19 – 24, 29-31)	Assessment of state of environment; standardization	Entity Standard, Inspection diagrams Projects of standards for PDV and PDS, PNOOLR	
		Chapter VI. Environment impact assessment and ecological expertise	Conduction of state expertise	Decision on passing of the state expertise	According FZ No174-FZ of 23.11.2005 (as in force of 30.12.2008)

	of 23.07.2008 No 160- FZ, of 30.12.2008 No 309- FZ, of 14.03.2009 No 32- FZ) In force from 17.03.2009	Chapter VII. General requirements in the field of env. protection at business and other activities.	Observation of requirements in the field of environment protection	Realization of measures insuring fulfilment of the requirements	
		Chapter XI Clause 67 Industrial control in field of env. protection (industrial environment control)	Conduction of industrial control	Industrial eco-analytical control diagrams	
		Chapter XII Clause 70 p.2. Scientific research in the field of env. protection is conducted to: development and creation of the best technologies in the field of env. protection and rational utilization of natural resources	Conduction of NIOKTR and TEI	Plans of NIOKTR and TEI Contracts of conduction of NIOKTR and TEI, NTP	
		Chapter XIII Clause 73 Training of executives and specialists in the field of env. Protection and environmental safety (laying on these subjects obligation to conduct industrial environment control, in particular)	Selection of executives and specialists responsible for decision making at realization of business and other activity influencing or may influence negatively on the environment. Personnel training	Plan of trainings for development of personnel. Report on fulfillment of the training plan	
		Chapter XIV. Responsibility for violation of legislation and resolution of disputes in the field of env. protection	Distribution of responsibilities and authorities in the field of env. protection	ORD on distribution of responsibilities and authorities in the field of env. protection	
3	Water Code of the RF of 03.06.2006 No 74-FZ (as in force of FZ of 04.12.2006 No201- FZ, of 19.06.2007 No102- FZ, of 14.07.2008 No118- FZ,	Chapter 2. Ownership rights and other rights on water objects. Chapter 3. Water use contract, Decision on granting the water object in use.	Presence of license/contract on water use and/or decision on granting the water object in use	Licenses/contracts on water use and/or decisions on granting the water object in use	

of 23.07.2008 No160- FZ) FZ On Introduction of amendments into clauses 16 and 19 of the Water Code of the Russian Federation and clause 27 of the Land Code of the RF of 19.06.2007 No102– FZ	Chapter 4 . Clause 33 p.p.4-6 On establishment of limits for withdrawal of water resources from water object and limits for sewage water discharge	Getting the established limits for withdrawal of water resources from water object and limits for sewage water discharge	Water use limits. Annual information of SP about water use limits	
	Chapter 4 . Clause 35 Development and establishment of the standards of permissible impact to water objects	Development of the standards of permissible impact to water objects	Project Standards of PDS and VSS of impurities, entering environment with sewage waters	
	Chapter 5.Water use	Keep count of volume taken (withdrawn) of water resources from water objects and volume of sewage discharge and its quality, regular water objects observations	Entity's standards, Industrial eco-analytical sewage control diagrams	
	Chapter 5. Clause 44 Utilization of water objects for sewage and/or drainage waters discharge purposes	Presence of established sewage discharge limits	Annual water use limits	
	Chapter 6 . Clause 56 Water object protection of lodgment and contamination	Zero discharge into water objects and waste dumping in them, incl. phasing out vessels and other water craft	PLA, ORD including measures to prevent water objects contamination resulting from accidents and their management	
	Chapter 6 . Clause 60 Water objects protection at project stage, placement, construction, reconstruction, putting into operation, exploitation of hydro economic system	Observation of standards of permitted impact on water objects, by exception of cases stipulated in the federal law		

4	FZ on Atmosphere Air of 04.05.1999 No 96- FZ (as in force of Federal Laws of 22.08.2004 No122- FZ, of 09.05.2005 No 45- FZ, of 31.12.2005 No 199-FZ, of 23.07.2008 No160- FZ, of 30.12.2008 No 309- FZ, of 30.12.2008 No 313- FZ) In force since 11.01.2009	Clause 12 – standards of harmful (polluting) substances into atmosphere and harmful physical impacts on atmosphere	Routine development and submission of pollutants emission standards, establishment of TNV and PDV	Project of standards for limits of allowable emissions of pollutants into the air	
		Clause 14 – permission for emission of harmful (polluting) substances into atmosphere	Getting permission for pollutants emission into atmosphere	Permission for pollutants emission into atmosphere	
		Clause 15 – Common requirement for economic and other activities, rendering negative impact on atmosphere	At putting into operation of new and/or reconstructed objects conducting emissions of pollutants, they are to be in conformity with air protection requirements	Presence of positive decisions of state expertise	
		Clause 16. - Air protection at project stage, placement, construction, reconstruction, putting into operation, exploitation of economic and other objects	Provision of non-excess of quality standards of the air in accordance with environmental, sanitary-hygienic and construction standards and rules as well	Control and monitoring of requirements observation	
		Clause 18 – regulation of harmful (polluting) substances at storage, dumping, neutralization and combustion of industrial and consumption waste	Industrial and consumption waste neutralization and combustion of such waste not in specialized units is prohibited	Documents making provisions for combustion of waste contaminated with materials of metallurgy shop	
		Clause 22 – inventory of emissions of harmful (polluting) substances and harmful physical impacts on atmosphere and their sources	Provide inventory of polluting substances emissions into atmosphere and their sources	Inventory report on emissions of polluting substances into atmosphere and their sources	

		Clause 28 – payment for pollution of environment with emissions of harmful (polluting) substances into atmosphere and other types of impact	Calculation of payment for pollutants emissions into atmosphere	Prepared calculations of payments for negative impact	
5	FZ on Waste of Production and Consumption of 24.06.1998 No 89- FZ (as in force of 30.12.2008 Published on 31.12.2009. In force since 30.06.2009, prepared since 01.01.2010)	Chapter III. General requirements for waste management. Clause 9. Licensing activities on collection, use, disinfection, transportation and disposal of harmful waste	Getting license for activities on harmful waste treatment	Materials to motivate license issuing	
		Clause 12. Requirements for waste disposal objects	Creation of objects for waste disposal is permitted only basing on permissions, providing positive decisions of the state expertise	Within the territory of the waste disposal objects and within the limits of their impact the enterprises are obliged to conduct monitoring of condition of environment	
		Clause 14. Requirements for harmful waste management	Determination of degree of harm in accordance with the criteria. Creation of harmful waste passport.	Presence of passport for waste of I-IV grades of harm, and materials to prove the harm degree	
		Clause 15. Requirements for professional training of persons, admitted to harmful waste management	Persons admitted to harmful waste management are obliged to have professional background	Presence of certificates permitting work with harmful waste	
		Clause 16. . Requirements for transportation of harmful waste	Observation of safety requirements for transportation of harmful waste by vehicles.	Presence of: - harmful waste passport; - specially equipped and marked with special signs vehicles; - documentation for transportation and transfer of harmful waste	

		Chapter IV Standardization, state accounting and reporting in the field of waste management Clause 18. Standardization in the field of waste management	Presence of standards for waste generation and limits for their disposal	Limits for waste disposal	
		Clause 19. Accounting and reporting in the field of waste management	Routine accounting of generated, utilized, disinfected, transferred or received waste and disposed waste	Presence of accounting documents and reports	
		Clause 23 Payment for waste disposal	According to the government decree of 12.06.2003 No344 (as in force since 01.07.2005 with amendments of 08.01.2009)	Calculation of payment for negative impact according to the authorized standards	
		Chapter VII. Responsibility for violation of the RF legislation in the field of waste management	Execution of the RF legislation in the field of waste management	Presence of TEB and ORD, regulating environmental requirements	
6	FZ of 21.02.1992 No 2395-1 on Sub-soil (as in force of 07.07.2009)	Clause 11 Presence of license for sub-soil use	Formalization of sub-soil in use by special state resolution in the form of license	Licenses for sub-soil use; Statistic reporting	
		Clause 12. Contents of license for sub-soil use			
		Clause 22 Basic rights and obligations of sub-soil users	Observation of terms and forms of contract relations of sub-soil use		
		Clause 39 Payment system for sub-soil use			
		Clauses 49 – 51 Responsibility for violating the law and order of compensation of the damage resulted from that violation			

7	FZ on Ecology Expertise of 23.11.1995 No174- FZ (as in force of 30.12.2008)	Clause 4 Types of ecology expertise	Direction of documentation to the state ecology expertise in accordance with Clauses 11,12,14	Positive decision of the state expertise	
		Chapter 3 Clause 10 State ecology expertise (SEE)			
		Clause 11 Objects of SEE on federal level			
		Clause 12 Objects of SEE on regional level			
		Clause 14 Order of conduction of the ecology expertise	Observance of dates of SEE conduction		
		Clause 18 Decision of the state ecology expertise	Document, issued by SEE expert commission		
		Chapter V – Determines rights and obligations of the customers of the documentation subject to ecology expertise			
		Chapter VII – types of infringements of the RF legislation on ecology expertise			
8	Order of State Committee for Ecology of the RF of 16.05.2000 No 372 on Approval of Provisions on Assessment of Intended Economy and Other Activities on the Environment in the RF	Requirements for conduction of impact assessment of intended economy and other activities on the environment and preparation of materials for development documentation on SEE objects	Complete set of documentation, prepared at conduction of impact assessment on the environment being part of the documentation presented to the SEE	Presence of positive decision of SEE	
9	Land Code of the Russian Federation No 136- FZ of 25.10.2001 (as in force of 24.07.2009)	Chapter II Land protection – determines goals of land protection, their contents (rights and obligations on holding the arrangements)	Observation of requirements on cleaning up, planning and organization of the allocated land	ORD and contracts in the sphere of activities on waste management and planning and organization of places for disposal	

		Chapter XIII Responsibility for lawlessness in the field of land use and protection	Observation of requirements		
10	Federal Law on Sanitary and Epidemiological Well-Being of Population of 30.03.1999 No 52- FZ (as in force of 30.12.2008) In force since 11.01.2009.	Clause 18. Sanitary and epidemiological requirements for the water bodies p.4	Coordinated standards of the marginal negative impacts to water bodies, standards of PDS for water bodies	Presence of coordinated standards of PDS with bodies conducting state sanitary and epidemiological supervision	
		Clause 20 Atmosphere air in residential locations and on the territory of industrial companies should not render negative impact on human. Safety criteria are set in sanitary regulations	Sanitary and epidemiological decision on adequacy of standards and projects of PDV to the sanitary rules	Presence of sanitary and epidemiological decision on adequacy of standards and projects of PDV to the sanitary rules	Project of standards of PDV GN 2.1.6.2309-07
		Clause 22 Sanitary and epidemiological requirements for collection, utilization, disinfection, transportation, storage and dumping of waste	Realization of radiation control on sites of centralized dumping of production and consumption waste	Contract on requital services, acts of survey	Protocol on results of control
		Clause 32 Industrial control	Conduction of control in conformity with SP 1.1.1058-01. First introduced by Decree of Ministry of Health of 13.07.2001 No 18	Program of industrial control of AV on border of SZZ	Information on results of survey
		Clause 40 Particularities of licensing of specific types of activity, appear to by potentially dangerous for human	Presence of positive decision of the state ecology expertise of the materials for intended activity on hazardous waste management	Positive decision of the state ecology expertise of the materials for intended activity on hazardous waste management	

		Chapter VII. Responsibility for sanitary legislation infringements. There are three types of responsibility for infringement of sanitary legislation – disciplinary, administrative and criminal	Observation of environmental and sanitary and epidemiological requirements	Presence of officially published sanitary regulations	
11	Tax Code of the Russian Federation (Part Two) of 05.08.2000 No 117- FZ (as in force of 19.07.2009, 24.07.2009)	Chapter 25.2. Water tax.	Water tax payment is effected only at realization of licensed special and/or special water use.	Tax statement	Payment for use of water body relates to non-tax payments
		Chapter 26. Mining tax	Object of taxation – multicomponent complex ores and nonmetallic useful minerals	Tax statement	Presence of license
		Chapter 31. Land tax	Object of taxation – land patches	Tax statement	According to Clause 398 and p.7 of Clause 80 of No 117- FZ
12	FZ of 24.12.2008 No 204- FZ on Federal Budget for 2009 and for Planning Period of 2010 and 2011 (as in force of 17.07.2009)	Clause 3. Indexation of rates of specific types of payments for 2009 p.3. Payment norms for negative impact on the environment, established by Russian government in 2003 and 2005 are implemented in 2009 with multiply coefficient of 1.62 and 1.32 respectively	Calculations of payment for negative impact to the environment with established coefficients	Fulfilled calculations of sum of payments for objects of negative impact	2

13	RF Governmental Decree of 12.06.2003 No 344 on Payment Norms... (as in force of 01.07.2005 with amendments of 08.01.2009)	Norms of payments for emissions into atmosphere of pollutants, discharges of pollutants into surface water bodies, disposal of production and consumption waste, coefficients, accounting environmental factors	Fulfillment of calculation of payment for negative impact utilizing established norms	Absence of claims to indicators of calculated payment for negative impact	
14	RF Governmental Decree of 28.08.1992 No 632 on Confirmation of Order of Payment Determination and its Limits for Pollution of Environment and Waste Dumping (as in force of 14.06.2001 with amendments of 14.05.2009)	Basic payment norms: a) for emissions, discharges of pollutants, waste disposal within the permitted norms; б) for emissions, discharges of pollutants, waste disposal within the permitted limits	Fulfillment of calculation of payment for negative impact utilizing established norms	Absence of claims to indicators of calculated payment for negative impact	

15	RF Criminal Code of 13.01.1996 No 63- FZ (as in force of 29.07.2009)	<p>Chapter 26 Environmental crime.</p> <p>Clause 246 Abuse of regulations of environment protection at fulfilling works</p> <p>Clause 247. Abuse of regulations of environmentally harmful substances and waste handling</p> <p>Clause 248 Abuse of safety regulations at handling of microbiological or other biological agents or toxins</p> <p>Clause 250. Water pollution</p> <p>Clause 251. Atmosphere pollution</p> <p>Clause 252 Marine environment pollution</p> <p>Clause 254 Land damage.</p>	<p>Observation of:</p> <ul style="list-style-type: none"> - established environmental requirements and norms at utilizing water bodies; - rules of emissions of pollutants into atmosphere and exploitation of UOG, buildings and other objects 	Permissions for pollutants emissions into atmosphere, discharges of pollutants in water bodies and waste disposal	The present code is basing on Constitution of the RF and acknowledged principles and norms of international law
16	RF Administrative Code of 30.12.2001 No195- FZ as in force of 19.07.2009, with amendments of 24.07.2009)	<p>Clause 8.5. Hiding or distortion of environmental information</p> <p>Clause 8.6. Land damage</p> <p>Clause 8.7. Non-fulfillment of obligations for land remediation to the state, suitable for use according to initial purpose</p> <p>Clause 8.10. Violation of requirements for rational use of sub-soil</p> <p>Clause 8.13 Violation of procedures of protection of water bodies</p>	Observation of environmental requirements	Presence of NTD and ORD, containing and regulating environmental requirements	

		Clause 8.14. Violation of procedures of water use			
		Clause 8.21. Violation of procedures of atmosphere protection			
		Clause 8.41. Un-payment in established terms payment for negative impact on the environment			
		Clause 9.2. Violation of procedures and safety rules of GTS			

Annex 3 – Methodology of the Norwegian – Russian Cleaner Production Education Programmes

The overall objective of the Cleaner Production Programmes is a cost-effective retrofit of industrial enterprises and at the same time improvement of their environmental performance. CP Education Programmes are aimed at improving the profitability of industrial enterprises by continuously reduction of consumption of raw materials, water and energy, reduction of emissions and waste output per unit of output at simultaneous improvement of product quality and increase of working safety.

Thus, CP brings win-win situation of achieving both economical and environmental improvements. Moreover, when it is applied consistently and to all parts of the enterprise (technological process), CP provides the perfect tool for assessment of situation, elaboration of measures, planning of further actions on improvement, that meets the basic requirements of any environmental management system (EMS), consistently supplying EMS with objectives and tasks for its functioning. Hence, CP should always be applied where such management systems as ISO 14001 or EMAS are applied. Main benefits of Cleaner Production are:

- Reduction of costs due to higher efficiency;
- Reduction of waste of utilized materials;
- Increase of productivity and often improve of product;
- Reduction of consumption of water, energy, and raw materials;
- By-products recovery;
- Minimization of problems and expenses on treatment and utilization of waste;
- Minimization of payments for emissions, discharge, and waste disposal.

Four main principles of the Norwegian Cleaner Production Programmes

- Pollution Prevention Pays;
- Beginning of Pipe;
- From Engineer to Engineer;
- Continuously and Gradually.

3 Levels of the Norwegian Programme

- 1 level – Resource Saving
- 2 level – Financial Engineering
- 3 level – Environmental Management

Training in accordance with the Norwegian model of the Cleaner Production Programme is carried out during 4-8 months, with off-job training during 11 working days. The curriculum consists of three sessions of three days each. The fourth session is two days long and includes consultation on the prepared graduation report and diploma awarding ceremony. Twice between first and second, and second and third sessions, the CP teachers make company visits providing individual consultations for every participant. Specialists of various professions previously successfully trained on the Programme are invited to participate in the CP training as teachers and advisers. Each group of participants consists of 20-30 people, each one representing a working group consisting of 2-4 specialists from the participating companies, thus ensuring dissemination of the methodology to about 100 people. In this way, the Programme's principle "From Engineer to Engineer" is pursued.

Participants of the Programme are provided with a Training Manual, which contains a summary, in the form of abstracts of: history and background of the methodology, general guidance for carrying out of the work, order of planning and organization, the elements of the technical assessment,

including assessment of resource use efficiency, use of chemicals, energy, including the principles of material balance. The Manual provides criteria for selection of ideas, from “pollution prevention at source” to “land-filling”, based on their technical, environmental and economical feasibility, including indicators of profitability, net present value (NPV), internal rate of return of projects.

5 stages of the Norwegian CP Education Programmes

1. Problem Formulation.

At the stage of Problem Formulation it is necessary to analyze the current situation of the company (size, volume of production, organizational structure), to find out where are problems with the environment, whether the environmental authorities are satisfied, whether consumers are satisfied with its products, whether the employees are satisfied with the working conditions, and what is necessary to do? Basing on the analysis of the process flow chart identification of place of use of materials, energy resources and their losses are determined; sources of pollution, where the formation of waste and emissions/discharge occurs are determined as well. Problems are formulating.

2. Planning and Organization

The main objectives of this stage are: obtaining the consent of the company's management, goals setting for the Programme, and organization of the working group that includes specialists of those directions that are needed to solve the determined goals. The managers issue an Order on the formation of the working group, in which it may be determined objectives and provided the necessary instructions to other divisions of the company for assistance to the working group members in obtaining of necessary information. The participant of the Programme – the working group leader, introduces to the members of the group the CP methodology, organizes the group's work to address the determined goals. The working group conducts the preliminary evaluation of selected problems, shapes a plan of further activities and allocates duties.

3. CP Assessment

At this stage of the Programme, the participants collect technological parameters of processes, and technical performance data of equipment, choice of evaluation objectives, inspection of production site, analysis of the collected information, and review of the data is conducted. The working group should figure out during inspection of the production site or studying the technological process: where are waste streams formed, in what quantities they are formed, are they permanent or volley, why are they formed, how are they separated from other streams, are they processed at the plant, which costs are associated with these streams, what can be done to prevent formation of or reduce streams. Special attention should be paid to working conditions and workers' safety, existence of effluxes and leaks, utilization of water, presence of heat loss, inefficient use of electricity, efficiency of the main and auxiliary equipment loading, conditions of storage and utilization of raw materials, etc.

Basing on these results a detailed analysis is carried out and basing on evaluation of all material and energy flows and analysis of the data the material balance is compiled. Optimal result is a compilation of the balance for each component. This gives a clear picture of how waste formation within the company occurs, as well as identifies the source and cause of waste flows and emissions.

In the context of limited time and resources to achieve successful implementation of the CP concept the activity of each participant should be focused on a limited number of major problems. Selection from three to five main problems can be made basing on preliminary estimate. If, for instance, an integrated waste stream is selected at the stage of preliminary

evaluation as a priority problem to be solved, the research can only consist of analysis of the main components of the stream.

Development of measures depends largely on the knowledge and creativity of the working group members. Organization of meetings, the so-called "Brainstorming" (creative chaos) and the study of literature on the prevention of waste formation and emissions, are the main methods for the identification of measures (generating ideas) to prevent environmental pollution. After the development of these measures, which can deal with: improvement of the quality of raw materials, improvement of the process, utilization and neutralization of waste and emissions at the site, changing assortment of the products, improving housekeeping, and so on, they are classified in three groups:

- Group A – real ideas which obviously do not require investments;
- Ideas that are obviously unreal and won't be analyzed within the project framework;
- The rest ideas for further examination.

The selected ideas are prioritized in accordance with the following list.

1. Pollution prevention at source;
2. Pollution reduction at source;
3. Recycling;
4. Waste separation and concentration;
5. Waste exchange;
6. Energy / material recovery;
7. Waste incineration / treatment;
8. Ultimate disposal.

4. Pre-feasibility study

The result of CP Assessment is a set of appropriate measures to prevent waste and emissions at priority areas. The next step is to evaluate the possibility of their implementation. Analysis of the possibility of implementation of the proposed measures consists of Environmental assessment, Technical assessment and Economical assessment.

Environmental assessment: how much is the estimated reduction of waste and emissions/discharges; would the project affect the health of neighborhood; how the project affects the suitability to environmental standards and permits.

Technical assessment: whether the project is safe for workers; would it change the quality of products; whether there is free space for new equipment; whether the project affects manufacturing operations, flow of work or working standards; would it require additional workers, whether there is necessary water, heat, and electricity supply available; would the project require stop of the production process; whether the project requires a special expert evaluation; whether the project creates new problems.

Economical assessment during which approximate estimate is made of cost reductions achieved through changes in: raw materials, environmental charges, cost of waste processing, consumption of water and energy, method of operating, maintenance, fixed costs associated with investment loans, training, education and putting in operation. Economical assessment allows to classify projects as follows: (-) Group A: Projects that do not require investments or external funding; (-) Group B: Projects that require external funding in the amount of up to 350,000 USD and have payback period up to three years; (-) Group C: Projects that require large amounts of external funding and/or with a longer payback period.

Further evaluation is given to (-) readiness for implementation: whether there is available necessary equipment, etc.; does the project has been already implemented somewhere else, if so, what are the results and lessons learned; (-) applicability: does the project fit in the enterprise management system; whether the project requires additional changes in other departments; does the project require additional training of personnel.

At the final stage selection of options for the first implementation is made even during the CP training with the best environmental and economic results.

5. Implementation.

At this stage the organization of the project is addressed, information on the composition of project is provided as well as on planning techniques (network graph, histogram, etc.), execution period, procurement of necessary equipment and accessories, financing, etc.

An important factor that allows obtaining high economical and environmental results is the involvement in the training not only environmentalists, but also specialists of the primary production of the company: technologists, mechanics, power engineers, etc. Participants get knowledge and practical experience in analyzing the current state of the production process from the point of view of the CP methodology, including sources of formation of discharges, emissions and waste during the training course. This makes it possible to identify environmental problems at the enterprise in production or technological processes and solve them, preventing formation of air emissions, wastewater discharge and pollutants with them into the water bodies, reducing formation of production waste by implementation, thus, the following principles of the Programme: "Pollution Prevention Pays" and "Beginning of Pipe".

During the CP training participants not only study the CP methods, but also get practical skills for independent technical, economical and environmental assessment of the measures under consideration, material and energy balances calculation, and calculating economic parameters of the project (internal rate of return, payback period, etc.).

Contents of the diploma work, presentation of results.

The result of the training is a Programme participant's Diploma work, which consists of: Group A projects that do not require investments and partially implemented during the course, Group B projects that require investments up to 350 thousand dollars and having a payback period of up to 3 years, and Group C projects for implementation in the future that require significant investments and/or have payback period longer than 3 years.

During preparation of the Diploma work the participants receive a template which contains all the necessary sections and tables and minimizing the time to develop the project following all the requirements of the CP methodology. The structure of the template includes the necessary chapters for the best description of the project, and brief explanation of their content is provided. During preparation of the Diploma work according to the template the participant describes step by step the project development cycle, using the experience gained during fulfillment of the educational tasks during training.

In the "Introduction" section there is a brief description of the company, its organization with indication of unit (shop, production section) for more careful analysis, information about the manufactured products, annual turnover, number of employees, and if the company has any achievements and awards, policies, including in the field of environment.

In the “Problem Formulation” section there is a description of the technological process and the current situation of the analyzed process, process chart is presented to show incoming and outgoing flows (materials, energy, different additives, water). All data represent annual indexes. Basing on the process chart the material, water or energy balance of the process is developed. Basing on the analysis of the technological process and balances presented the problem is formulated, such as: large consumption of heat, electricity, raw materials, water, presence of emissions, discharges, waste generation, etc.

In the “Planning and Organizing” section, the working group's activities at the plant are described in accordance with the methodology, as well as the method of generation of ideas addressing the problems, how many ideas were generated and which of them were subject to more detailed assessment.

After that the detailed assessment, each measure is presented. Technical evaluation includes the description of the actual project, existing situation and after the introduction of new equipment, equipment specification, what is changing in the process: the amount of water, and corresponding sewage, raw materials, heat, air, electricity consumed, waste produced, how much work is required to perform the implementation of the proposal, whether there are necessary resources and communications available. Environmental evaluation includes calculations (performed in the tables) of savings (USD/year) at the expense of environmental savings, i.e. reduction in water consumption, sewage, waste formation, electrical energy consumption, etc., expressed respectively in cubic meters, tons, kWh, etc. And, in the separate table for each measure savings of resources, reduction of emissions and waste on those ingredients, or types of waste, etc., on which the company has set standards and effects payments of a fee for negative impact are presented. Economical evaluation includes detailed calculations of the net annual savings before and after the implementation of measures, taking into account the cost of raw materials, fuel, maintenance costs, and environmental charges and so on.

In the “Project Costs” (Investments) section there is an assessment of expenses (USD), required for the project, including design, procurement of equipment and completion materials, the need for construction works, personnel training, etc.

In the “Economical Parameters of the Project” chapter there are presented the key economic indicators in the summary table, such as: total investments, net savings, payback period, net present value, net present value coefficient, internal rate of return.

The final sections of the template “Implementation” and “Further activities” provide information on what CP measures are already implemented during the training Programme, which measures require additional investments for the implementation, what is planning to do, to implement, and what problems to solve, an assessment of the effectiveness of the CP methodology is presented, etc.

After finishing the work on the project the participants fill the CP Projects Summary – a set of tables where all information on the project is tabulated, including information about the company, the proposed measures for improvement, environmental and economical performances, the required investments, as well as information on the already obtained results after the implementation of measures and planned timeframes for implementation of the projects.

In accordance with the methodology of the Cleaner Production Programme after participant's graduation the project is sent to the management of the enterprise. After reviewing the project the management provides conclusions on practicability of the project and prospects for further work.

Based on the project the participants are preparing a presentation of the project and present it for discussion of group of the participants and company management.

Use of the template for the preparation of projects, allows to successfully complete the project in a step-by-step manner, in accordance with the CP methodology with minimal time consumption by responding to questions in the template and filling in the information in its tables. Unification of the projects can subsequently facilitate the analysis of the proposed measures for improvement.

The template can be used in future by the participants of the Programme for further development of CP projects.

As experience show, a large number of Group A measures can be implemented already during the training process without additional funds. The resulting funds can be released to invest in the implementation of more costly projects, which is an effectiveness mark of one more principle of the Programme: “Continuously and Gradually”. Examples are the measures from the list of completed CP projects at the “Hot Spots”.

Annex 4 – Companies Participants of the Cleaner Production Education Programmes since 2003

Komi Republic

Vorkuta:

1. Open Joint Stock Company for coal mining “Vorkutacoal” (“Vorkutaygol”);
2. Structural units of “Vorkutacoal”:
3. “Zapolarnaja mine”;
4. “Komsomolskaja mine”
5. “Vorkutinskaya mine”
6. Vorkuta Mechanical Plant;
7. “Karjer” Ltd.;
8. “Vorkutacement” Ltd.;
9. “Murego” Ltd.;
10. “Ecology” Ltd.;
11. Municipal unitary enterprise “Vorkuta heat networks”;
12. Municipal unitary enterprise “Vodokanal” of the municipal formation of the urban district “Vorkuta”;
13. Municipal unitary enterprise management company “Centralnoe” (“Central”) of the municipal formation “Vorkuta”;
14. Municipal unitary enterprise on apartment buildings management “Gornjackoe”;
15. Automotive enterprise “Marshrut” (“The route”);
16. Power generating station “Vorkuta heat station-1” of the “TGK-9” daughter company, “Vorkuta heat station 2”;
17. “Severcemremont” Ltd.

Zheshart:

18. Zheshart plywood mill

Syktvykar:

19. Municipal unitary enterprise “Syktvykar Vodokanal”;
20. Housing company “Stroitel” (“The builder”) Ltd.;
21. “Repair and maintenance office for population services” Ltd.;
22. “Heat company” Ltd.;
23. Enterprise “Management of housing communal services (Customer service)”;
24. “Komi housing company” Ltd.;
25. “Gilremont” (“Housing repair”) Ltd.;
26. “Dirnos community services operational office”;
27. “Gorzelenohoz” Ltd.
28. “Chovskaya housing company” Ltd.;
29. “SGKK” Ltd.;
30. “Ecotechnology” Ltd.;
31. “Decon” Ltd.
32. “Gorblagoustroistvo” Ltd.;
33. “TODEZ” Ltd.;
34. “Repairing operational company” Ltd.;
35. “Universal service” Ltd.

Uhta:

36. The Ukhta State Technical University
37. Municipal Unitary Enterprise “Ukhtavodokanal”

38. "LUKOIL – Severnefteprodukt" Ltd.
39. "Neftegaspromtrch" Ltd.
40. Production and Technical Department of Communication in the settlement of Ugor
41. Severnigipgas Ltd.
42. Open Joint Stock Company "Severgeofizika"
43. "Ecoalyans" (the City of Sosnogorsk) Ltd.
44. Heat Power Station (Sosnogorsk)
45. "Planning Work and Building System Department" Ltd.
46. Open Joint Stock Company "Neftechimmontazh – LUKOIL Company"
47. Open Joint Stock Company "Building Metal Structures Plant"
48. Closed Joint Stock Company "The Ukhta Electromechanic Plant"
49. "NK Recher-Komi" Ltd.
50. "Severgasprom" Ltd.
51. Business enterprise "LUKOIL – Ukhtaneftegas"
52. Open Joint Stock Company "Severnnye magistralnye nefteprovody" AK "Transneft"
53. Closed Joint Stock Company "LUKOIL- Trans", the Ukhta Subsidiary
54. Geotechnology" Ltd.
55. The Ecological Centre "Akvilon"
56. "CNPCI" Ltd.

Arkhangelsk Oblast

Arkhangelsk:

57. Municipal enterprise "Vodokanal";
58. Municipal enterprise "Gilkomservis";
59. "Heating system" Ltd.;
60. "Heat system" Ltd.;
61. Open Joint Stock Company "Solombalskiy pulp and paper plant"
62. KCBK BL "Karton";
63. Open Joint Stock Company "Arkhangelsk pulp and paper plant"
64. Closed Joint Stock Company "Lesozavod 25";
65. Open Joint Stock Company "Kuznechevsk plant of building materials and constructions";
66. Open Joint Stock Company "LDK No.3";
67. "Ecopolis" Ltd.
68. Arkhangelsk subsidiary of the Federal State Unitary Enterprise "Rosmorport"
69. Northern State Medical University, Institute of hygiene and medical ecology
70. Municipal Unitary Enterprise "Stigla"
71. "Arkhangelsk EOASPTR" subsidiary of the Federal State Unitary Enterprise "Gabasu"
72. "Arkhangelsk garbage recycling plant" Ltd.
73. Institute of oil and gas;
74. "TORN" Ltd.;
75. Pedagogical State University named after Lomonosov
76. "Arkhangelsk vessel repairing plant";
77. Open Joint Stock Company "Lesozavod No.3";
78. Open Joint Stock Company "Northern shipping company";
79. "Alviz" Ltd.;
80. Housing and communal services and energetic authority;
81. Open Joint Stock Company "Arkhangelsk marine commercial port"
82. Open Joint Stock Company "ATF";
83. Municipal Unitary Enterprise "MKP No.1";
84. MU REP "Varvarino-Faktoria"
85. RTC "Isakogorskiy" Ltd.
86. MU REC "Solombalskoe"

87. Administration of Solombalskiy district;
88. Municipal Unitary Enterprise "Arkhangelsk boilers enterprise";
89. Municipal Unitary Enterprise "GKP-4"
90. MU "City hall management service";
91. Municipal Unitary Enterprise "MGKP-9"
92. Municipal Unitary Enterprise "MGKP-6"
93. Municipal Unitary Enterprise "Gilkomservice", "Oktiabrskoye" department
94. Municipal Unitary Enterprise "Gorsvet";
95. Municipal Unitary Enterprise "City bathhouse";
96. Municipal Unitary Enterprise "Spectrest for population service";
97. MUREP "Mayskaya gorka"
98. Municipal Unitary Enterprise "Municipal emergency-repairing enterprise"
99. City hall of Arkhangelsk:
100. Commercial and population service department;
101. Building and major repair department;
102. Economy department
103. Housing and communal services department
104. Roads and bridges management department
105. Transport and communication department
106. MU REP "Lomonosovskoe";
107. Municipal Unitary Enterprise "Arkhangelsk service on energy audit"
108. Municipal Unitary Enterprise "Speocautoservice for territory maintenance"
109. MUP MGKP No.7
110. Municipal Unitary Enterprise "Arhkomhoz";
111. Administration of Lomonosovskiy district
112. MKP No.3 sewage treatment system
113. Municipal Unitary Enterprise "Center of public services"
114. Municipal institution of the public health "Municipal hospital No.6"
115. Municipal institution of the public health "Municipal hospital No.7"
116. Emergency repairing enterprise
117. Municipal educational institute "Informational and methodological center"
118. MUP AMTTP
119. "ZNV remstroy" Ltd.
120. MU "Experimental rehabilitation center for children with disabilities"
121. "Decom" Ltd.
122. MU "Public rehabilitation center for youth "Dria"
123. MOU "SOS No.45"

Severodvinsk:

124. NIPTB "Onega";
125. Severodvinsk subsidiary of the Open Joint Stock Company "Arkhangelskoblgas";
126. FSUE "Sevmash";
127. FSUE "Northern production union "Arktika";
128. SMUP "Specavtohozaistvo";
129. Severodvinsk heat station-1;
130. Open Joint Stock Company "Severodvinsk bread-baking plant";
131. SMUP Housing and communal service "Gorvik"
132. SMUP "PGKO Jagri"
133. FSUE "Northern road";
134. Severodvinsk administration, ecology and nature management department

Kotlas:

135. Open Joint Stock Company "Kotlass pulp and paper plant"

- 136. BL "Lesohimya"
- 137. BL "Cellulose";
- 138. BL "Energetics";

City of Kargopol:

- 139. Administration of the municipal formation "Kargopol municipal district";
- 140. "Kargopol heating systems" Ltd. ;
- 141. "Kargopol vodokanal" Ltd.;

Konoshskiy municipal district:

- 142. Administration of the municipal formation "Konoshskiy municipal district";

City of Nyandoma:

- 143. OGU "State environmental inspection in Arkhangelsk oblast"
- 144. Open Joint Stock Company "Shalushskiy lesozavod"
- 145. "Heatenergetic" Ltd.
- 146. Municipal enterprise "Vodokanal" of municipal formation Njandom district;

Karelia Republic:

Petrozavodsk:

- 147. Community facilities (Vodokanal);
- 148. Municipal institution "Centralized accounting department No.1" of the education administration;
- 149. "Municipal children clinic No.1";
- 150. "Onega stevedoring company" Ltd.;
- 151. Municipal institution of the public health "Municipal children's hospital";
- 152. Municipal institution of public health "Maternity hospital named after Gutkin";
- 153. Petrozavodsk municipal unitary enterprise on laundry services;
- 154. Division of consumer protection of Petrozavodsk urban district administration;
- 155. Municipal institution of the public health "Municipal clinic No. 3";
- 156. Municipal educational institution "School No. 43 specialized in learning of some subjects";
- 157. Municipal institution of public health "Children's dental clinic";
- 158. Municipal institution "Economic-operational service";
- 159. Municipal institution of public health "Ambulance hospital of Petrozavodsk";
- 160. Petrozavodsk urban district administration municipal institution of the public health "Municipal clinic No.1".
- 161. Open Joint Stock Company "PKS" "Proneghskiy" filial;
- 162. Open Joint Stock Company "Petrozavodsk community systems", subsidiary company in Petrozavodsk
- 163. Closed Joint Stock Company "Holod Slavmo"
- 164. Information legal fund "Nevond";
- 165. "AEK" Ltd.
- 166. Petrozavodsk State University;
- 167. Open Joint Stock Company "Suojarvskiy bread-baking plant";
- 168. Open Joint Stock Company "Pitkyarantskiy bread-baking plant";
- 169. Closed Joint Stock Building Company "VEK";
- 170. Open Joint Stock Company "Pudojskiy bread-baking plant";
- 171. Open Joint Stock Company "Petrozavodsk "Sampo";
- 172. Petrozavodsk KEC
- 173. FGU "SAS Karelsakaya"
- 174. Open Joint Stock Company shipyard "Avangard"
- 175. Open Joint Stock Company "Mechanization-4 administration"

176. Closed Joint Stock Company "N-invest"
177. Open Joint Stock Company "LORI"
178. FGU "Karelia institute PPKK APK"
179. Petrozavodsk oil storage depot Closed Joint Stock Company "Ecotec-Rosika"
180. "PEROSET" Ltd.
181. Closed Joint Stock Company "Belomoro-Onega shipping company"
182. Administration of Petrozavodsk urban district
183. MU DSC "Podrostok"
184. MU "CRSU"
185. MU CB №2
186. Karelia subsidiary of St. Petersburg "Environmental enterprise "Mercury" Ltd.
187. MUP "City building bureau"
188. PMUP "Autospectrans"
189. Open Joint Stock Company "Trolleybus department"
190. PMUSP "Memorial"
191. Municipal institution of the public health "Municipal clinic No. 2";
192. Municipal institution of the public health "Municipal clinic No. 5";
193. FGU Petrozavodsk leshoz
194. Forest management agency in Karelia Republic
195. Petrozavodsk building college
196. Sole proprietorship Zikin
197. PMUP "GDEU-plus"
198. PMUP «Electrical system"
199. PMUP "Heat system"
200. Forest Institute, Karelia Science Center, RAS
201. Civil defense and emergency situation department of the Petrozavodsk administration

Kondopoga:

202. MMP Housing and Communal services
203. Open Joint Stock Company "Production plant of house building"
204. Kondopoga administration, environment protection department

Lahdenpohja settlement:

205. "Vozrozhdenie" Ltd.;
206. Administration of Kurkiek settlement;
207. Municipal Unitary Enterprise "Water of Lahdenpoye";
208. Municipal Unitary Enterprise "Housing and communal services management company";
209. Municipal Unitary Enterprise "Teploresurs";
210. GU RK "Lahdenpohskiy leshoz";
211. Open Joint Stock Company "Lahdenpohskiy lespromhoz"
212. GOU NPO RK PU-9 College No.9;
213. Municipal Unitary Enterprise "GES";
214. Central City Library;
215. Administration of the Elisenvaer settlement;
216. Municipal Unitary Enterprise "Teplogarant";
217. Rosselkhoznadzor Karelian Republic department;
218. GIMS MCS of RF;
219. Lahdenpoh school No.1;
220. Municipal Unitary Enterprise "Housing maintenance service of Elisenvaar settlement";
221. Municipal Unitary Enterprise "Housing operational service of Laxdenpoh";
222. MUK "House of culture"
223. Municipal Unitary Enterprise "Management company"
224. Lahdenpoh gas section

- 225. Municipal Unitary Enterprise “Kurkiekskoe housing and communal service”;
- 226. Closed Joint Stock Company “Lahdenpoh bread-baking plant”;

Nadvoici:

- 227. “Nadvoici aluminium plant” subdivision of the “SUAL” (Siberian-Urals Aluminium Company)

Murmansk oblast

- 228. “Pechenganikel” plant (City of Zapolyarniy);
- 229. FSUE ship repairing plant “Nerpa” (City of Sneghnogorsk)
- 230. Open Joint Stock Company “Kola GMK”
- 231. FSUE “Atomflot” (City of Murmansk);
- 232. Northern fleet;
- 233. FSUE SevRAO (City of Murmansk);
- 234. “Gefest” Ltd.;
- 235. Open Joint Stock Company “Murmansk Shipping Company” (City of Murmansk)
- 236. Open Joint Stock Company “Murmansk ship repairing plant MF”;
- 237. FSUE “82 Shipping repairing plant” (City of Murmansk)
- 238. “Eco cross” Ltd. (City of Murmansk);
- 239. “Protein” Ltd. (City of Murmansk)
- 240. Closed Joint Stock Company “Arcticoil” (City of Murmansk)

Annex 5 – Summary of Cleaner Production Education Programmes Performed since 2003

Environmental Hot Spot			Company/ Organization	Duration	Nr. of trainees	Nr. of projects			Savings	Inv-ents	Environmental Improvements*						
№	Environ-al impact	Location, Group number				A*	B*	C*	x10 ³ , USD	x10 ³ ,USD	Wastage minimization			Reduction of Resources Use			
											Emissions	Waste- water	Solid waste	Water	El.	Heat	Tons of oil equivalent
											x10 ³ ,USD	x10 ³ ,USD	x10 ³ ,USD	x10 ³ M ³	x10 ³ , kWh	x10 ³ , kWh	t.o.e.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
M3-1, M3-2	Emissions of acidifying compounds and dust, organic matter and salts discharge	Murmansk, group 59A	JSC “Apatite”	10.02 - 03.03	28	54	28	12	11979	5887,2	2,7	13487	-	14249	757	6917	1655
M3-1, M3-2		Murmansk, group 60B	JSC “Apatite”	10.02 - 04.03	24	65	25	17	11020	51218	19	10779	0,27	10769	17, 7	592594	87174
A1-1, A1-2	Emissions of specific contaminants, waste water discharge	Archangels k, group 61	Solombala PPM, HPP-1,2 Kotlas PPM	19.02 - 04. 03	23	39	34	10	13411	21538	5,2	1392.8	59,8	2039,3	858,5	51205	40508
K3-3	Poor quality of drinking water	Karelia, Sortavala, group 68	Companies from the District	09.03 - 02.04	17	35	26	14	689	1971,7	0,632	-	-	148,4	2308,7	-	938

A1-2, A6	Waste water discharge, solid toxic waste	Archangelsk, group 71	Housing and public services (HPS)	01.04 - 06.04	24	51	29	16	4024	10134	0,544	3156.0	3,5	4273	7690,5	385	430
K42	Emissions of pollutants, discharge of waste water	Karelia, Kondopoga, group 73	Kondopoga PPM	03.04 - 06. 04	17	30	24	20	847,5	2113,5	0,086	20,9	-	1200	3723,3	-	54
M1 (M32)	SO2 emissions, discharge of salt waste water	Murmansk, group 74	JSC "KMMC "Severonickel"	06.04 - 12. 04	14	50	29	5	5260,8	4374,8	0,52	1296,1	0,275	667.7	5844,7	11252	960
A1-2, A6	Discharge of waste water, solid toxic waste	Archangelsk, group 76	HPS	11.04 - 05. 05	22	47	33	13	1134,4	9409,7	0,292	6046,6	2,4	541,1	22709,2	1644,5	7916
A4-1, A4-2	Specific compounds emissions, discharge of waste water	Archangelsk Oblast, Novodvinsk, group 78	Archangelsk PPM	02.05 - 06. 05	18	24	23	8	6617,1	10965	0,595	19406	83,5	19856.2	2569	-	-
K5	Pollution of Onega lake, poor work of waste water treatment facilities	Karelia, Petrozavodsk, group 79	Petrozavodsk, HPS	04.05 - 07.05	12	22	15	18	688,6	5527,8	0,367	-	29,8	31,1	41,8	861771	1633

A5-2	Discharge of waste water, suspended solids, incl. lignosulfonates	Archangelsk Oblast, Koryazhma group 81, financed by ACAP	JSC "Kotlas PPM"	09.06 - 02.07	12	21	20	7	5955	7595	-	10755.0	283,9	12649	2148	227400	-
Ko7	Large amount of timber waste are landfilled	Komi, Zheshart, group 84	Zheshart plywood plant	11.05 - 06.06	20	38	39	8	10499	12758	0,26	1863	59,5	1826	1051,9	76569	4364
M1 (M32)	SO2 emissions, discharge of salt waste water	Murmansk Oblast, Zapolyarny. group 85	JSC "KMMC "Petchenga nickel"	0.06.06	15	20	7	4	45480	20960	0,013	3059,1	-	1550	2190	2190	-
K2	Fluor containing emissions, discharge of waste water	Karelia, Nadvoitsy, group 86	Nadvoitsy Aluminum Smelter	2006	15	16	17	3	2899,3	14113	3,48	-	4,7	393,3	157,7	-	-
A4-1, A4-2, A6	Specific compounds emission, discharge of waste water	Archangelsk Oblast, Novodvinsk, group 88	Archangelsk PPM	12.06 - 04.07	22	49	33	15	9700	26500	0.01	700	75,1	2270.0	7000	85400	1101

Ko6	Dumping grounds of industrial and household waste pollute ground waters	Komi, Syktyvkar, group 89	HPS	03–06. 2007	20	48	33	2	1340	7900	-	5770	0,38	5490	3690	390	2680
K5	Pollution of Onega lake, poor work of waste water treatment facilities	Karelia, Lahdenpohja, group 90	HPS	03–06. 2007	15	21	15	2	301,5	301,7	0,128	5,6	-	165,5	395	4128000	2834
K4	Poor water quality in water supply network	Karelia, Petrozavodsk, group 91	Communal Systems (Vodokanal)	10.07-03.08	18	19	9	23	4500	4400	0,26	220	6,25	11920	18300	-	499
Ko1, Ko8, Ko2-2	Emissions of acidifying compounds, methane, coal mines waste	Komi, Vorkuta, group 92	Vorkutaugol, HPS, transport companies, HPP	11.07 - 05.08	18	18	31	4	5700	6000	21,6	350	33,26	405	8730	16300	-
A3	Emissions of SO2 and dust	Archangelsk Oblast, Severodvinsk, group 93	HPS, waste	12.07 - 04.08	20	43	35	14	4280	7620	9,85	34,1	70	913,4	1960	464	1747

A1-2, A6	Waste water discharge, solid toxic waste	Archangelsk Oblast, Nyandoma, group 96	HPS	2009	11	19	19	7	1400	2600	0,067	334,4	4,36	290,6	737	1105	2008
Ko2-1, Ko2-2	Emissions of acidifying compounds and dust	Komi, Vorkuta, group 97	Cement Plant	12.08 - 04.09	18	16	26	5	8075	12300	8,9	99,3	-	328,3	247,3	92,3	52372
Total:					403	745	550	227	155801	246187	74	63471	717	69182	93110	6063679	208873

* The table in its column 'Environmental Improvements' does not comprise data on minimization of some specific types of solid wastes, waste water and chemicals

Annex 6 –Cleaner Production Projects implemented at the ‘Hot Spots’

Hot Spot Description			Implemented CP projects							
N o	Project No “Hot Spot”, name of company	Environmental and human health problems	Group No, Date, Participant name	Name of the project	Description of the project	Environmental effect	Savings, (USD/yr)	Invest. (USD), Payback period (yr)	Implemen- -tation	Conclusion on the implemented projects
1	2	3		4	5	6	7	8	9	10
	Murmansk Oblast									
1	M32(2) JSC MMC “Norilsk Nickel” JSC Kola MMC “Severonickel” combined smelter, Monchegorsk	The second largest emitter of air pollutants, particularly SO ₂ . Reduction of SO ₂ emissions and waste water discharges	Group 74 Murmansk 06-12 2004 Vasilissa Baranovskaya Engineer, Environment department +(7) 81536 79152	Optimization of converter process stage	Optimization of converter process stage reached by reduction of reload stops of oxygen- vertical converters KVK-30	Reduction of pollution emissions through aeration lantern by 3.5 %	1 276	-	2005	According to the Table 1.2 of AMAP Report total emissions in Monchegorsk was 58.1 thou. tons, including SO ₂ emissions – 43 900 tons Implementation of these measures led to reduction of total pollutants emission into atmosphere through aeration lantern by 3,5 %, and SO ₂ emission by 8.7 %, that does not allow to make a decision on exclusion of this “hot spot” from the list. Besides, it is necessary to clarify the actual ELV for the emissions and actual volume of emissions as of 01.01.2010 to be able to judge on the current state of the ‘Hot Spot’.
2			-//-	Modification of control algorithm of suction valves # 3, 4, 5 of fume exhausters No 10, 11, 12 of oxygen- vertical converters KVK-30	Modification of control algorithm of opening of suction valves and increase in vacuum in dust collar at initial stage of melting process	Reduction of pollution emissions and increase in SO2 utilization by 8.7 %	3 195	-	2005	
	Republic of Karelia									
3	K1(11)	Kondopoga PPM	Group 34	Replacement of	To implement the	(-) Fresh water consumption	65 4671	-		According to the Table

	JSC "Kondopoga" (Kondopoga PPM), Kondopoga town	is responsible for 18% of total industrial air emissions in Karelia. It is the only large polluter in the Republic, which emissions increased since 1995.	09.1999 – 01. 2000 Ms. Olga Vinnik Chief, Laboratory of Pulp plant	primary water delivered to the basin with washed cellulose with circulated water	project it is necessary to install a pipe of 100 mm in diameter and 3 m in length. Circulated water will be supplied by gravity through this pipe in amount of 100 m3 per hour	reduction by 868 800 m3/year; (-) Reduction of sewage water by 868 800 m3/year; (-) Reduction of pulp losses with sewage by 23.8 t/year.			2000	2.7 of AMAP Report total volume of sewage of Kondopoga PPM in 2002 was 53.6 mil.m3. Reduction of consumed volume of primary water and corresponding reduction of sewage resulted from the project by 1.12 mil.m3 equal to 2.3 % total reduction does not allow to make a decision on exclusion of this "hot spot" from the list. Additional information regarding volume of sewage of Kondopoga PPM itself is necessary to obtain.
4		K42. Kondopoga PPM, waste water treatment and gas and dust emissions.	-/-	Reduction of internal specific water consumption per ton of the pulp	The measure does not require investments and is possible from the technological point of view (according to laboratory data)	(-) Reduction of primary water consumption by 255 427 m3/year; (-) Sewage reduction by 255 427 m3/year; (-) Reduction of pulp losses by 7 t/year	19 246	-	2000	
Archangelsk Oblast										
5	A1 (21) JSC Solombala pulp and paper mill (SPPM), Archangelsk	Air emission is almost 20% of total in Archangelsk, all air pollution with specific contaminates and dust originates from SPPM A47: Solombala pulp and paper mill in Archangelsk. Reduction of waste water	Group 61 Archangelsk 09.2002 – 03.2003 Mr. Aleksey Kotcov Engineer-technologist, HPP - 2 +7(8182)230525	Modification of operation of soda-regenerating water heaters SRK-1 and SRK-2	Development of technological flow-charts of SRK-1 and SRK-2. Development of process regulations for SRK-1.	(-) Reduction of gas-dust emissions by 321.88 t/year (77.7%), (-) Including reduction of CO emissions by 319.31 t/year ; And reduction of NO _x emissions by 2.57 t/year	440	-	2003	According to the Table 3.7 of AMAP Report total emissions of SPPM was 10,415 tons in 2002, including dust in amount of 5,083 t, SO ₂ – 3,381 t, CO – 1,081 t, NO _x - 867 t. Implementation of the projects resulted in total emissions reduction of dust SO ₂ –56 t (1.7 %), CO by 409.1 t (37.8 %), NO _x by 262.87 t (30.3 %). Total reduction of

		discharges and gas emissions								emissions was 727.97 t (less than 7%), and does not allow to make a decision on exclusion of this "hot spot" from the list. It is necessary to specify emission data of SPPM and authorized for it MP
6		Air emission is almost 20% of total in Archangelsk, all air pollution with specific contaminants and dust originates from SPPM A47: Solombala pulp and paper mill in Archangelsk. Reduction of waste water discharges and gas emissions	Group 61 Archangelsk 09.2002 – 03.2003 Mr. Vladimir Koshelev, Shift master, Lime carbonate regeneration shop +7(8182) 23-05-25	Oxidizing of white liquor sludge with oxygen from atmosphere	Oxidizing of white liquor sludge with oxygen from atmosphere occurs in sludge storage tanks.	Reduction of gas-dust emissions by 426.2 t/year, including reduction of CO emissions by 89.8 t/year; (-) Reduction of SO ₂ emissions by 56.0 t/year; (-) Reduction of NO _x emissions by 260.3 t/year; (-) Reduction of mercaptan CH ₃ SH emissions by 11.2 t/year; (-) Reduction of H ₂ S emissions by 8.9 t/year.	61 410	26 550 0,43	2003	
7	A4-2(24) JSC "Archangelsk pulp and paper mill", the city of Novodvinsk	APPM is the largest discharger of waste waters in the Oblast (32%). Being located upstream Archangelsk in its vicinity creates permanent environmental and health hazard for the city.	Group 78 Novodvinsk 02.2005 – 06.2005 Ms.Elena Shikova, Acting Shift master, Biological treatment shop +7(81852) 6-34-09	Transfer of the 2 nd stage of bio treatment from 25% to 50% regeneration	When «Cardboard» and «Cellulose» productions are stopped the 1st stage of biological treatment becomes out of work. Transfer of regeneration of biological sludge in aerotanks of the 2nd stage from 25% to 50% results in	(-) Reduction in BOD (total) in treated water by 28.8 tons/year, (30%); (-) Reduction in COD (total) in treated water by 201.6 tons/year (35%); (-) Reduction in suspended solids by 144 tons/year (70%)	34 255	-	2005	Data listed in the Tables 3.9 and 3.10 of the AMAP Report do not allow to make a correct assessment of the effectiveness of the project. However, the proposed measures do not allow to transfer the whole volume of waste water of APPM, 142 mil.m3, containing also specific pollutants, such as: turpentine, methanol,

		Reduction of discharges of insufficiently treated waste waters from APPM.			termination of negative impact of peak loads to biological sludge.					formaldehyde, lignosulphonate, to the category of clean water. It is necessary to obtain additional information on capacity of sewage treatment plant and its efficiency, authorized quality norms.
8	A5-2(25) JSC Kotlas pulp and paper mill (KPPM), the city of Koryazhma	KPPM is the largest waste water discharger in the Oblast (almost 50%) Reduction of organic and suspended matter discharges with KPPM waste waters.	Group 81 Koryazhma 09.2006-02.2007 Mr. Nikolay Golovko, Chief technologist, Station for bio-l treatment of industrial sewage	Utilization of circulated water to cool down of packings of mud pumps in pumping stations No 2 and 3 at sludge catchers and dewatering site	Replacement of mechanically purified water for cooling down of packings of mud pumps and for floors cleaning to circulated water from machine hall No 2.	(-) Reduction of mechanically purified water by 96 360 m3/year; (-) Reduction of waste water by 96 360 m3/year	2 350	-	2007	According to the Table 3.10 in 2002 KPPM discharged 9.6 mil.m3 of sewage without treatment and insufficiently purified sewage in amount of 184.9 mil.m3. Implementation of the project results in reduction of sewage by 869.8 thou.m3 totally that equals to 0.4 % of total discharge, thus not allowing to solve this environmental problem completely and, correspondingly, not allowing to exclude this "hot spot" from the list. Besides, it is necessary to clarify what is described as "fresh filtrated water"? Drinking quality water or secondary used technological water? Of what quality is insufficiently treated water? How much the concentrations of
9	A5-2(25) JSC Kotlas pulp and paper mill (KPPM), Business Line "White Paper", the city of Koryazhma		Group 81 Koryazhma 09. 2006- 02. 2007 Ms. Olga Vereschagina, Chief of section of purification, bleaching of chemicals, and pulp catching	Utilization of filtrate from hypochlorite and chlorine dioxide bleaching at the end jets of vacuum filters No 4 and 5 of the previous stage of washing	Utilization of filtrate from hypochlorite and chlorine dioxide bleaching at the end jets of vacuum filters No 4 and 5 previous stage of washing leads to savings in fresh water consumption and sewage reduction.	(-) Filtered water consumption reduction – 213 000 m3/year (-) Reduction of waste water - 213 000 m3/year (5.4 %)	26 091	-	2007	
10	A5-2(25) JSC Kotlas pulp and paper mill (KPPM), Business		-/-	Utilization of filtrate from bleaching stages for dilution of pulp in storage tank of MSA	To deliver pulp after vacuum filters there are pumping units, which are pumping pulp of	Filtered water consumption reduction – 144 840 m3/year	17 472	-	2007	

	Line "White Paper", the city of Koryazhma	Reduction of organic and suspended matter discharges with KPPM waste waters.		pumps before those stages	medium concentration. Thus, the pulp is diluting in the storage tank with fresh water to the required concentration. Utilization of filtrate instead of fresh water leads to reduction of consumption of fresh water and reduce volume of waste water.	Reduction of waste water - 144 840 m3/year (3.6 %)				pollutants increase the approved ELV/MAC? What is the capacity of the water treatment plant and methods used (mechanical, biological, physicochemical,...)?
11	A5-2(25) JSC Kotlas pulp and paper mill (KPPM), Business Line "White Paper", the city of Koryazhma	KPPM is the largest waste water discharger in the Oblast (almost 50%) Reduction of organic and suspended matter discharges with KPPM waste waters.	Group 81 Koryazhma 09. 2006- 02. 2007 Ms. Olga Vereschagina, Chief of section of purification, bleaching of chemicals, and pulp catching	Utilization of circulated water from paper making machines No 5 and 6 for preparation of chalk suspension	In the section of chemicals preparation to produce chalk suspension they use fresh water. Replacement of fresh water to circulated water from paper making machines results in reduction of fresh water consumption and of waste water production.	(-) Filtered water consumption reduction – 138 593 m3/year; (-) Reduction of waste water - 138 593 m3/year (3,6 %)	16 977	-	2007	
12	A5-2 (25) JSC Kotlas pulp and paper mill (KPPM), Business	KPPM is the largest waste water discharger in the Oblast (almost 50%)	Group 81 Koryazhma 09. 2006- 02. 2007	Warm water delivery from yeast reactor No 6 to circulated water tank	Resulted in reducing volume of warm water in industrial canalization. Does	Reduction of waste water - 248 000 m3/year (100 %)	16 120	-	2008	

	Line "Cellulose", the city of Koryazhma	Reduction of organic and suspended matter discharges with KPPM waste waters.	Mr. Igor Ludanov, Chief of section of biochemical treatment +7 (81850) 4-52-71		not require additional costs to existing budget for maintenance.					
13	A5-2(25) JSC Kotlas pulp and paper mill (KPPM), the city of Koryazhma	KPPM is the largest waste water discharger in the Oblast (almost 50%) Reduction of organic and suspended matter discharges with KPPM waste waters.	Group 81 Koryazhma 09. 2006- 02. 2007 Mr. O.Startsev Chief Technologist, Chemi- cals Production. +7 (81850) 4-53-38 4-59-33	Secondary utilization of water after heat exchangers of chlorate electrolyzers of salt dissolving unit	Works can be fulfilled within maintenance budget	(-) Reduction of mechanically purified water – 32 022 m3/year (4.5%) (-) Reduction of waste water - 32 022 m3/year (4.5%)	9 319	-	2007	
14	26(6) JSC Kotlas pulp and paper mill (KPPM), the city of Koryazhma	Toxic solid waste in Arkhangelsk Oblast.	Group 81 Koryazhma 09. 2006- 02. 2007 Mr. Sergey Kolpakov, Engineer on Environment Protection +7(81850) 3-04-34 3-33-27	Remediation of liquor remover by industrial waste	Liquor remover since 1961 till 1988 was used as buffer capacity for sulfite liquors before their supply to biological treatment facilities Since 1995 the territory of the liquor remover is used for storage of solid industrial waste and dewatered sewage sludge The project intends to remediate the site.	(-) Reduction of amount of 4 th grade of danger waste for disposal – 37 600 t; (-) Reduction of amount of 5 th grade of danger waste for disposal – 110 634 t	369 200	368 365 1.0	2007	Basing on data from Chapter 3.3.6, Table 3.11 of the AMAP Report a conclusion can be made that this project temporarily allows during the period of conducting remediation (filling by industrial waste) of liquor remover to reduce amount of KPPM solid waste disposal. However, this project does not allow to exclude the "hot spot" from the list.

15	A53(26) JSC "Archangelsk Garbage Processing Plant" Ltd.	Municipal waste management in the cities of Archangel and Severomorsk	Group 88 Archangelsk 11.2006-04.2007 Mr. Mikhail Orlov Assistant to Director +7(8182) 29-74-46	Introduction of bulk transportation of solid waste in the cities of Severodvinsk and Novodvinsk.	The measure utilize free capacity of existing garbage sorting unit which results in reduction of waste for disposal.	Reduction of amount of waste for disposal - 33 960 m3/year (56.6%)	98 204	-	2007	The project allows to reduce volume of solid waste formation in the cities of Severodvinsk and Novodvinsk. However, the measures proposed do not solve the problem as a whole and do not allow at current stage to exclude the "hot spot" from the list basing on the given information.
Komi Republic										
16	Ko1(35) JSC "VorkutaCoal"	Coal industry is one of the most significant contributors to greenhouse gas emissions to the atmosphere. Coal-mining industry has emitted into the atmosphere 74.2% of total methane, emitted in the Republic of Komi.	Group 92 Vorkuta 11.2007-05.2008 Mr. Nickolay Popov, Chief, Environmental dept. JSC "Vorkutacoal" +7 (82151) 7-09-67	Development of a technique of calculation volume of methane emissions	This technique affords to increase effectiveness of work of the personnel, working with methane	Reduction of methane emissions by 9 097 t/year (5.3 %)	58 586	-	2008	In the Table 5.5 of the AMAP Report there are no data on methane emissions by coal mines of Vorkuta. The proposed project allows to put in order methane emissions calculations, but does not allow to reduce amount of emissions. The "hot spot" can't be excluded from the list at current stage .
17	Ko2-2(36) "Vorkuta Heat and Power Plant -1" – branch of JSC	A number of enterprises in Vorkuta city emit large amounts of contaminants to	Group 92 Vorkuta 11.2007-	Reduction of emission of contaminants during adverse weather	Proposed measures are of organizational and technical origin, they do not	(-) Reduction of ash emissions – 118.2 t/year; (-) Reduction of sulfur oxides	515	-	2008	The measures proposed allow to decrease negative impact of industrial emissions within

	"Territory Generating Company No9" "Vorkuta Heat and Power Plant -2"	the atmosphere. Proposed project - Reduction of emission of acidity substances from "Vorkuta Heat and Power Plant -1".	05.2008 Ms. Irina Sprogis Leading engineer of environment protection, Industrial Technological Department +7 (82151) 9-45-27	conditions	require additional expenses and do not reduce productivity.	emission – 58.6 t/year; (-) Reduction of nitrogen oxides emission - 12.5 t/year; (-) Reduction of carbon oxide emission – 12.5 t/year. Total reduction of emissions – 189.6 t/year (by 10%)				lands allotted for settlement during adverse weather conditions, however, does not solve the problem by reducing emissions, including at "the beginning of pipe". Implementation of this project does not allow to exclude the "hot spot" from the list.
1 8	"Vorkuta Heat and Power Plant -1" – branch of JSC "Territory Generating Company No9" "Vorkuta Heat and Power Plant -2"	Formation of industrial and domestic wastes. 11.0 million tons of industrial and domestic wastes including 3.5 million tons of toxic waste are formed Komi annually. Only 1.2% of wastes are utilized.	Group 92 Vorkuta 11.2007-05.2008 Ms. Irina Sprogis Leading engineer of environment protection, Industrial Technological Department +7 (82151) 9-45-27	Experimental determination of grade of Toxicity and Danger of ash aiming to confirm the 5 th grade of danger.	Confirmation of the 5 th grade of danger for ash.	To increase ecological attractiveness of ash for its future utilization (for instance, as additive to cement or to reduce spontaneous firing of solid municipal waste at landfill). Reduction of payments for waste disposal as a result.	348 195.	8 000	2008	Confirmation of the 5 th grade of danger (practically non-danger) for ash waste of Vorkuta Heat and Power Plant -1 with further utilization does not allow to solve the waste formation problem. According to the AMAP Report there are 590.7 thou.tons of waste from electricity production which equals to about 4.5% of total amount of waste formed. The "hot spot" could not be excluded from the list..

Annex 7 –Cleaner Production Projects Developed at the ‘Hot Spots’

N o	Project No Environmental “Hot Spot”, name of company	Environmental and human health problems	Group No, Date, Participant name	Name of the project	Description of the project	Environmental effect	Savings, (USD/y)	Invest. (USD), Payback (yr)	Implemen- -tation	Conclusion on the projects
1	2	3	4	5	6	7	8	9	10	11
Murmansk Oblast										
1	M32(2) JSC MMC “Norilsk Nickel” JSC Kola MMC “Severonickel” combined smelter, Monchegorsk	The second largest emitter of air pollutants, particularly SO ₂ . M32. “Severonickel” combined smelter, Monchegorsk. Reduction of SO ₂ emissions and waste water discharges.	Group 74 Murmansk 06-12.2004 Ms. Vasilissa Baranovskaya Engineer, Environment department +7 (81536) 7-91-52	Installation of aspiration suction unit with over blow on oxygen-vertical converters KVK-30	Two air supply side attachments and slotted nozzle of upper over blow are mounted	Reduction of pollution emissions through aeration lantern by 49.5 %	18 345	34 490 1,9	Planned in 2006	Sealing of connection of gas flues of oxygen- vertical converters KVK- 30 by means of soft asbestos sealer and implementation of aspiration suction unit with over blow on KVK- 30 will result in: - significant reduction of fugitive emissions in the working zone and consequent emissions of

2			-/-	Sealing of gas flues of retractable and stationary gas flues connection	To seal the gas flues connection to prevent gas emissions it is proposed soft asbestos seal	Reduction of pollution emissions and increase in SO ₂ utilization grade by 9.5 %	3 485	780 0,22	Planned in 2005	untreated gases into atmosphere; - effect emissions into atmosphere of additionally caught gases through gas treatment; - increase grade of utilization of SO ₂ , -improve of environment in the city of Monchegorsk
Republic of Karelia										
3	K2(12) JSC "SUAL", "Nadvoitsy aluminium smelter"	Gas emissions of Nadvoitsy aluminium smelter. The plant is responsible for 97% of total air emissions in Nadvoitsy. Emissions from the plant, particularly of fluorine compounds, create significant human health problems.	Group 86 Nadvoitsy 02.2006-07.2006 Mr. D.Barminov Master of Anode Supply, Aluminum Electrolysis Shop No 1 Mr. V.Sergeev, Shift Master, Aluminum Electrolysis Shop No 1 +7 (81431) 6-23-32	Construction of gas cleaning station	Dry gas cleaning has high effectiveness of cleaning of all components (HF - 99.76%; dust - 98.8%; tarry matter – 99%; benzapyrene – 99.4%), Besides sulfur compounds (SO ₂ - 60.3%). For sulfur compounds catching wet gas cleaning remains in the technological scheme where sulfur dioxide adsorption occurs by soda liquor.	(-)Reduction of emissions: SO ₂ – by 111.19 t/year (by 59.9%);(-) CO – by 1152.25 t/year (by 99.8%);(-) HF – by 140.4 t/year (by 98.9%); (-) Solid fluorides - by 238.29 t/year (by 98.9%);(-) tarry matter – by 492.62 t/year (by 99%);(-) inorganic dust – by 882.88 t/year (by 99%);(-)benzapyrene – by 0.59 t/year (by 98.3%); Total: by 3018 t/year (by 97%).	813 401	9 016 666 11,09		In the Table 2.5 of the NEFCO/AMAP Report information regarding emissions of specific substances of Nadvoitsy aluminium smelter is presented as of 2002. Comparison of the data from the Report and calculated data of the project, basing on indicators for 2005 shows that implementation will enable, including other conducted in the plant work, reduce emissions of SO ₂ by 93%, CO – by 99.9%; HF – by 99.5%; Solid fluorides - by 99.5%

4	K3(13) Municipal Unitary Enterprise "Water-Sort", Sortavala	In many towns and settlements drinking water quality does not correspond to chemical and microbiological sanitary and epidemiological guidelines. Poor water quality presents serious threat to human health. K3-3 Improvement of drinking water supply in the city of Sortavala.	Group 68 Sortavala 09.2003 –02.2004 Ms. S.Dolgaya Chief of Section; Ms. E.Guba Engineer, Planning Technological department +7(81430) 4-03-44	Unit for initial water chlorination to reduce color prior to coagulation	To install the ADVANCE-200 chlorination unit with remote control at the water inlet at Tohmajoki river	(-)Improvement of color of water by 30 degrees. (-) Reduction of consumption of chemicals as follows: $Al_2(SO_4)_3$ by 10 t/year ; Na_2CO_3 by 7 t/year .(-) Reduction of electricity consumption by 99 865 kWh/year	6 500	2 070 0,32	Planned in 2004	Implementation of the project will improve quality of tap water, reduce reagents consumption, reduce electricity consumption and volume of waste formation after water purification.
5	K4(14) JSC "Petrozavodsk Communal Systems"	Poor water quality in water supply network of Petrozavodsk The city is supplied with water from Onega lake, with water quality that does not meet the existing guidelines. The existing treatment facilities do not allow to get the required water quality, particularly on chemical parameters	Group 91 Petrozavodsk 10.2007-04.2008 Ms. V.Loskutova Engineer +7(8142) 78-41-01 Ms. M.Geidarova, Shift master	Replacement of liquid chlorine to sodium hypochlorite	The project stipulates utilization of dry 45% sodium hypochlorite. It is suggested to use 4 existing tanks for coagulant preparation. It is necessary to reconstruct system for air distribution and make hydro insulation of walls. There is space for dosing pumps and storage of chemicals. The reconstruction and installation works are to be done by the company itself.	(-)Reduction of electricity consumption – 75 599 kWh/year. (-) Reduction of water consumption by 212 991 m ³ /year. Improved quality of water treatment.	98 218	25178 0,26 (95 days)		Introduction of sodium hypochlorite is planned to effect within 3 years. The project is developing by JSC Lenvodo-kanalproject Ltd.. Variants of exchange of the decontamination agent (liquid chlorine) to more safe agents, such as sodium hypochlorite or oxidizing solution (AQUACHLOR unit). A comparison of technological and environmental indicators of modernization options for water treatment unit of 44 000 thou. M3/year capacity was made. Implementation of the

6			-/-	Replacement of liquid chlorine by oxidizing solution (AQUACHLOR unit)	In AQUACHLOR-type units there are utilizing positive nature of oxidants, such as chlorine, chlorine dioxide and ozone and negative influence from by-products of chlorination and ozonation is excluded. It is proposed a purchase of 16 modules AQUACHLOR-500 of total capacity 44 000 thou. m ³ /year. The installation will be made by the supplier.	(-) Reduction of water consumption by 145 942 m ³ /year. Reduction of sodium consumption - 112.128 t/year. Reduction of emissions – 39.2 kg/year. (-) Improvements in water treatment quality.	256 468	718105 2,8	Not in the plan yet	project will afford to increase reliability of decontamination, improve purified water quality, and reduce risk of formation of chlorine-organic compounds.
7			Group 91 Petrozavodsk 10.2007-04.2008 Ms. E.Fomkina Engineer-technologist +7(8142)57-12-78	Restart of reagent treatment by aluminum sulphate at water treatment unit in the settlement of Vilga	It is necessary to purchase dosing pump, air blower, coagulant and to start operation of vortex agitator. All work is to be done by self staff.	Reduction of color of treated water by 79.2%	-	4282,97	Planned in fall of 2008	There is a detailed description of the flow chart of water purification and current situation in the project. On the moment of training the water treatment facilities worked with gross violation of the water purification technology. And water quality in the Vilga settlement was not in conformity with Sanitary Norms. It is proposed to install missed equipment, to restore the reagent treatment of water with
8			-/-	Exchange of current coagulant to RAH-18	Exchange of current aluminum sulphate coagulant to RAH-18 coagulant	Reduction of color of treated water by 92%.	-	4718,11	Planned in fall of 2008	
9			-/-	To install and put into operation electrolysis unit	Proposed to install and put into operation	(-) Refuse of chlorine gas in amount of 0.59	303,95	397 1,31	Planned in fall of 2008	

					electrolysis unit EN type. It is of lentic type with graphite electrodes to produce sodium hypochlorite by electrolysis of technical salt solution.	t/year. (-) Reduction of biological indicators to Sanitary requirements. Improving working conditions				simultaneous replacement of the reagent with more effective and modernize the process of water decontamination. The listed measures will afford to provide reliable drinking water supply in conformity with sanitary standards
10	K7 (17) JSC "Petrozavodsk Communal Systems" Heat supply network	Burning of coal and oil in boiler-houses	Group 91 Petrozavodsk 10.2007-04.2008 Ms. N.Shubina Engineer of Industrial-Technical Department +7(8142) 76-70-28 Ms. E. Andrusenko Site master +7(8142) 75-06-22	Boilers transfer from mazut to natural gas	Exchange of equipment not required. But it is necessary to build a gas pipeline by other construction company	(-) Reduction of electricity consumption by 16 200 kWh/year (11%); (-) Total reduction of emissions by 40.91 t/year (92%), including reduction of smut emissions by 0.819 t/year, reduction of sulfur oxides emission by 36.824 t/year, reduction of nitrogen oxides emission by 2.047 t/year, reduction of carbon oxides emission by 1.146 t/year	238 471	349 900 1,5	planned 2010	The project has not been prioritized. Implementation is not planning yet. Environmental and economical estimations of transfer of the boiler-house of 5 150 Gcal capacity from mazut to natural gas are made in the project
11	K8-2(18) JSC "Petrozavodsk Communal Systems"	Hazardous industrial solid waste and communal waste. Almost 1/3 of 206 landfills in Karelia	Group 91 Petrozavodsk 10.2007-04.2008 Ms. I.Varfolomeeva +7(8142) 71-00-24	Construction of sewage sludge incineration plant	It is stipulated that the plant will process 3 000 tons of sludge into 144 tons of ash which can be used later in	Start of operation of the plant will cause close of the landfill.	208 360	410 000 2,1	* Not in the plan yet	Besides described in the work project of sewage incineration plant, it worth to put attention to the descriptions of two other measures:

	Workshop “Sewage Treatment Facilities”	are illegal.	Ms.Y.Kazantseva +7(8142) 71-00-59		road and industrial construction. The combustion of sludge will be effected in pseudo- liquefied layer at temperature of more than 8500 C. Utilization of heat energy for internal use is foreseen by means of turbo generators. Special attention paid to three-step purification of exhaust gases.					-composting of sludge of the sewage water treatment facilities and further its utilization as fertilizer, -thermal drying of the sludge to produce granulated organic- mineral fertilizer, containing nitrogen, phosphorus, and microelements.
Archangelsk Oblast										
12	A1-1(21) JSC Solombala pulp and paper mill (SPPM), Archangelsk	Air emission is almost 20% of total in Arkhangelsk, all air pollution with specific contaminates and dust originates from SPPM A47:Solombala pulp and paper mill in Archangelsk city. Reduction of waste water discharges and gas and dust emissions	Group 61 Archangelsk 10.2002 –03.2003 Mr. A.Kotcov Engineer-technologist HPP – 2 +7(8182) 23-05-25	Erection of 2 nd stage of exhaust gases purification at soda- regenerating water heaters SRK-1 and SRK-2	Scrubber Unit for purification of exhaust gases at soda-regenerating water heaters SRK- 1 and SRK-2 by “Tampella” production	(-) Reduction of gas-dust emissions by 516.754 t/year (by 67.6%), including reduction of SO ₂ emissions by 161.74 t/year; reduction of mercaptane CH ₃ SH emissions by 3.76 t/year;(-) Reduction of H ₂ S emissions by 7.865 t/year; reduction of Na ₂ SO ₄ emissions (losses) by 343.389 t/year.	104 745	1 007 560 9,6	n/d	Not implemented due to lack of own funds Phased implementation of the measures, developed by participants of the Group 61 will reduce gas and dust emissions of JSC SPPM by 4 675 tons per year, which is equal to 45% of the emission data from the Table 3.7 of the NEFCO/AMAP Report 2003.
13			Group 61 Archangelsk	Oxidizing of turbid green liquor sludge	Turbid green liquor sludge after black-	(-) Reduction of gas-dust emissions	16 130	24 9501 1,55	Partially implement	

			10.2002 – 03.2003 Mr. V.Koshelev Shift master, Lime carbonate regeneration shop +7(8182) 23-05-25	with oxygen from atmosphere	ash cake dissolver of soda-regenerating water heater delivered to a special oxidizing unit. The oxidizing degree depends on duration of air bulbs presence in the unit.	by 209.4 t/year, including reduction of CO emissions by 10.1 t/year;(-) Reduction of SO ₂ emissions by 123.6 t/year; reduction of NO _x emissions by 15.6 t/year; (-) Reduction of mercaptane CH ₃ SH emissions by 38.2 t/year; reduction of H ₂ S emissions by 21.9 t/year.			ed	
14			Group 61 Archangelsk 10.2002 – 03.2003 Mr. A.Zaychev Chief Engineer, HPP-2 +7(8182) 23-05-25	Modernization of electrical filters	Specialized company Fingo Engineering Ltd. was contracted for filters modernization. For replacement of the drift transport maintenance service team of the company will be used.	Reduction of Na ₂ SO ₄ emissions (losses) with exhaust gases by 3 949.75 t/year (by 90.8 %)	400220	320 100 0,8	Planned in 2003	
15	A1-2(21) JSC Solombala pulp and paper mill (SPPM), Archangelsk	A47: Solombala pulp and paper mill in Archangelsk city. Reduction of waste water discharges and gas and dust emissions	Group 61 Archangelsk 10.2002 –03.2003 Mr. A.Zaychev Chief Engineer, HPP-2 +7(8182) 23-05-25	Modernization of technical water supply system to soda-regenerating water heater SRK-1	Construction of new equipment is necessary, such as: pipes, valves, regulating valves, automatic control devices.	(-) Reduction of technical water consumption 77 685 m ³ /year (by 38 %);(-) Reduction of waste water effluent by 77 685 m ³ /year.	3 620	1 410 0,4	Planned in 2003	Total effect in result of implementation will result in: - reduction of influent water consumption by 80 000 m ³ /year, -reduction of waste water discharge by 80 000 m ³ /year, -reduction of losses, i.e. return into the process of
16			Group 61 Archangelsk	Prevention of tallous products	It is proposed to settle acid water in	(-) Reduction of waste water by 1	40 500	-	Imple-ted.	

			10.2002 – 03.2003 Mr. A.Uzkij Deputy Chief, Wood-Chemical Shop Mr. A.Begunov Shift master, Wood- Chemical Shop +7(8182)23-48-84 29-96-00-23-04-94	discharge with waste water from tall oil producing unit by settling	existing buffer tank. To pump out surfaced lignin to utilize as fuel at soda-regenerating water boilers of HPP-2	200 m ³ /year (by 11.7 %);(-) Reduction of tall oil loss with waste water by 180 t/year; Reduction of lignin loss with waste water by 1 020 t/year.				2 040 tons/year of lignin -reduction of tall oil losses with waste water in amount of 380 tons per year
17			-/-	Replacement of separators of unit for decomposition of sulphate soap	Erection of two “Alfa-Laval” (Sweden) separators proposed to replace the 2 old separators	(-) Reduction of waste water by 1 220 m ³ /year (12.0 %); (-) Reduction of tall oil loss with waste water by 200 t/year; (-) Reduction of lignin loss with waste water by 1 020 t/year.	43 700	162 200 3,9	Is not planned yet	*
18	A3(23) SU JSC «TGC-2» in Archangelsk oblast, Severodvinsk heat and power plant (HPP) 1	HPPs are responsible for 95% of gas emissions in the city. HPP-1 is the matter of particular concern due to emission of 95% of dust.	Group 93 Severodvinsk 12.2007 - 04.2008 Ms. V.Zueva Leading engineer, Exploitation Service +7 (818) 450 70 48	Exchange of two line pumps 14D6M type to one pump SE-2500-180 type	There are 10 line pumps 14D 6M type and 2 SE-2500-180 pumps at Severodvinsk HPP- 1. It is proposed to install instead of two line pumps 14D6M type one pump of SE-2500- 180 type.	(-)Coal savings by 415 t/year Reduction of ash emission by 9 t/year. (-) Reduction of sulfur oxides emission by 27.4 t/year. (-) Reduction of nitrogen oxides emission by 2.5 t/year	32 532	44800 1,4	Planned in 2009	
19			Group 93 Severodvinsk 12.2007 - 04.2008 Ms. V.Zueva	Reconstruction of feeding high pressure electric pump	There are 6 feeding high pressure electric pumps at Severodvinsk HPP-	(-)Coal economy 282 t/year Reduction of ash emission by	21182	54280 2,6	Planned in 2009	Implementation of the measure on optimization

			Leading engineer, Exploitation Service +7 (818) 450 70 48		1 It is proposed to reconstruct flow tube of a pump into 9-stage.	6.2 t/year Reduction of sulfur oxides emission by 18.0 t/year Reduction of nitrogen oxides emission by 1.7 t/year				of work of HPP-1 will reduce mazut consumption by 698 t/year, reduce emissions by 9 755 t/year, which is equal to 12.9% of total emissions of Severodvinsk HPP-1 according to the NEFCO/AMAP Report 2003 (Table 3.7 – 75.7 thou t/year)
20			Group 93 Severodvinsk 12.2007 - 04.2008 Ms. V.Zueva Leading engineer, Exploitation Service +7 (818) 450 70 48	Replacement of Venturi tubes by circular emulgators	It is suggested to utilize new apparatus of wet cleaning of gases – circular emulgator developed by KOCH company. It is intended for purification of exhaust gases of ash (due to heat and mass exchange between liquid and gas inside rotating foam layer – faze inversion mode) and for partial or deep (if alkali additives are added in to spraying water) neutralization of sulfur oxides. It is made of titanium that makes it work during 20 years.	Ash emissions reduction by 9 690 t/year	481 243	3 636 000 7,6		
21	A4-1(24) JSC Archangelsk pulp and paper mill (APPM),	APPM annual emission is comparable with total emission of	Group 78 Novodvinsk 02.2005 – 06.2005	Combustion of emissions of melt tank in recovery boiler as tertiary	Emissions of melt tank to be directed into recovery boiler to be combusted as	Reduction of solid substances emissions (sodium carbonate and	2 280	6 900 3,0		Not planned, as no claims by authorities.

	Novodvinsk	Archangelsk city. Emissions of specific contaminants and dust are of particular concern. A46: APPM - reduction of waste water discharges and dust emissions	Ms. Y.Konina – Leading Engineer, Env. Department	draft.	tertiary draft. Emissions from melt tank totally excluded. Additionally it is required to purchase and install a fan and 12 m long pipe.	sulfate-sulfite salts of sodium) into atmosphere by 18 t/year				Implementation of the measures developed by the participants of Group 78 during the CP training will result in decrease of:
22			Group 78 Novodvinsk 02.2005 – 06.2005 Ms. Y.Konina – Leading Engineer, Env. Department	Replacement of electric filter of recovery boiler to more effective	It proposed replacement of existing electro filter to more effective one – three-field.	Reduction of solid substances emissions (sodium sulfate) into atmosphere by 542 t/year	203 960	820 000 4,0	Effected as a part of regular maintenance	- chalk consumption by 160 t/year; - glue consumption by 25 t/year; - dust emissions by 560 t/year; - small fiber loss with waste water by 447 t; - primary water consumption by 7 762.7 thou cub m; - waste water discharge by 7 763.0 thou cub m along with the impurities, such as suspended solids by 9 246 t, BOD by 6 518 t. According to the NEFCO/AMAP Report 2003 Table 3.10, discharge of untreated waste water by JSC APPM in 2002 was 4.1 mil cub m, thus implementation of the measures will cancel discharge of untreated waste water.
23	A4-2(24) JSC Archangelsk pulp and paper mill (APPM), Novodvinsk	APPM is the large discharger of waste waters in Oblast (32%). Being located upstream Archangelsk in its vicinity, creates permanent environmental and health hazard for this city. Reduction of discharges of insufficiently treated waste waters from APPM.	Group 78 Novodvinsk 02.2005 –06.2005 Ms. L.Sukhih Deputy chef, Technical Control Department Ms. E.Popova Leading Engineer, Technical Control Department +7(81852)6-35-00 6-32-31	Introduction of new chemical – Silica Gel “Eka T3 442” at the paper producing factory No 1.	To keep small parts of fiber, glue and filling mass it is proposed to introduce new chemical additive - Siliceous agent “Eka T3 442” that increases by 8% fiber and filling mass catching in paper and, correspondingly, reduces suspended solids load in waste water.	(-) Reduction of sludge dumping with waste water by 110 t/year (18 %). (-) Reduction of small fiber in waste water by 477 t/year (0.9%).(-)Reduction of chalk use by 160 t/year (2.4%). (-)Reduction of glue consumption by 25 t/year (10.7%)	191 625	128 4300 0,67	Planned in 2006 but not implemented	
24			-/-	Utilization of circulated water from Paper production factory No1	Circulated water is clarified and then goes to spray of paper making machines. Flotation	(-)Reduction of fresh water consumption by 5 465 m ³ /year (83%). (-)Reduction	392 220	255 000 0,65	Planned in 2006	*Water is used once more, additional measures are not in the

					save-all Aquaflow AFC 9.5x1.3 used for clarification .	in waste water by 5 800 m ³ /year. (-) Reduction of suspended solids in waste water by 980 t/year (1.4%)				plan.
25			Group 78 Novodvinsk 02.2005 – 06.2005 Ms. E. Shikova Acting Shift master +7(81852) 6-34-09	Introduction of process of mineralization	Anaerobic stabilization of sludge of bio treatment provides low values of BOD of sludge water and formation the end-product without smell and with ash-content up to 50%.	Reduction of BOD (total) in treated water by 230 t/year (15%); Reduction of BOD (total) in internal flows by 19.7 t/year (67%); Reduction of COD in treated water by 2 235 t/year (15%); Reduction of COD in internal flows by 447 t/year (50%). Reduction of electricity consumption by 2 630 kWh/year; Reduction of flocculants consumption by 0.045 t/year.	850 410	1 399 360 1,7		Not implemented. Other measures are in consideration.
26			Group 78 Novodvinsk 02.2005 –06.2005 Ms. I.Minets Leading Engineer Env. Department Ms. L.Moseeva Leading Engineer Technology	Local waste water treatment after cardboard making machines CDM-1 and CDM-2.	The idea of the project is to install new local waste water treatment to catch fiber that is used at fibreboard production. Water after treatment will be used one more time at sprinklings of press and net	Reduction of suspended solids in waste water by 3 280 t/year; Reduction of clean water consumption by 6 100 000 m ³ /year (4.2%); Reduction of waste	1 082 320	2 409 850 2.3	Planned in 2005-2009	Included in the Investment Plan for the reconstruction of the cardboard production.

			Department		units and for filling of vacuum pumps of CDM-1 and CDM-2 and for flushing of cones of cleaning system of CDM-1 unit.	water by 6 100 000 m ³ /year (4.2%).				
27			Group 78 Novodvinsk 02.2005 – 06.2005. Ms. I.Osipova Chief Master Sludge Utilization Shop	Transfer of wet sludge from conventionally clean water tank to primary settlers of the 2nd extension of the biology treatment shop.	Transfer of wet sludge from conventionally clean water tank to primary settlers of the 2nd extension of the biology treatment shop.	(-)Reduction of river water consumption by 457 200 m ³ /year (100%);Reduction of waste water by 457 200 m ³ /year (100%);(-) Reduction of suspended solids by 113.9 t/year (16%).	66 765	55 560 0,83	Planned in 2005	The measure implemented within another project.
28			Group 78 Novodvinsk 02.2005 – 06.2005 Ms. I.Osipova Chief Master Sludge Utilization Shop	Installation of step grates on the sludge tanks for preliminary purification process in the dewatering shop.	Installation of step grates will help to remove from the sludge large mechanical impurities that decrease exploitation period of equipment and increase secondary pollution as well.	Decrease of suspended solids on filters by 350.4 t/year (50%)	103 060	277 780 2,7	Planned in 2006	Not implemented.
29			Group 78 Novodvinsk 02.2005 – 06.2005. Mr. S.Kuznetsov Chief technologist Mr. A.Malygin Chief, Timber shop;	Installation of local treatment unit for waste water in timber preparatory shop No 3	As local treatment unit it is proposed to install a RIOTECH grate to purify waste water of gross weighted inclusions and bark that results in	(-)Reduction of clean water consumption by 1 200 000 m ³ /year.(-) Reduction of waste water by 1 200 000 m ³ /year.(-) Reduction of	222 430	125 800 0,6		Not implemented. There are no available technologies at present.

			Mr. V.Kalinin Chief, Timber Preparatory Shop No3 +7 (81852)6-35-00 6-32-31		decrease of pollutants in waste water. Gross inclusions caught by grate are going to TES-3 for combustion.	suspended solids in waste water by 4 000 t/year.(-) Reduction of BOD (total) in treated water by 6 000 t/year. (-)Reduction of COD in treated water by 3 900 t/year. (-) Reduction of sludge by 5 800 t/year.				The measure is implemented within another project.
30			Group 78 Novodvinsk 02.2005 – 06.2005 Ms. E.Ananjina Chemist-Engineer, BioTreatment Shop +7(81852) 6-34-09	Modification of aeration system of aerotank on the 1 st stage of biological treatment	Replacement of existing tube aerators (middle sized drops aeration) by new ones of Ecopolymer design (small sized drops aeration). Total increase in treatment quality will be 15%.	(-) Reduction of BOD (total) in treated water discharge into Severnaya Dvina river by 205 t/year. (-) Reduction of COD in treated water discharge into Severnaya Dvina river by 1 987 t/year. (-) Reduction of electricity consumption by 37 926 170 KWh/year.	90 120	278 570 3,1	Planned in 2006	Not implemented, as there is no necessity after implementation of the 1 stage of reconstruction.
31			-/-	Reconstruction of water intake system of mediate sedimentation tanks of the 1st stage of the biological treatment.	It is planned to introduce polymer bio-contactors with plain-parallel load made by Ecopolymer company onto mediate sedimentation tanks.	(-)Reduction of BOD (total) in treated water discharge into Severnaya Dvina river by 177.7 t/year (13%);(-) Reduction of COD in treated water discharge into	195 530	125 000 0,64	Planned in 2007	Implemented

						Severnaya Dvina river by 1 721 t/year (13%).(-) Reduction of suspended solids in waste water by 872.4 t/year (2%).				
32			Group 78 Novodvinsk 02.2005 – 06.2005. Ms. E.Ananjina Chemist-Engineer, BioTreatment Shop +7(81852) 6-34-09	Introduction of Nalko bioproduct into activated sludge.	To increase effectiveness of biological treatment it is proposed to use bioproduct of Nalko company.	(-) Reduction of BOD (total) in treated water discharge into Severnaya Dvina river by 136 t/year (10%);(-)Reduction of COD in treated water discharge into Severnaya Dvina river by 1 325 t/year (10%).	7 251	23 000	Planned in 2007	
33	A5-2(25) JSC Kotlas pulp and paper mill (KPPM), the city of Koryazhma	Reduction of organic and suspended matter discharges with KPPM waste waters. KPPM is the largest waste water discharger in Oblast (almost 50%) Discharge of large amounts of organic and suspended matter strongly impacts aquatic ecosystem. Significant increase of lignosulphonates is of particular	Group 81 Koryazhma 09.2006-02.2007 Mr. N.Golovko Chief technologist Biological Treatment of Waste Water Station +7(81850)3-47-14 5-91-22	Delivery of flocculant to preliminary sedimentation tanks of 1-2 stages.	Delivery of flocculant to preliminary sedimentation tanks for more effective sedimentation of organics, containing in waste water.	(-)Reduction of suspended solids in waste water by 2 180 t/year.(-) Reduction of BOD (total) in treated water discharge into Vychegda river by 316.4 t/year (5.7%)	89 340	62 000 0.7	Planned in 2007	Not implemented Implementation of all developed measures by participants of Group 81 during training will result in decrease of: - water consumption by 10 479.4 thou cub m, - waste water discharge by 10 317.7 thou cub m, - and impurities in them, such as suspended solids in amount of 2 180.9 t, BOD – 316.4 t,- fiber losses with waste water by 9 936 t/year. According to the NEFCO/AMAP Report

		concern.								
34			-/-	Utilization of attached microflora during waste water treatment.	Utilization of plastic packings covered with bio film (attached microflora). The packings are in intensive turbulence environment. Content of organic compounds and toxic substances in waste water decreases.	(-)Reduction of suspended solids in waste water by 2 242.6 t/year (44.4 %).(-) Reduction of BOD (total) in treated water discharge into Vychevda river by 2 747 t/year (49.5 %).(-) Reduction of filtered water use by 263 500 m ³ /year (29.8 %)	1 309 100	1 610 000 1,2		2003, Table 3.10 discharge of untreated waste water at KPPM in 2002 was 9 600 thou cub m, hence, implementation of the measures will result in cancellation of untreated water discharge.
35			Group 81 Koryazhma 09.2006-02.2007 Mr. N.Volov Chief Technologist Energo-Technological Station +7(81850) 4-57-74	Delivery of mechanically treated water after oil coolers of turbogenerators to circulated water station	It requires purchase and installation of pipeline	(-)Reduction of mechanically treated water consumption by 518 400 m ³ /year.(-) Reduction of waste water by 518 400 m ³ /year.	45 100	4 940 0,11	Planned in 2007	
36			-/-	Installation of control valves on pipelines with mechanically treated water of heat exchangers for cooling oil of fluid couplings of smoke exhausters SRK-5 of the boiler shop TES-2.	To implement the project investments needed to purchase and install valves and materials	(-)Reduction of mechanically treated water consumption by 712 280 m ³ /year.(-) Reduction of waste water by 712 280 m ³ /year	6 200	9 960 1,1	Planned in 2007	

37			<p>Group 81 Koryazhma</p> <p>09.2006-02.2007</p> <p>Mr. I.Ladanov Chief, Section of Bio- Chemical Treatment, Business-line "Cellulose"</p> <p>+7 (81850)4-52-71</p>	Utilization of mechanically treated water instead of filtrated water in heat exchangers in section for utilization of hexose sugars	It requires purchase and installation of pipeline	(-)Reduction of filtered water consumption by 259 200 m ³ /year (100 %).(-) Reduction of waste water by 129 600 m ³ /year (50 %)	17 370	4 000 0.23	Planned in 2008	
38			<p>Group 81 Koryazhma</p> <p>09.2006-02.2007</p> <p>Mr. I.Ladanov Chief, Section of Bio- Chemical Treatment, Business-line "Cellulose"</p> <p>+7 (81850) 4-52-71</p>	Modification of air supply scheme in yeast production unit No 4	Modification of air supply scheme in yeast production unit No 4 resulted in reduction of temperature of yeast suspension inside the unit and, hence, reduce water consumption by 10 m3 per hour utilizing as cooling agent.	(-)Reduction of mechanically treated water consumption by 64 800 m ³ /year (25%). (-) Reduction of waste water by 64 800 m ³ /year (25 %)	5 640	3 750 0.66	Planned in 2008	
39			<p>Group 81 Koryazhma</p> <p>09.2006-02.2007</p> <p>Mr. D.Politsyn Leading Engineer, Cardboard Business Line</p> <p>+7 (921)946-46-80</p>	Construction of local treatment system for waste water at Cardboard business-line	Project work, purchase, and construction of local treatment system for waste water at Cardboard business-line	Reduction of water consumption by 8 247 700 m ³ /year (46.7%).(-) Reduction of waste water by 8 247 700 m ³ /year (46.7 %) (-)Reduction of fiber losses by 9 936 t/year (93.3%)	2 205 785	2 202 750 1.0		
40			<p>Group 81 Koryazhma</p> <p>09.2006-02.2007</p>	Return of cooling water after heat exchangers of	It requires purchase and installation of	Reduction of mechanically treated water	52 315	5 604 0.11	Planned in 2008	

			Mr. O.Startsev Chief technologist, Chemical reagents production shop +7 (81850) 4-53-38 4-59-33	chlorate electrolysers to the circulated water station	pipeline	consumption by 677 026 m ³ /year (88.5%).(-) Reduction of waste water by 645 004 m ³ /year (93.0 %)				
41	A6(26) JSC "Archangelsk Garbage Recycling Plant" limited	A53: Municipal waste management in the cities of Archangelsk and Severodvinsk	Group 88 Novodvinsk 11.2006-04.2007 Mr. M.Orlov Assistant to Director +7(8182) 29-74-46	Introduction of technological line for PET bottles treatment	PET bottles, construction plastics (ABS, PS, PM) will be treated to produce PET flocs	Utilization of PET bottles in amount of 4 000 t/year	527 900	1 950 000 3.7		Participants of the Group 88 proposed and made economical and environment calculations for measures for used tyres and PET bottles within the working enterprise – JSC "Archangelsk Garbage Recycling Plant" limited
42			Group 88 Novodvinsk 11.2006- 04.2007 Ms. N. Pomazkina Engineer-ecologist +7(8182)29-74-46	Introduction of technological line for used tyres treatment	Ozone Knife Technology. Utilizing ozone to destruct rubber and results in separating rubber from reinforcing elements without mechanical cutting, producing pure rubber particles with high surface activity.	Utilization of used tyres in amount of 4 000 t/year	527 900	2 300 000 4.4		
43	(26) Federal State Health Protection Entity Central Medical Unit No 58, Severodvinsk	Toxic solid wastes in Archangelsk Oblast. A53:Municipal waste management in the cities of Archangelsk and Severodvinsk	Group 88 Novodvinsk 11.2006-04.2007 Ms. O. Antsiferova Docent, Hygiene and Medical Ecology Institute, Northern	Treatment of medical waste from Severodvinsk at Archangelsk Garbage Recycling Plant	Requires purchase of additional containers for collecting and storage of medical waste in every structural branch of given medical unit	Reduction of medical waste landfilling by 240 t/year (95.6 %)	13 878	2 760 0.2	Planned in 2008	It is proposed to solve the problem of collection and utilization of used oils in the Archangelsk Oblast by means of boiler-utilizator on the site of JSC "Archangelsk Garbage Recycling Plant" limited. The

			State Medical University +7(81852)4-25-51							generated at combustion heat will be used for heating of the plant buildings.
44			-/-	Creation of special city service for transportation of medical waste of Severodvinsk with its further thermal destruction	To purchase plasma unit for medical waste destruction	Reduction of medical waste landfilling by 800 t/year (100%)	48 230	465 000 9.6		
45	(26) Small Unitary Enterprise "Flora Design", Landfill for solid municipal waste, Novodvinsk	Toxic solid wastes in Archangelsk Oblast.	Group 88 Novodvinsk 11.2006 - 04.2007 Ms. L.Sokolova Chief Teacher, Hygiene and Medical Ecology Institute, Northern State Medical University +7(81852)4-25-51 4-58-54	Treatment of solid municipal waste from Novodvinsk at Archangelsk Garbage Recycling Plant with introduction of separate collection of waste.	To realize the project it is necessary to purchase and install 411 standard containers, to raise awareness of the population, to sign a contract with the Plant for transportation and utilization of waste.	Reduction of land filling of the waste by 5 271 t/year , including: solid municipal waste by 3 637 t/year (40%) - industrial waste by 1 634.0 t/year (40%)	88 476 (without savings from reduction in ecoduties to the city budget in amount of 171 086 USD/year)	58 236 0.66		
46			-/-	Arranging collection and treatment of bulk waste	To realize the project it is necessary to purchase and install 411 standard containers	Reduction of landfilling of the waste by 686 t/year (40 %)	76304 (without savings from reduction in eco-duties to the city budget in amount of 22 278 USD/year)	150 000 1.96		
47			Group 88	Project work and	It is proposed to	(-)Reduction of	800 000	2 190 000		

			Novodvinsk 11.2006 - 04.2007 Ms. L.Sokolova Chief Teacher, Hygiene and Medical Ecology Institute, Northern State Medical University +7(81852) 4-25-51 4-58-54	construction of waste treatment facility in Novodvinsk	purchase mechanical line for sorting and pressing of waste for recycling, to construct processing building and storage for temporary waste collecting	landfilling of the municipal waste by 3 637 t/year (40%). (-)Reduction of landfilling of the industrial waste by 1 634 t/year (40%).(-)Reduction of landfilling of the bulky waste by 686 t/year (40%).		2.7		
48	A6(26) Kargopol Municipal District Municipal Administration	Toxic solid wastes in Archangelsk Oblast.	Group 96 Nyandoma 11.2008 – 03.2009 Ms. T.Popova Leading Specialist (881841)21408	Installation of waste containers of two different colors	Production and installation of waste containers of green color for waste to be utilized through treatment and of grey color for mixed waste.	Reduction of solid municipal waste for landfilling by 250 t/year	11 250	28 800 2.6		Step-by-step implementation of the proposed projects will allow to arrange separate waste collection, storage, and further treatment at waste separation complex. This will result in reduction of solid municipal waste landfilling by 3 900 t/year
49			-/-	Purchase of waste separating complex	The waste separating complex will include press unit to reduce volume of municipal solid waste to be landfilled	Reduction of solid municipal waste for landfilling by 3 900 t/year	175 500	520 000 3.0		
50	A8(28) JSC "Archangelsk Garbage Recycling Plant" limited	Development of the used motor oil management. Since 1995, spent motor oil is not collected and treated in Oblast, and became a serious source of environmental pollution.	Group 88 Novodvinsk 11.2006-04.2007 Ms. N. Pomazkina Engineer ecologist, Environmental Safety Department +7(8182) 29-74-46	Introduction of boiler for used oil combustion	Replacement of water heating boilers utilizing diesel oil as fuel with boiler utilizing used motor oil as fuel.	Utilization of used motor oil from enterprises and companies of Archangelsk – 80 t/year	25 910	24 600 0.95	Planned in 2007	It is proposed to solve the problem of collection and utilization of used oils in the Archangelsk Oblast by means of boiler-utilizator on the site of JSC "Archangelsk Garbage Recycling Plant" limited. The generated at combustion heat will be used for heating of the plant

										buildings.
Komi Republic										
51	Ko1(35) JSC "VorkutaCoal"	Coal industry is one of the most significant contributors to greenhouse gas emissions to the atmosphere. Coal-mining industry has emitted into the atmosphere 74.2% of total methane, emitted in the Republic of Komi in 2002.	Group 92 Vorkuta 11.2007-05.2008 Mr. N.Popov Chief Ecologist, Chief, Environmental Department, JSC "VorkutaCoal" +7 (82151) 7-09-67	Prevention of methane emissions, captured by vacuum-pumping station No3 of "Vorkutinskaya" mine.	Introduction of micro turbo generator CAPSTON C65 in the boiler house of Vorkutinskaya mine. The C65 generator utilize methane now emitted to the atmosphere as it is not suitable for existing boiler due to low concentrations of methane. C65 besides utilization of methane generates electricity	Prevention of methane emissions by 6 720.0 t/year	50 390,16	44 500 0.88	Planned in 2009	According to the NEFCO/AMAP Report 2003, Table 5.5 emissions of carbohydrates including methane of Vorkutinskaya mine are 43 151 t/year. Implementation of the proposed project will cancel methane emissions totally and reduce total emissions by 14.5%.
52			-/-	Prevention of methane emissions, captured by vacuum-pumping station "South" of "Komsomolskaya" mine	Prevention of methane emissions, captured by vacuum-pumping station "South" of "Komsomolskaya" mine with introduction of gas-	Prevention of methane emissions by 5 240.0 t/year	828 403.7	2025 000 2.77		According to the NEFCO/AMAP Report 2003, Table 5.5 emissions of carbohydrates including methane of Komsomolskaya Mine are 50 544.9 t/year. Implementation of the

					piston electric station DEUTZ TCG 2020K					proposed project will cancel methane emissions totally and reduce total emissions by 10.4%.
53	Ko2-1(36) JSC "VorkutaCement" Limited	Reduction of dust emissions by Vorkuta Cement Plant.	Group 97 Vorkuta 12.2008 – 04.2009 Ms.Zh.Savchenko, Laboratory Analytic	Preparation of raw mix with liquidifying agents	Intensification of calcinations process by adding a special liquidifying agent, which leads to reduce of coal consumption and reduce fly ash. It is necessary to conduct industrial tests to choose the proper agent.	(-)Reduction of coal consumption by 5 000 t/year;(-) Reduction of fly ash by 15 102 t/year (576 t/year-9%)	181 829	161151 0.9		According to the NEFCO/AMAP Report 2003, Table 5.5 dust emissions of JSC Vorkuta Cement Plant Ltd. are 11 304 t/year. Implementation of the projects proposed by participants of Group 97 will stop dust emissions and gradually increase effectiveness of raw materials utilization.
54	Ko2-1(36) JSC "VorkutaCement" Limited	High air contamination in the city of Vorkuta. Reduction of dust emissions by Vorkuta Cement Plant.	Group 97 Vorkuta 12.2008 – 04.2009 Mr. N.Kovalchuk, Technical Director (82151)2-56-57	Installation of system to return fly ash back to kiln	It is necessary to purchase and erect pneumo-screw type pump, screw compressor, pipe network, starting, control, and measurement apparatuses, to return fly ash caught by electro filter.	(-) Reduction of electricity consumption by 367 920.0 kWh/year (2.7%).(-) Reduction of coal consumption by 2 278.0 t/year (4%).(-)Reduction of raw material use by 22 776.0 t/year (7.8%), (-) Reduction of primary water consumption by 13 140.0 m ³ /year (8.1%).(-)Reduction of CO ₂ emissions by 6 924 t/year; SO ₂ -36.4 t/year, NO _x -10.2 t/year.		200 000 0.33	Planned in 2009	

55			-/-	Reconstruction of heat exchangers	It is necessary to conduct tests in chain zone of kiln, make calculations of chain heat exchangers, purchase new chains of required type, mount them on the kiln according to new mounting scheme.	(-)Reduction of electricity consumption by 115 300.0 kWh/year (0,9%).(-) Reduction of coal consumption by 1 402 t/year(2.5%).(-) Reduction of raw material use by 2 562 t/year (09%).(-) Reduction of primary water consumption by 1 577 m3/year.(-) Reduction of CO ₂ emissions by 4 262 t/year; SO ₂ -22.4 t/year, NO _x -6.3 t/year.	153 349	200 000 1.33	Planned in 2010	According to the NEFCO/AMAP Report 2003, Table 5.5 dust emissions of JSC Vorkuta Cement Plant Ltd. are 1 733.1 t/year. Implementation of the proposed project will cancel gas emissions by
56	Ko6 JSC "VorkutaCement" Limited	Development of waste utilization system. 11.0 million tons of industrial and domestic wastes including 3.5 million tons of toxic waste are formed Komi annually. The dumping grounds of industrial and domestic wastes are pollution sources for ground waters and surface water bodies, from	Group 97 Vorkuta 12.2008 – 04.2009 Ms. L.Isakova Environmental Engineer (82151) 2-56-57	Equipment for tyres delivery into kiln	It is necessary to fulfill the project, purchase the required equipment for preparation and delivery of tyres into kiln. Heat generation ability of tyres increases that of coal by 25%, steel cord of the tyres will reduce ferrous additions.	Reduction of coal consumption by 13 191.0 t/year by combustion of 5 659 tons of used tires, leading to waste landfilling reduction.	475 913	350 000 0.75	Planned in 2009	Participants of Group 97 propose a number of projects, allowing to reduce coal consumption by used oil combustion, used tyres, waste of 4-5 grade of danger, thus, to reduce volume of landfilled waste.

		which water intake of potable water is carried out.								
57	Ko6 JSC "VorkutaCement" Limited	Development of waste utilization system. 11.0 million tons of industrial and domestic wastes including 3.5 million tons of toxic waste are formed Komi annually. The dumping grounds of industrial and domestic wastes are pollution sources for ground waters and surface water bodies, from which water intake of potable water is carried out.	Group 97 Vorkuta 12.2008 – 04.2009 Mr. M.Kostin Master of main production (82151) 2-56-57	Installation of equipment for preparation for combustion of waste of 4-5 grade of danger	Development of methodology for combustion, its coordination in proper manner. Purchase of rotary cylinder LAITEX R13/50 mill	(-)Reduction of coal consumption by 2 725 t/year,(-) Reduction of waste formation by 3 100 t/year	85 500	200 000 2.3		
58			Group 97 Vorkuta 12.2008 – 04.2009 Ms. L.Isakova Environmental Engineer (82151)2-56-57	Installation of boiler on used oil	Installation of boiler for utilization of used oil for heat production for internal use at plant	Reduction of coal consumption by 226 t/year (100%) on behalf of combustion of 89 tons of used oil	10 194	27 000	Planned in 2010	
59	Ko7(41) Closed JSC	Wastes of timber and pulp and paper industries	Group 84 Zheshart	Utilization of fiber waste of fiberboard production at wood	Utilization of distinct types of fiber waste in	Reduction in landfilling of solid waste by 5 600	100 065	82 500 0.8		Chipboard production stopped due to economic ineffectiveness. Hence,

	"Zheshart Plywood Factory"		11.2005 – 05.2006 Mr. V.Efimov Leading Researcher, Scientific Industrial Laboratory +7(82134)4-71-75 ext.528, 616	chipboard production	middle layer of chipboard.	m ³ /year (15%)				the project has not realized yet.
60			Group 84 Zheshart 11.2005 – 05.2006 Mr. A.Lopatin Chief, Scientific Industrial Laboratory +7(82134) 4-73-23, ext 212	Clogging of wood waste for further utilization	It is proposed to produce blocks of wood waste without chemical additives by high pressure pressing by UBO Zhasko press.	Reduction of landfilling of wood waste by 40 000 m ³ /year	613 300	90 000 0.15	Planned in 2006	Project is not implemented due to finance situation.
61				Introduction of thermo-oil boiler on solid waste fuel	Thermo-oil boiler made by BERSEY company with capacity of 7 Gcal will be used for heat supply of dryer of FEZER company and for heating of the shop. Thermo-oil boiler will be able to utilize waste from whole plywood production.	Reduction of wood waste landfilling by 47 500 m ³ /year	468 000	980 000 2.1	Planned in 2007	Project is actual, but not implemented due to lack of own financial resources. Participants of the Group 84 proposed a number of projects to utilize separate types of fiber waste in chipboard production, wood waste for blocks production free of chemicals, plywood waste to be combusted in thermo-oil boiler house to produce heat. Thus, 101 500 m ³ of wood waste will be utilized.

62			<p>Group 84 Zheshart</p> <p>11.2005 – 05.2006 Mr. A.Maslov Technologist, Technological Department +7(82134)4-71-75 (ext.2-45)</p>	Modernization of wood waste furnaces to use saw dust as fuel.	Fuel exchange from wood waste which can be used in cardboard production (in the middle layer) to saw dust, which goes to landfill	<p>(-)Reduction of saw dust landfilling by 8 400 dense m³/year. (-) Reduction of ash and slag disposal at the landfill by 365 m³/year.(-) Reduction of water consumption by 19 710 m³/year</p>	135 500	200 700 1.48	Planned in 2006-2007	*Project is in implementation phase.
63	<p>Ko8(42) JSC "VorkutaCoal" JV "Vorkutinskaya Mine"</p>	Numerous coal-mining wastes disposed near mines are the sources of land and atmospheric contamination and pose threat for human health	<p>Group 92 Vorkuta 11.2007-05. 2008 Ms. E.Bushueva Assistant to Chief Engineer on Ecology +7 (82151) 5-93-15 fax 7-30 30 (Mr.V.Kozachenko)</p>	Secondary use of tailings	It is proposed to install equipment for production of bricks made of small parts and dust of coal, thus transferring them from low grade fuel to high consumer value. Sludge, breeze extraction and oil-and-tar binding substance are used as raw material in 55:37:8 ratio.	Secondary use of tailings (coal waste) by 33 120 t/year.	1 142 778	596 000 0.5		There is a proposal and made economical and environmental calculations for coal bricks production from tailing (coal waste) in the project.

Annex 8 – List of the companies surveyed

Murmansk region:		
No.	Companies	Representatives
1	OOO PolarPharm	D. Rybakov, Director
2	OAO Murmansk Heat and Power Plant	P. Shmidt, Chief Engineer; T. Fedorovich, Engineer
3	OAO Apatity Heat and Power Plant	A. Sobakin, Chief Engineer; G. Smirnov, Head of the Industrial Engineering Department; M. Ermolenko, Engineer
4	OAO Murmansk Fish Factory	M. Zub, Director
5	OOO Protein	A. Samokhval, Director
Republic of Karelia:		
1	Subdivision of OAO Petrozavodsk Communal Systems - Vodokanal	M. Pchelov, Director; V. Ostapchuk, Head of the Industrial Engineering Department
2	Subdivision of OAO Petrozavodsk Communal Systems - Heating Systems	S. Prilutsky, Director
3	Subdivision of OAO Petrozavodsk Communal Systems – Power Supply Systems	G. Smirnova, Engineer; L. Sidorova, Engineer; P. Prebashevsky, Head of the Industrial Engineering Department
4	ZAO Petrozavodskmash	V. Museichuk, Chief Engineer
5	OOO Ryboprodukty	A. Kondratuk, Chief Engineer
Republic of Komi:		
1	ZAO Zheshartsky Plywood Manufacturing Plant	Z. Troshina, Chief Ecologist; V. Mitronina, Head of the Environmental Monitoring Department
2	OOO Syktyvkar Plywood Manufacturing Factory	A. Lelekov, Deputy Chief Engineer; G. Sivkova, Environmental Engineer
3	OOO Vorkutacement	A. Lomako, General Director
4	MUE Vodokanal, Syktyvkar	A. Fomin, deputy chief of planned economic department
5	OOO Gorzelenhoz	O. Novosyelova, economic manager
Arkhangelsk Region:		
1	OAO Arkhangelak Pulp and Paper Mill	S. Ulanov, Deputy Chief Engineer T. Soboleva, Chief of Environment

		Department
2	ОАО Solombala Pulp and Paper Mill	T. Drobeshkina, Chief of Environment Department
3	ОАО Shipping Center Svezdochka	S. Tsikov, Chief Ecologist
4	ОАО Sevmash	V. Ivanov, Chief of HSE Department
5	ООО Ekoprom, Severodvinsk	J. Djyachenko, Director

Annex 9 – List of organisations surveyed

Murmansk Region:		
No	Companies	Representatives
1	Committee of environmental management and ecology of the Murmansk Oblast	<ul style="list-style-type: none"> • A. Smirnov, head of the Committee • S. Ivkin, specialist in the environmental protection department • E. Makarova, head of the environmental protection department
2	Rosprirodnadzor of the Murmansk Oblast	M. Hruckiy, head of Rosprirodnadzor of the Murmansk Oblast
3	Rostehnadzor of the Murmansk Oblast	S. Gonchar, head of the department of normalization in the sphere of environmental protection
4	CP advisors in Murmansk	S. Zhavoronkin D. Ribakov
Republic of Karelia:		
1	Ministry of environmental resources of the Republic of Karelia	V. Markov, deputy minister M. Orlov, minister
2	Ministry of agriculture, fishery and ecology of the Republic of Karelia	I. Kipruhin, specialist of the environmental protection department
3	Administration of the City of Petrozavodsk	L. Mladenova, head of environmental department
4	CP advisor in Petrozavodsk	A. Potapov
Republic of Komi:		
1	Ministry of Natural Resources and Environmental Protection of Republic of Komi	<ul style="list-style-type: none"> • M. Nekipelova, Minister • E. Izjurov, Head of Environment Protection and Legal Support Department • T. Tyupenko, Head of International Programme Implementation Department • L. Sedyakina, Head of Environment Safety Department
Arkhangelsk Region:		
1	Agency on Natural Resources and Environment of the Arkhangelsk region	<ul style="list-style-type: none"> • I. Shabalin, Head • M. Sukhanevich, Vice-Head
2	CP organization of the Arkhangelsk Region	<ul style="list-style-type: none"> • V. Kuznetsov, Head, CP advisor •
Moscow		
1	IFC Cleaner Production Programme	• Yana Gorbatenko, head of the Programme

		<ul style="list-style-type: none"> • Kristina Turilova, deputy head of the Programme
2	Moscow Cleanr Production and Sustainable Development Centre	<ul style="list-style-type: none"> • Yan Cygankov, director
		Ukraine
1	Energy Centre at Sumy University	<ul style="list-style-type: none"> • D.Laznenko, Head
2	Kiev Cleaner Technology Centre	<ul style="list-style-type: none"> • S.Schevchenko, technical expert
		Norway
1	Ministry of Environment	<ul style="list-style-type: none"> • Senior advisers: Ingrid Andersen Lillehagen, Ingrid Bertinussen, Anne Berteig , Jan Thompson
2	The Norwegian Fridtjof Nansen Institute	<ul style="list-style-type: none"> • Lars Rowe, senior advisor
3	TEKNA, the Norwegian Association of Chartered Engineers	<ul style="list-style-type: none"> • Bjørn Borgaas, department head
4	Norsk Energi	<ul style="list-style-type: none"> • Kjell Olav Nerland, head of environmental department

Annex 10 – Example of Environmental Authorities Response

Rosprirodnadzor – Murmansk Oblast:

A. Вопросы для идентификации препятствий для осуществления ЧП

		да/ нет	рекомен дации
	<i>Политические / национальные</i>		
1.	Незрелость общей структуры политики в области окружающей среды	да	
2.	Действия по принуждению к исполнению являются слишком слабыми и не оказывают реального давления на предприятия	нет	
3.	Власти имеют тенденцию одобрять методы контроля за загрязнением как стандарт при выполнении требований и норм	да	
4.	Доминирование в промышленности контроля над выбросами, что затрудняет упрочнение позиций ЧП	да	
5.	Отсутствие или недостаток специальных стимулов для внедрения ЧП (например, налоговых льгот, и т.п.)	да	
6.	Слишком узкая интерпретация или недопонимание концепции ЧП	да	
7.	Недостаточная фокусировка на ЧП в стратегиях развития промышленности и торговли	да	
8.	Нехватка научно-исследовательских инициатив в отношении новых технологий ЧП	да	
9.	Недостаток готовности современной информации по методам и технологии ЧП, учитывающим конкретные местные или национальные потребности	да	
10.	Недостаток содействия организации обучения и курсов повышения квалификации в отношении ЧП для занятых на различных уровнях производства.	да	
	<i>Производственные</i>		
11.	Отсутствие приоритетности экологических проблем	да	
12.	Отсутствие реального беспокойства в отношении экологических проблем на уровне предприятия и органов управления	нет	
13.	Традиционная философия очистки выбросов и контроля за загрязнением доминирует у многих менеджеров	да	
14.	Недостаток стимулов для менеджеров работать над осуществлением проектов ЧП	да	
15.	Общее сопротивление переменам: Методы и технологии контроля над загрязнением более просты в понимании и, таким образом, более легки для использования в имеющихся производственных процессах	да	
16.	Слишком мало демонстрационных проектов в соответствующих секторах экономики или местностях для того, чтобы проиллюстрировать выгоды ЧП	да	
17.	Общая незрелость организационной структуры, управления и информационных систем	нет	
18.	Ограниченный опыт вовлечения менеджеров в систему ЧП и проектов ЧП	да	
19.	Ограниченный доступ к оборудованию, обеспечивающему ЧП, а также к технической информации	да	
20.	Представление, что ЧП является слишком сложным (например, что требуется всесторонняя оценка для выявления соответствующих возможностей)	нет	
21.	Отсутствие или ограниченность программ капиталовложений на предприятиях	да	
	<i>Экономические / финансовые</i>		
22.	Представление, что Инвестиции в ЧП связаны с более высокими финансовыми рисками, т.к. ЧП носит инновационный характер	нет	
23.	Относительно высокая стоимость внешнего капитала для инвестиций в ЧП в промышленности	да	
24.	Недостаток механизмов финансирования (на всех уровнях) кредитных программ, предназначенных для инвестирования в ЧП	да	
25.	Недостаток интереса со стороны финансовых учреждений в финансировании проектов	нет	
26.	Конкуренция заявок на дефицитные ресурсы делает затруднительным рассмотрение долговременных инвестиций в ЧП даже тогда, когда его выгоды очевидны.	да	

В. Вопросы для идентификации возможных практических мер

		имеет место	обсуждается/ вносится
1.	Усовершенствование законодательства по охране окружающей среды, включая налогообложение и финансовые инструменты		да
2.	Предоставление экономических стимулов	нет	
3.	Использование местного практического опыта и иных возможностей	нет	
4.	Обеспечение наличия демонстрационных проектов	нет	
5.	Поддержка и финансирование исследований и разработок в области технологий ЧП	нет	
6.	Инициирование информационных программ и программы содействия	нет	
7.	Всестороннее развитие программы ЧП для страны/области/местности	нет	
8.	Содействие предприятиям в преодолении финансовых ограничений	нет	
9.	Продвижение ЧП на политическом уровне и развитие политики его продвижения	нет	
10.	Продвижение концепции ЧП в среде принимающих решения	нет	
11.	Развитие понимания и применения ЧП на предприятиях малого и среднего бизнеса	нет	
12.	Разработка экологических критериев для экономического сотрудничества и представления технологий	нет	
13.	Минимизация излишнего налогообложения и предоставление правильных отчётов перед государственными органами власти	нет	
14.	Предоставление последней/новой информации для потребителей	нет	
15.	Наличие легко доступной информации по ЧП (например, широкое распространение газет и бюллетеней по ЧП)	нет	
16.	ДРУГОЕ,		

Annex 11 – Example of Companies Response

ОАО 'Apatity Heat and Power Plant':

Компания: ОАО «Апатитская ТЭЦ»
 Интервьюируемый: Ермоленко М. В.
 Должность: инженер ПТО _____

А. Общая информация

Отрасль промышленности:

Горная ☐ Химическая ☐ Нефтехимическая ☐ Пищевая ☐
 Целлюлозно-бумажная ☐ Машиностроение ☐ Чёрная металлургия ☐ Цветная металлургия ☐
 Текстильная ☐ Мебельная ☐ Иное (пожалуйста, укажите): теплоэнергетика

2. Является ли компания: Государственной ☐ Муниципальной ☒ Частной ☐ Иное:

Если компания была приватизирована, то в каком году:

3. Когда было начато производство на заводе / участке: 1959

Сколько лет большей части оборудования завода: 50

Среднесписочное число работающих: 800

Основная продукция и производство:
 производство тепловой и электрической энергии

В. Управление энергетикой

1. Кто отвечает за управление энергетикой/энергоэффективностью (должность и подразделение):
 главный инженер Собакин А.П.

2. Когда проводилась последняя инвентаризация энергопотребления: 2009 год

3. Имеете ли Вы программу энергетического управления и/или цели по энергоэффективности:
 имеем

4. Привлекали ли Вы когда-нибудь внешние компании для рассмотрения вашего энергопотребления и разработки мероприятий по энергоэффективности? Да ☒ Нет ☐
 2004 г, Кольский Центр Энергоэффективности

С. Управление окружающей средой

1. Кто ответственен за управление экологией (должность и подразделение):
 Отдел ПТО, начальник отдела Смирнов А. Д.

1. Какой вид систем экологического менеджмента внедрён или планируется к внедрению в ближайшие 3 года? (Оценка воздействия для нового предприятия, Экологический аудит для площадок, Аудит производственных процессов, Экологические обзоры поставщиков, Годовой экологический отчёт, ...)

№	Система	внедрена	планируется	нет планов
	Ежеквартальный/ежегодный отчет по выбросам парниковых газов	да		
	Ежегодный контроль работы золоулавливающих установок, Мурманская ЦЛАТИ	да		

D. Занятость и квалификация относительно технологий Чистого производства

1. Разработали ли Вы и внедрили технологические решения самостоятельно или использовали внешних поставщиков? Пожалуйста, выберите:

Вся работа сделана самостоятельно ☒
 Вся работа сделана внешними поставщиками ☐
 Комбинация собственных усилий и внешних поставщиков ☐

2. Какой тренинг/обучение были проведены в отношении применения более чистых технологий?

Курсы повышения информированности для менеджеров ☐
 Курсы повышения информированности для инженеров ☐
 Курсы повышения информированности для рабочих ☐
 Технический тренинг для инженеров ☐
 Технический тренинг для рабочих ☐
 Тренинг по системам экологического менеджмента ☐
 Программа Чистое производство ☒
 Не было формального тренинга: все сделано в рабочем порядке ☐
 ДРУГОЕ, пожалуйста, укажите: _____

3. Какие из этих источников тренингов/обучения и информирования по технологиям Чистого производства наиболее полезны для Вас?

№	система	Очень полезно	Полезно	Бесполезно	Не используется
1	Штатные специалисты	+			
2	Университеты/Исследовательские организации	+			
4	Промышленные ассоциации				+
5	Внешние обучающие организации	+			
7	Поставщики более чистых технологий				
8	Другие компании	+			
9	Конференции и семинары	+			
10	Консультанты		+		
11	ДРУГОЕ, пожалуйста, уточните				

4. Каково Ваше мнение об эффективности и методологии программы ЧП, проведённой на Вашем предприятии?

	Очень полезно	Полезно	Бесполезно	Не используется
Эффективность	+			
Методология				

5. Какие виды методологических материалов ЧП были предоставлены внешним консультантом?

Методологическое/образовательное обеспечение ☒
 Шаблон отчёта ☒
 Шаблон презентации ☒
 Руководство, учебники ☐
 Программы для расчётов ☒
 Таблицы ☐
 Рекомендации по нормативным расчётам ☐
 Схемы энергетического баланса ☐
 Программы финансовых расчётов ☐
 Программное обеспечение ☐
 ДРУГОЕ, пожалуйста, уточните: _____

6. Используете ли Вы методические материалы, полученные во время обучения по ЧП, в Вашей работе по разработке других проектов?

Нет ☐ Да ☒

Если НЕТ, то почему _____

7. Какие части методологии программы ЧП были наиболее полезны/интересны и наименее полезны/интересны?

Лекции	Очень полезно	Бесполезно
Работа в группах	+	
Домашнее задание	+	
Практическая работа	+	
Другое, пожалуйста, уточните:		

8. Что необходимо добавить в методологию программы ЧП, чтобы сделать её более применимой к практическим вопросам, включая возможность/наличие реализации проектов?

Финансовая сторона

9. В ближайшие 3 года, какое влияние ожидаете Вы получить от инвестиций в ЧП в повышение Вашей квалификации? Пожалуйста, укажите:

№	система	Да	Нет	Не знаю
1	Больше опыта внутри компании по более чистым технологическим процессам	+		
2	Больше опыта внутри компании по экологическому менеджменту	+		
3	Больше опыта внутри компании по экологическому дизайну продукции			
4	Больше использовать консультантов по экологии			+
5	ДРУГОЕ, пожалуйста, уточните:			

Е. Деятельность по улучшению ситуации

1. Пожалуйста, укажите 3 наиболее важных мероприятия, выполненных за последние 5 лет (Экологически чистые мероприятия, мероприятия по энергоэффективности, модернизация или другие мероприятия)

№	Наименование проекта	Оценочные инвестиции (валюта)	Оценочные годовые сбережения (валюта)
1	Существенное снижение выбросов сернистого ангидрида достигнуто за счет сокращения объемов использования высокосернистых углей Интинского месторождения с доведением их доли в общем объеме используемого топлива с 80-87% до 33-40%		
2	2000-2006 – на всех работающих котлах внедрена система подсушки топлива с отработанными дымовыми газами, что позволило повысить безопасность топливоподготовки и уменьшить выбросы ЗВ в атмосферу		
3			

Проекты, разработанные и внедренные в ходе обучения по программе «ЧП»**Группа А. Мероприятия без внешних инвестиций**

N	Название проекта	Экономический эффект руб.	Экологический эффект м3\год	Внедрение
1.	Внедрение приборного учета хозяйственно-бытовых стоков	532800	Улучшение экологической ситуации	2кв.2004 г.
2	Замена писсуаров лоткового типа	16420	Экономия воды, сокращение объема стоков 2000	2кв.2004 г.
3.	Повторное использование стоков в схеме ГЗУ	247000	Повторное использование стоков 30000	2004 г.
4	Внедрение схемы блокировки подачи воды в душевые кабины	82100	Экономия воды, сокращение объема стоков 10000	2004 г.

Контролируете ли Вы

- сбережения (кВт*ч, руб): да
- снижение загрязнения (тонн/год): да

2. Как вышеуказанные мероприятия финансировались:

Внутренние средства

3. Кто утверждал эти виды? Главный инженер

- Экологически чистые инвестиции: _____
- Инвестиции в энергоэффективность: _____
- Проекты по модернизации: _____

4. Какая приблизительно доля Ваших процессов образования отходов и производственных процессов была изменена или замещена технологиями чистого производства? ...%

5. Какую приблизительно долю процессов, как Вы ожидаете, будут контролировать технологии чистого производства через 3 года? ...%

6. Какая приблизительно доля продукции получила новый дизайн или была заменена с тем, чтобы сделать её более экологически чистой? ...%

7. Какая приблизительно доля продукции, как Вы ожидаете, будет заменена или получит новый дизайн для того, чтобы сделать её более экологически чистой, в ближайшие 3 года? ...%

8. Пожалуйста, укажите 3 наиболее важные экологически более чистые варианты/меры, которые будут по-вашему мнению внедрены в ближайшее время

№	Наименование проекта	Оценочные инвестиции (валюта)	Оценочные годовые сбережения (валюта)
1	Реконструкция котлов (10), внедрение НТВ-технологии по сжиганию топлива для снижения выбросов азота	1 котел: Подготовка проекта – 6 млн. руб. Внедрение – 40 млн. руб.	
2			
3			

9. Какова приоритетность вышеуказанных мероприятий ЧП по сравнению с другими рассматривавшимися инвестициями: высокая

10. Как могут быть финансированы вышеуказанные мероприятия (например, внутренние фонды, займы, лизинг ...): фонды «ТГК-1»

11. Будете ли Вы подготовлены взять банковский заём для финансирования вышеуказанных мероприятий: по решению «ТГК-1»

12. Какие условия предоставления займа будут приемлемы (процентная ставка, срок погашения, обеспечение) низкие %-ставки

13. Знаете ли Вы о существующих инициативах, помогающих улучшить экологический статус: _____ всегда отслеживаю новое в Интернете, стараюсь участвовать в семинарах

Г. Преимущества и проблемы чистых технологий

1. Что Вы считаете основной причиной для инвестирования в экологический менеджмент и более чистые экологические технологии?

№	причина	Очень важно	Важно	Не важно
1	Соответствие инструкциям	+		
2	Предвидение будущих инструкций			
3	Ответ на действия конкурентов			
4	Давление заинтересованных лиц (акционеров, общества, финансистов)		+	

5	Требования заказчиков			
6	Корпоративные обязательства по социальной и экологической отчётности			
7	Сокращение расходов/большая эффективность	+		
8	Увеличившаяся конкуренция			
9	Сфера для диверсификации			
10	Другое, пожалуйста, уточните			

2. Что Вы видите в качестве наиболее важных **выгод**, полученных от инвестиций в технологии ЧП в Вашей компании?

- Экономия расходов через лучший экологический менеджмент ☐*
- Экономия расходов через лучший энергетический менеджмент ☐*
- Экономия расходов через лучшее обращение с отходами ☐*
- Диверсификация с новыми продуктами ☐
- Улучшенная эффективность процесса ☐
- Улучшенная эффективность продукта ☐
- Новый опыт, полученный на предприятии ☐*
- Улучшенный общественный имидж предприятия ☐*
- Увеличенная прибыльность ☐
- ДРУГОЕ, пожалуйста, уточните

3. Какие наиболее важные **проблемы**, связанные с внедрением технологий ЧП, Вы видите?

- Недостаток инвестиционного капитала в связи с кризисом ☐*
- Большой срок окупаемости/требование быстрого возврата инвестиций ☐
- Нехватка собственных специалистов ☐
- Представление, что ЧП является сложным по характеру (например, требуется всеобщая оценка для нахождения соответствующих возможностей) ☐
- Плохие внешние источники информации и советов ☐
- Высокая стоимость по сравнению с решениями «конца трубы» ☐*
- Нехватка научно-исследовательских работ в области технологий ЧП ☐
- Много технологий ЧП ещё не доказаны ☐
- Плохой сервис от поставщиков ☐
- Нехватка интегрированных систем от поставщиков ☐
- Неопределённость относительно регулирующих документов ☐
- Приоритет очистки выбросов и контроля за загрязнением, как стандарта при выполнении требований и норм ☐*
- Стратегии развития компаний недостаточно фокусируются на ЧП ☐
- Отсутствие приоритетности экологических проблем ☐
- Недостаток стимулов по разработке проектов ЧП (например, налоговые льготы) ☐
- Ограниченный опыт вовлечения управляющих в систему ЧП и программы ЧП ☐

Отсутствие приверженности менеджеров высшего звена к стратегическому
подходу к экологическим вопросам



Отсутствие приверженности менеджеров среднего звена



ДРУГОЕ, пожалуйста, уточните ниже:

18. Что по Вашему мнению воодушевит Вас на внедрение проектов ЧП в Вашей компании:

Больше информации о возможностях, идеях, обмен опытом

19. Существуют ли другие комментарии, которые Вы бы хотели сделать, исходя из Вашего опыта применения технологий ЧП на Вашем предприятии? Пожалуйста, напишите ниже:

Согласны участвовать в подобных обучающих программах

Annex 12 – CP Projects Status by the Survey Results

#	Project	Estimated investments, USD	Project status
REPUBLIC OF KARELIA			
Subdivision of OAO Petrozavodsk Communal Systems – Vodokanal, K4 (14)			
1	Replacement of liquid chlorine with sodium hypochlorite ¹⁾	25 178	Planned to be implemented in the nearest 3 years. Project is being developed by ZAO "Lenvodokanalproekt"
2	Replacement of the liquid chlorine with solution of oxidants (AQUACHLOR installation) ¹⁾	718 105	Project was not implemented, no current plans
3	Construction of the plant for sewage sludge incineration ¹⁾	410 000	Project was not implemented, no current plans
4	Purchase and installation of centrifuges for dewatering of sludge on drinking water treatment plant	1 120 385 ²⁾	Planned to be implemented in the nearest 3 years
5	Modernization of drinking water treatment plant in Petrozavodsk. Phase 2	8,032 mln ²⁾	Planned to be implemented in the nearest 3 years. Credits are provided probably by NEFCO and NIB
6	Modernization of sewage treatment plant in Petrozavodsk	8,561 mln-credit ²⁾ and 10,561 mln – grant ²⁾	Planned to be implemented in the nearest 3 years. Credits and grants are provided probably by NEFCO and NIB
Subdivision of OAO Petrozavodsk Communal Systems - Heating Systems, K7 (17)			
1	Conversion boiler from oil fuel to natural gas ¹⁾	349 900	Project was not prioritized, no current plans
2	Replacement of boiler equipment ¹⁾	140 000	Project was not prioritized, no current plans
Subdivision of OAO Petrozavodsk Communal Systems – Power Supply Systems – no information			
ZAO Petrozavodskmash – no information			
OOO Ryboprodukty – no information			
MURMANSK REGION			
OAO Apatity Heat and Power Plant (M4)			
1	Reconstruction of boilers (10), introduction of NTV-fuel combustion technology to reduce emissions of nitrogen	1 559 321 ²⁾	Project is prioritized, searching for financing. Cost was estimated for 1 boiler which includes design and implementation.
2	2000-2006 – system of fuel drying was installed on all used boilers	no information	Project was implemented
3	Reducing of using coal with high content of sulfur from 80-87% to 33-40%	no information	Project was implemented
OAO Murmansk Heat and Power Plant			
1	Waste water treatment (oil products and heavy metals) of boiler-turbine unit. Phase 1	222 881 ²⁾	Project was implemented
2	Introduction of anticorrosive vanadium inhibitor	135 593 ²⁾	Project was implemented
3	Introduction of the reverse water system for cooling of bearings of the turbine	3 389 ²⁾	Project was implemented

	production unit		
4	Waste water treatment (oil products and heavy metals) of boiler-turbine unit. Phase 2	94 915 ²⁾	Project is prioritized, searching for financing
5	Reconstruction of sewage treatment plant of boiler unit-2	508 475 ²⁾	Project is prioritized, searching for financing
6	Reconstruction of transfer system of heat energy from the incineration plant to the East boiler plant	894 915 ²⁾	Project is prioritized, searching for financing
OOO PolarPharm			
1	Water consumption reducing	-	Was implemented
2	Switching to energy-efficient heating system	-	Was implemented
OAD Murmansk Fish Factory– no information			
OOO Protein– no information			
ARKHANGELSK REGION			
OAD Solombala Pulp and Paper Mill, A 21 (1)			
1	Installation of stage II of furnace gas treatment system for sodoregenerating boilers (SRK-1,2) ¹⁾	1 007 560	Not implemented because of lack of own financial means
2	Oxidation of unrefined green alkali liquor by the air oxygen ¹⁾	24 950	Was implemented partially. No necessity at present time.
3	Reconstruction of electrical filters ¹⁾	320 100	Was implemented.
4	Modernization of technical water supply system for sodoregenerating boiler SRK-1 ¹⁾	1 410	Was implemented. It was internal project and was not a part of CP programme.
5	Elimination of melting products discharges from the installation for melting oil production into the sewage water system using settling method ¹⁾	-	Was implemented.
6	Replacement of separators of installation for expansion of sulfate soap ¹⁾	162 200	Not implanted, no currents plans.
OAD Arkhangelsk Pulp and Paper Mill, A 22(2)			
1	Reconstruction of the bark boiler with combustion of bark and wood waste in the boiling bed	5 732 135 ²⁾	Was implemented.
2	Construction of a new wood preparation shop with a dry bark-stripping technology	66 569 000 ²⁾	Was implemented.
3	Reconstruction of steam condensing system CDM 2	5 226 372 ²⁾	Was implemented.
4	Combustion of the emissions from the melting tank into the sodoregenerating boiler (SRK) as a tertiary blast ¹⁾	6 900	Not implemented. Not necessary to implement because the situation is good as it is.
5	Replacement of electrical filter of the sodoregenerating boiler by more effective one ¹⁾	820 000	It is current maintenance work, electrical filters are changing permanently.
6	Use of new chemical "Eka T3 442" on the paper mill No. 1 ¹⁾	128 430	Not implemented. Not actual any more.
7	Use of pulpwat on the paper mill No. 1 ¹⁾	255 000	Pulp waters are used regularly. Local treatment is not planned.

8	Introduction of mineralization process ¹⁾	1 399 360	Not implemented. Other measure is more realistic instead of this.
9	Construction of the local wastewater treatment system for cardboard machines CDM-1 и CDM-2 ¹⁾	2 409 850	Is included in investment plan. Reconstruction of cardboard productions was partially fulfilled. Feasibility study is developed for this measure.
10	Transfer of the raw sludge from septic tanks of conditionally clean water to primary sedimentation tanks of the 2 nd stage of biological treatment unit ¹⁾	55 560	Reconstruction was implemented by using other technology.
11	Installation of the step gratings for preliminary treatment of sediments in the dewatering unit ¹⁾	277 780	Not implemented. This measure was not planned, not actual any more.
12	Installation of the local sewage treatment system in the wood-preparation unit No.3 ¹⁾	125 800	Not implemented. It is plan to implement this measure but the problem is that there is no acceptable technology at present time.
13	Reconstruction of the aeration system of aero tank of the 1 st stage of the biological treatment ¹⁾	278 570	Was implemented but with more deep modernization.
14	Reconstruction of the water intake facility of the intermediate sedimentation tanks of the 1 st stage of biological treatment ¹⁾	125 00	Not implemented. Is not actual any more because reconstruction of 1 st stage was implemented.
15	Introduction of the bio-product of the "Nalco" company to the activated sludge ¹⁾	23 000	Was implemented as it was planned from beginning.
16	Addition of flocculant to the primary sedimentation tanks of the 1 st and 2 nd stages ¹⁾	62 000	Was implemented.
17	Construction of a new neutral sulfite pulp stream	36 000	Planned to be implemented in the nearest 3 years
18	Construction of a new evaporation station	28 000	Planned to be implemented in the nearest 3 years
ОАО Shipping Center Zvezdochka			
1	Introduction of the "Suprarex" machines for heat metal cutting	-	Was implemented.
2	Introduction of the new system of mazut heating at the boiler plant	-	Was implemented.
3	Introduction of oil waste products collecting system	-	Was implemented.
4	Construction of electric boiler for methane-tanks heating at WWTP	-	Was implemented.
5	Recycling water supply for industrial needs	-	Was implemented.
6	Replacement of old equipment for cutting of furniture boards on more efficient	-	Was implemented.
7	Construction of UV disinfection at WWTP	-	Is planned for implementation. No available own financing means.
8	Construction of UV drinking water treatment facility at 4 th relift pumping plant	-	Is planned for implementation. No available own financing means.
9	Construction of the site for compacting and sorting of industrial waste		Is partly implemented. Buildings, networks, fencing were constructed and site was prepared. Incineration installation and presses were bought. However, there are

			no activities on the site because of the financing lack for the completion of works.
OAO Sevmash – no information			
OOO Ekoprom, Severodvinsk – no information			
REPUBLIC OF Komi			
ZAO Zheshartsky Plywood Manufacturing Plant, Ko 7 (41)			
1	Use of fiber waste from the workshop of composite wood fiber board in production of wood chip boards ¹⁾	82 500	Production of wood fiber board is stopped at the enterprise as economically unprofitable product; therefore the project will not be developed.
2	Briquetting of wood waste for further use ¹⁾	90 000	The project is not implemented and is not stated in the immediate plans for implementation. The reason is difficult financial situation at the enterprise.
3	Installation of the thermo-oil boiler plant on solid waste ¹⁾	980 000	Project is actual, but is not planned to be implemented because of lack of own financial means.
4	Conversion from firing on waste wood to a plant using gas and dust burner	200 700	Project is implemented. Implementation of project began before the CP Training.
OOO Vorkutacement, Ko2-1			
1	Installation of electric filters on the stack	450 000	Project is being implemented. Equipment has been procured, assembly works are delayed. The plant has temporarily been closed down due to financial crisis (products are not being sold out). The activity has been developed by the management individually, before the CP training.
MUE Vodokanal, Syktyvkar			
1	Application of catalytic module and absorptive catalysts in the technology of water treatment. ¹⁾	4 550 000	The project has not been considered for implementation as the pay-off period is 10 years
2	Replacement of pumping equipment and optimization of its work ¹⁾	330 000	The project is being implemented on a staged basis.
OOO Gorzelenhoz			
1	Production of pellets from the wood processing wastes ¹⁾	-	The project is at the stage of development; due to the financial situation implementation is impossible in the nearest future.
OOO Syktyvkar Plywood Manufacturing Factory			
1	Procurement of the boiler-house, use of the heat from the technological process in hydrothermal treatment of raw materials ¹⁾	-	The project is at the stage of development of design documentation and selection of required equipment.

1) projects developed in the framework of Cleaner Production programme

2) actual cost

1 USD = 29, 5 RUR

Annex 13 – Climate Doctrine of Russian Federation

ДОКУМЕНТЫ И КОММЕНТАРИИ

ГОСУДАРСТВЕННАЯ политика в области климата

Президент РФ Дмитрий Медведев подписал Климатическую доктрину России. Это первый официальный документ о климате, принятый в нашей стране.

В доктрине содержится анализ ситуации с возможными последствиями климатических изменений для России, описываются вызовы, с которыми может столкнуться страна, а также ответы на них.

Чтобы избежать отрицательных последствий глобального потепления, которое уже давно констатировали ученые всего мира, Россия намерена значительно снизить выбросы парниковых газов – на 25% к 2020 г. по сравнению с уровнем 1990 г., т. е. на 30 млрд т. Для этого будут предприниматься действия, связанные с повышением энергоэффективности экономики. Перед Россией, отмечается в доктрине, стоит задача увеличить этот показатель к 2020 г. на 40% по сравнению с 2008 г.

Одним из направлений достижения этой цели должно стать снижение доли газа в потреблении первичных топливно-энергетических ресурсов до 46%. Планируется также прекратить практику сжигания попутного газа.

Принято решение о поэтапном увеличении в энергобалансе доли возобновляемых источников энергии: до уровня 1,5% в 2010 г., до 2,5% – в 2015 г., до 4,5% – к 2020 г. Снижению выбросов парниковых газов в электроэнергетике (на долю этого сектора приходится около четверти всех выбросов углекислого газа) будет также способствовать увеличение на 25% доли атомной энергии в энергобалансе.

Борьба с глобальным потеплением – не основная цель доктрины. Россия декларирует, что готова идти по пути модернизации экономики и в разработке глобальной климатической доктрины будет отстаивать свои интересы, даже если это пойдет вразрез с желанием мирового сообщества. Не случайно Президент подписал доктрину накануне поездки в Копенгаген на климатическую конференцию ООН.



№ 2 ФЕВРАЛЬ 2010

3

Экология Производства

РАСПОРЯЖЕНИЕ ПРЕЗИДЕНТА РФ

от 17 декабря 2009 г. № 861-РП

О Климатической доктрине Российской Федерации

В целях осуществления скоординированных действий, направленных на обеспечение безопасного и устойчивого развития Российской Федерации в условиях изменяющегося климата:

1. Утвердить прилагаемую Климатическую доктрину Российской Федерации.
2. Правительству Российской Федерации при проведении государственной политики Российской Федерации по вопросам, связанным с возможным глобальным и региональным изменением климата и его последствиями, руководствоваться положениями Климатической доктрины Российской Федерации.

Президент РФ
Д. Медведев

ОФИЦИАЛЬНЫЙ ДОКУМЕНТ

Ввиду большого объема Климатическая доктрина РФ полностью размещена на сайте журнала.

ЭКОНОМОСТИ

Климатическая доктрина предполагает адаптацию российской экономики

Министр природных ресурсов и экологии РФ Юрий Трутнев: «Подписанная Президентом России Климатическая доктрина предполагает адаптацию российской экономики к текущему и ожидаемому изменению климата».

По словам Министра, согласно Доктрине для каждой из отраслей существуют как выгоды, так и риски, связанные с глобальным потеплением.

«Выгоды для топливно-энергетического комплекса – это увеличение водных ресурсов и новые возможности развития гидроэнергетики, облегчение доступа к арктическим шельфам, сокращение расходов энергии в отопительный период», – отметил Ю. Трутнев. К рискам он отнёс повреждение трубопроводов в зоне деградирующей вечной мерзлоты, увеличение в ряде регионов ветровых нагрузок и ледовых отложений на ЛЭП, а на юге России – увеличение расхода электроэнергии на кондиционирование воздуха.

Среди плюсов для сельского хозяйства министр выделил увеличение продолжительности благоприятного периода для созревания сельскохозяйственных культур, возможности использования новых культур, зон земледелия. Среди негативных изменений – рост повторяемости, интенсивности и продолжительности засух в одних регионах, экстремальных осадков, наводнений, случаев опасного для сельского хозяйства затопления почвы – в других.

Климатическая доктрина разработана в соответствии с поручениями Президента РФ и Правительства РФ, а также в рамках выполнения взятых Россией обязательств согласно Рамочной конвенции ООН по борьбе с изменением климата.

«Разработка системы мер в соответствии с Доктриной будет способствовать снижению ущерба от опасных природных явлений, уменьшению затрат на ликвидацию чрезвычайных ситуаций, повысит устойчивость отдельных отраслей экономики», подчеркнул глава Минприроды России.

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