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TRANSLATIONS ON ENVIRONMENTAL QUALITY

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CONTENTS

PAGE

EASTERN EUROPE

BULGARIA

- Future Environmental Protection Measures Outlined
(Stamen Stamenov; TEKHNIЧЕСКО ДЕЛО, 12 Feb 77).... 1
- More Efficient Measures for Environmental Protection
Needed
(Georgi Pavlov; EKONOMICHESKI ZHIVOT, 12 Jan 77)... 4

YUGOSLAVIA

- Zasavje Area of Slovenia Endangered by Air Pollution
(Silvestra Rogelj; ДЕЛО, 8 Jan 77)..... 9
- Celje Pollution Abatement Measures Inadequate
(Drago Hribar; ДЕЛО, 8 Jan 77)..... 14

SUB-SAHARAN AFRICA

UGANDA

- Water Corporation Advises Boiling Water Before Use
(Asuman Nakenda; VOICE OF UGANDA, 7 Feb 77)..... 18

USSR

- Proposal for All-Union Inter-Sector Center To Deal With
Water Pollution
(G. Dolgov; VODNYY TRANSPORT, 25 Jan 77)..... 21

CONTENTS (Continued)

Page

WESTERN EUROPE

GREECE

Elevisis Area Pollution Seen Very Serious, Solutions Sought (Khara Kiosse; TA NEA, 27 Jan 77).....	26
Proposals Made To Correct Athens Pollution (TA NEA, 21 Jan 77).....	30
Propose Area Restoration for Pendeli Quarries (St. P. Drosos; O OIKONOMIKOS TAKHYDROMOS, 13 Jan 77).....	34
Thermaikos Gulf Pollution Measures Under Discussion (Nikos Samaras; O OIKONOMIKOS TAKHYDROMOS, 27 Jan 77).....	37

NETHERLANDS

Atomic Waste Disposal Poses No Problem (Pierre Huyskens; ELSEVIERS MAGAZINE, 22 Jan 77).....	38
--	----

FUTURE ENVIRONMENTAL PROTECTION MEASURES OUTLINED

Sofia TEKHNICHESKO DELO in Bulgarian 12 Feb 77 p 5

[Article by Engr Stamen Stamenov, deputy chairman of the Committee for Environmental Protection Under the Council of Ministers: "The Protection of the Environment--An Urgent Problem"]

[Text] A major consequence of the developing scientific and technical revolution has been the harmful impact of production activities on the environment and the growing use of replaceable and irreplaceable natural resources. The development of modern production and the use of scientific and technical achievements raise the level of human activities to such a level that even now it is disrupting the chain of natural processes in the biosphere itself. Two examples are sufficient to illustrate the gigantic scope of man's influence on the elements of nature.

Each year, world agriculture uses around 300 million tons of mineral fertilizers and around 4 million tons of pesticides. Along with their beneficial effect on increasing soil fertility and combatting pests in agriculture, many of the chemicals, and primarily the organochlorine compounds, have a toxic effect upon a number of organisms on land and in the water.

Many scientists throughout the world have expressed serious concern over the rate at which the oceans and seas are becoming polluted. As is known, petroleum and the products of its refining are one of the most serious sources of polluting surface waters. According to the existing calculations, as a result of the drilling on shelf areas, from maritime transport and tanker accidents, each year around 1.5 million tons of oil escape into the oceans. The waters of the world oceans also receive 4.5 million tons of oil lost or consumed on land and transported by various ways to the ocean. Oil escapes into the waters of the sea also through its natural underwater pools. The total annual discharge of oil into the world ocean has been estimated at around 10 million tons. In figuring that one ton of oil covers up to 12 square kilometers of water surface, and the period of the complete self-purification of the water equals 4-5 years, it has been assumed that around 20 percent of the surface of the world ocean is covered by oil. All of this shows that the protection of the environment against pollution in our days goes beyond the limits of the individual countries and has become an urgent international problem.

The intensified processes of industrialization, urbanization, the intensification of agriculture and the development of transport in our nation as well have also led to a disturbance of some of the elements of our environment. However, it must be noted that as a whole, nature in our country has still been protected. But considering the negative effect of environmental pollution on human health and the necessity of creating the conditions so that future generations will receive the riches of nature, the BCP and our government are giving exceptionally great attention to the problems of protecting and improving the environment. Due to this, during the years of the Sixth Five-Year Plan, a number of effective measures were taken, including: 162 new sewage treatment plants were built; the treated industrial and household sewage has risen from 3 cubic meters per second in 1971 up to 14.5 cubic meters per second; by the reequipping and installation of new purification installations for waste gases at large industrial enterprises which pollute the air, we have eliminated the release of around 500,000 tons of dust into the air on an annual basis; biological and integrated plant protection has been expanded, and at the end of the 5-year plan this encompassed 1.2 million decares. During the last 5-year plan, a start was made to organize work in the area of recultivating the disturbed terrain of strip mines and quarries, and 2,616,000 decares of new forests were planted.

In spite of the achieved successes, what was done during the last 5-year plan was not sufficient to stop the process of environmental pollution. From the rostrum of the 11th Party Congress, Comrade Todor Zhivkov stated that "...in the work of environmental conservation, a turning point must be reached, the harm must be stopped, new violations must not be permitted, and a comprehensive approach must be applied in order to achieve, in the words of Marx, a harmonious relationship between society and nature...."

The first thing which we must realize, according to the specific instructions which have been given, is measures to protect and restore the environment; these measures have been outlined in the Unified Plan for the Socioeconomic Development of the Country During the Seventh Five-Year Plan. The plan envisages that around 840 million leva will be allocated for these activities, and these funds are to be invested in the building of 507 sewage treatment stations at industrial enterprises and 26 municipal treatment plants. By these measures, the aim is to have the presently-polluted rivers be suitable for economic use by 1980.

In line with protecting the purity of the air, during the 5-year plan, highly efficient gas-scrubbing and dust-catching facilities will be installed at major industrial installations such as the Kremikovtsi Metallurgical Combine, the cement plants, the G. Damyanov Copper Combine, and others. The total number of these installations in the nation will reach 51. This should lead to a sharp reduction in the concentration of the basic air pollutants to the health standards in the most heavily polluted settlements and regions. It is also foreseen that biological plant protection will be expanded, and will cover an area of around 1.2 million decares annually. Along with this, during this 5-year plan, the creation of new forests will be continued by the annual reforestation of more than 500,000 decares. Various erosion-preventive measures will be carried out on an area of 2.46 million decares.

Recently the Bulgarian State Council approved two very important documents: the basic statutes for preserving, restoring and improving the environment in the territorial complexes of the Bulgarian Black Sea Coast and the Danube. On the basis of these documents, our committee at present is working out specific programs for preserving the purity of lakes Vaya, Atanasovsko and Mandrenko.

However, the broad program of protecting and improving the environment requires the solving of a number of problems, among which only a few will be touched upon here. In first place there is the problem of beginning to create and introduce waste-free production methods. The introduction of them is considered to be the most effective method for fundamentally preventing the release of pollutants into the environment.

Another important problem is to convert our industry to complete reutilization of water in each individual enterprise. This will improve the present negative water balance of our country. The task has been set this year of realizing a 30 percent savings in water as a result of reutilization. A key problem which is of definite economic significance is the decontamination and utilization of solid waste products. This question will be solved during the 5-year plan, particularly for Sofia.

In a word, the introduction of the newest scientific and technical achievements into the struggle to protect and improve the environment is a task which is awaiting its rapid solution. Undoubtedly, the engineers and technicians will be among the first to provide significant help in solving it. Their duty is to study and introduce positive foreign experience, and to also develop new production methods and facilities which will aid in the struggle for a pure and fresh nature.

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BULGARIA

MORE EFFICIENT MEASURES FOR ENVIRONMENTAL PROTECTION NEEDED

Sofia EKONOMICHESKI ZHIVOT in Bulgarian 12 Jan 77 pp 1, 15

[Article by Georgi Pavlov, chairman of the Council of Ministers Committee for Environmental Protection: "A Breakthrough Is Needed - Let's Protect the Environment!"]

[Text] The environment is one of the basic factors in the development of any country, every nation. Protection, restoration, and rational use of the environment are coming to be of especially vital importance at the present stage of development of human society.

The problem of halting further damage to the environment was raised at the 10th BCP Congress. During the Sixth Five-Year Plan concepts and programs were worked out, legislation was improved, and measures were implemented for environmental protection. However, out of 324 million leva allocated for the period, only 263 million were spent for the purpose. Serious shortcomings were allowed in the use of capital investment funds, of which barely 69.4 percent were spent. During the five-year plan 82 projects were to have been completed, yet only 32 were put into operation. Complete facilities treat, fully or partially, not more than 14.5 cubic meters of waste water per second, and trap about 500,000 tons of dust annually. Of the specific treatment programs approved by the government for the areas of Pernik, Sofia, Kremikovtsi, and Devnya, cement plants, and so on, only the program for Pernik was completed.

The plan for forestation and soil protection has been satisfactorily fulfilled during the Sixth Five-Year Plan.

Because of nonfulfillment of many of the basic measures, in a large number of areas and river areas there is as yet no appreciable effect from the work that has been done. Despite the fact that up to now 904 water treatment and 425 air treatment facilities have been built in the country, pollution is still above permissible norms. The slow construction of urban treatment plants and cleansing facilities in certain installations which

severely pollute the environment is aggravating the unfavorable effect. At the moment, about 20 percent of the completed facilities are not in operation, and 30 percent have an impaired cleansing effect. The reasons for this are primarily subjective--inadequate operation because of a lack of qualified cadres, incomplete or poor-quality construction, the shortage of structures and designs manufactured here.

Problems Must Be Solved in a New Way

The 11th Party Congress laid down the line most clearly: To achieve a breakthrough in environmental protection using the integrated approach for the elimination of damages. It was emphasized that special attention must be focused on measures to prevent new violations, to increase the rights and responsibilities of the appropriate state and social authorities, and in the long run ensure harmonious relations between nature and society.

The newly-created supra-departmental authority has as its task that of controlling, coordinating, and undertaking effective measures to implement the policies and decisions of the CC BCP, the National Assembly, and State Council, and the Council of Ministers with respect to the protection, improvement, and rehabilitation of the environment and the integrated utilization of water resources. The Committee for Environmental Protection also has the task of providing a scientific-information service for activities throughout the country having to do with this vital problem, creating for the purpose a unified national system for observation, registration, and information on environmental conditions.

In addition to strengthened control to prevent new violations and to make up for losses, special attention is being focused on the problem of eliminating the causes of these violations. The Committee will undertake measures and provide aid in improving production technology. Attention will be directed toward the implementation of technologies which will serve to utilize natural resources in an integrated fashion and reduce harmful wastes from one operation to be maximally used in another operation, and to transform unutilized wastes into harmless products or food for certain microorganisms which help to rehabilitate the environment.

In its activity the Committee works on state-social principles and in close interaction with the national movement for environmental protection. In addition to it a council for environmental protection and a water council have been formed, participated in by representatives of social organizations, ministries, and other departments, eminent scientists, specialists, and public figures. These bodies will take part in working out basic problems having to do with environmental protection and rehabilitation, the integrated use of water resources, and changes in social consciousness.

It is also necessary to work out the kind of normative base which will regulate activities having to do with environmental protection and will combine into a unified whole the interests of society and the collectives of polluting enterprises.

The restructuring of the work of rayon environmental inspectorates has begun for the successful accomplishment of these tasks. The local control authorities on the integrated use of water resources have been transferred to them. Four new inspectorates have been set up on the basis of the territorial principle--Pernik, Shumen, Khaskovo, and Varna. In addition to exercising control over environmental protection, they are to coordinate and assist local efforts to implement the basic measures having to do with the resolution of these problems in entire rayons and river areas.

Accelerated Construction of Treatment Facilities

The directions of the 11th BCP Congress served as the basis in formulating the "Environmental Protection" section in the Unified National Economy Plan for the Seventh Five-Year Plan. In order to achieve the greatest effectiveness, funds are being channeled into the most polluted river areas--the Iskur, the Maritsa, and the Yantra, and the badly polluted air basins of Kremikovtsi, Devnya, the cement plants, and so on. By 1980 plans call for the rivers Iskur, Mesta, Struma, and Vit to be completely cleaned up. Substantial improvements are to be made on various sections of the Ogosta, Yantra, and other rivers. The redistribution and concentration of funds created possibilities for building treatment facilities in not more than two to three years.

The Committee is enforcing the line of strict compliance with our country's laws which stipulate that new production facilities cannot be put into operation unless they have the necessary treatment facilities.

The Seventh Five-Year Plan allocates about 840 million leva for measures on environmental protection. This represents 2.5 times more than the amount allocated for this purpose in the Sixth Five-Year Plan. Of these funds, 373 million leva are to be spent for water treatment, including 130 million for the construction of urban treatment plants. Plans call for installing about 750 treatment facilities in industrial enterprises, and 29 urban treatment plants. The five-year plan calls for the spending of 28 million leva for the construction of such facilities in the ferroalloy, blast-furnace, ore-preparation, and sintering operations of the Kremikovtsi Metallurgical Combine. A new tailing dump in the Rosen section of the Burgas Copper Mines will be built.

One of the most important problems now being worked on is the construction of livestock farm facilities. The problems of furnishing primarily hog complexes with such facilities will be solved with the use of Soviet and other technologies.

The construction of all these projects will create conditions for treating about 57 percent of the waste water (as against the present 27 percent). In this way, water from the main river areas--the Vit, the Yantra, the Iskur to Kurilo, the upper reaches of the Maritsa, and others, will again become suitable for economic use.

In order to achieve the necessary effect from the construction of treatment stations, they need to be built simultaneously with urban sewer systems, and beautification measures need to be synchronized with water purification.

At present, efforts are also being made to reduce the use of fresh water for industrial purposes and to convert recycled water; this will lead to a sharp reduction in capital investments for treatment facilities. This will also solve the problem of meeting the rising demand for drinking water.

The Campaign To Clean Up the Air and Soil

Funds for protecting air purity have been channeled into the most polluted industrial areas. Out of a total of 107.3 million leva, 80 percent goes to the areas of Kremikovtsi, Sofia, the G. Damyanov Metallurgical Combine in Pirdop, Pernik, Devnya, cement plants, and so on. It is expected that by the end of the five-year plan new installations and facilities will trap 1.35 million tons of harmful substances annually, now emitted into the atmosphere. In this way, 60 percent of the polluted air will be rendered harmless, as against 14 percent at the end of the Sixth Five-Year Plan.

The worst of all environmental damages are the consequences of erosion. In our country, about 60 percent of the total territory and 72 percent of the arable land are subjected to these harmful effects. The limited application of anti-erosion techniques on vast agricultural areas and the use of unsuitable irrigation methods in some places have accelerated the erosion process. Every year the government allocates about 20 million leva to reduce the damages. Many hydroengineering anti-erosion facilities are being built (dams and so on), but after the completing organization pulls out (DSO [State Economic Trust] and MTS [Machine-Tractor Station] and Erosion Control) these facilities become neglected, are not maintained, and after a few years break down. This situation is intolerable, and the necessary measures will be taken to prevent it.

Many problems still remain with regard to the use of pesticides.

Specifically in order to prevent all these harmful effects on the environment, plans call for spending 359.6 million leva during the five-year plan for purposes of forestation, erosion control, recultivation, and other measures directed at soil protection. More than 42,000 decares of damaged land will be recultivated (as against 11,000 decares in the Sixth Five-Year Plan). Biological and integrated plant protection will be expanded, and by 1980 the amount of land treated by this method will come to 2.8 million decares (as against 1.2 decares at the end of 1975).

The Committee will handle these and other problems of national importance on the basis of its own experience and, especially, the broad application of experience of other countries, primarily the USSR and the CEMA member countries.

Problems of ecology--that is, the interaction between man and the environment--today constitute the main problems whose correct solution will largely determine mankind's future. This interaction is becoming increasingly hazardous to the very biological existence of man because of the disappearance of a number of vitally important natural resources and because of environmental pollution which is dangerous to human life. This makes it especially mandatory, when planning new industrial projects, to stipulate a high technical level and the latest achievements in technology and the problems of environmental protection. These tasks impose high standards on the cadres involved with study, planning, equipping, and other problems having to do with environmental protection.

It is essential to make use of the new favorable conditions created by the party and the government and to resolve the cardinal problems of environmental protection. In order to achieve a breakthrough in these efforts, it will be necessary in this five-year plan to overcome a number of difficulties. The efforts of all must be directed toward implementing the measures stipulated by the plan, so that by the end of the five-year plan our people will feel the actual results of this highly humane activity.

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ZASAVJE AREA OF SLOVENIA ENDANGERED BY AIR POLLUTION

Ljubljana DELO in Slovenian 8 Jan 77 p 26

[Article by Silvestra Rogelj]

[Text] This summer and fall the ridges above the narrow Zasavje Valley seemed to be free from the "evil blossom"--the peculiar wonder of nature brought about by abnormal ecological conditions whereby fruit trees bloom and bear fruit at the same time. Nor did the farmers of the valley look concernedly at the smouldered leaves. A new, 360-meters-high smokestack of the Trbovlje thermoelectric power plant banished the destructive smoke high into the clouds and restored, at long last, an atmosphere to Zasavje of air 10 times cleaner and less poisonous than has been the case in the last few years.

The smothering by sulfur dioxide was a serious threat to the area around Trbovlje and Hrastnik. The Zasavje area experienced its full development at a time when factory smokestacks belching billowing black smoke were a hallmark of progress.

These were the years following World War II when industrial development was our primary goal. Industry needed energy, and energy was available where there was coal. We constructed a thermoelectric power plant in the narrow Zasavje Valley. At that time no one paused to think that siting this plant in a narrow valley hemmed in by the surrounding hills, where because of the thermal inversion smoke could not rise but stayed close to the ground, was everything but appropriate from the point of view of environmental protection and the well-being of the people themselves. The main consideration was the ready availability of coal. However, coal from the Zasavje Valley has a very high sulfur content--from 1.5 to 3 percent--which at combustion becomes sulfur dioxide and on coming into contact with moisture becomes sulfuric acid that burns vegetation like fire far and near in the surroundings.

In Zasavje vegetation was burned for the first time 20 years ago when the third boiler in the thermoelectric power generating plant Trbovlje No 1 was

put in operation. That was when the pines withered away. When the thermo-electric power plant Trbovlje No 2 began to operate more vegetation began to wither. The concentration of sulfur dioxide which had already been very high prior to that time reached the critical limit. By 1972, 5,000 hectares of forest had been damaged while 80 hectares were completely destroyed. In any strong wind the trees were being overturned. Moreover, the first danger signs announcing death of the valley appeared--erosion. Rain was washing away the soil until the rock beneath lay bare. How did it come to pass that Zasavje began to wither and die, so to speak, overnight?

To the local residents this was no surprise. The thick veil of smoke and dust spread over their towns smothering all things alive was only too well known to them. The two thermoelectric power plants burned 4,000 tons of coal per day and belched out 240 tons of sulfur dioxide. Until this year, all this huge quantity of suffocating smoke used to remain close to the ground because of the impenetrable layer of air associated with the temperature inversion that was covering the valley as a lid.

The smokestacks of the two power plants--100 and 200 meters in height--were both lower than the inversion layer.

In the construction of the two power plants it was erroneously thought that the low smokestacks would pollute only the nearby environment. It was estimated that the sulfur dioxide concentration in the air would not exceed 0.15 milligram per cubic meter. The concentrations that actually occurred under the suffocating lid were so high that even the meteorologists were surprised.

When measurements of the air pollution in Zasavje began 5 years ago, the Meteorological Institute of the Slovenian Socialist Republic purchased instruments that could measure up to 10 milligrams of sulfur dioxide in a cubic meter of air. These instruments, however, failed as soon as they were put in operation--because the sulfur dioxide content in the Zasavje air was considerably higher. The apparatus was changed to allow for concentrations up to 20 milligrams but even this limit was often exceeded. Let us recall what the maximal permissible limit is. The republic law on air pollution abatement permits a daily average concentration of sulfur dioxide to be not more than 0.30 milligram per cubic meter of air, and the 30-minute average to be not more than 0.75 milligram. Moreover, the air was heavily polluted not only near the smokestacks but everywhere the wind carried the smoke. Complaints about the "gas" were heard from the Savinja River Valley and Radece as well as in Sevnica, where vegetation was burned, too. The vegetation, however, was not the only thing the gas attacked; health of the local residents was also impaired.

It was imperative to take some kind of action. Could the operation of the two power plants be discontinued? Impossible. What then? After examining numerous proposals it was decided to build a smokestack with a height sufficient to penetrate the inversion layer so that the valley could be saved from suffocation.

How high should the lifesaving smokestack be? After numerous measurements and intricate calculations in which the height of the thermal inversion layer eluded determination for some time, the experts at the Meteorological Institute of the Slovenian Socialist Republic recommended a height of 385 meters. With a smokestack of such height the concentration of sulfur dioxide in the air would under normal conditions not exceed 2.5 milligrams, which would represent adequate protection of the threatened areas. If, on the other hand, it were desired to keep the concentration below 2 milligrams, the smokestack would have to be 420 meters high.

The commission decided upon a 360-meter smokestack which will offer protection to the lower strata of air--that is, the floor of the valley--because each additional meter would greatly increase the cost of construction. A lower smokestack would not penetrate the inversion layer above the valley and reach the strata where circulation of air is incomparably stronger and where the sulfur dioxide can be diluted to harmless concentrations. Even with the reduced height of 360 meters this smokestack is still the highest smokestack in Europe and the second highest in the world. The construction was completed in May 1976. What has been the effectiveness of this 70-million-dinar giant? Has the air been improved because of it?

Professional engineer Bojan Paradiz, chief of air quality protection service at the Meteorological Institute of the SRS, assured us that air pollution caused by the thermoelectric power plant No 2 in the lower parts of the valley--that is in the Sava River Valley proper and at the floor of the Trbovlje basin--is now only slight and somewhat greater in the higher parts of the valley but in any case such pollution is considerably less pronounced than it used to be. Of course, this does not mean that the air is now clean in Zasavje. It is still being polluted by the cement plant, the glass manufacturing factory, the Hrastnik chemicals plant and the old thermoelectric power generating plant. The measurements are even more informative. Because the smokestack is 25 meters lower than recommended, the concentrations measured in the summer months of 1976 were indeed somewhat higher than expected. At Savne Pec above the valley floor the air pollution decreased two or three times in comparison with 1971. This summer air at Kovk on the left bank of the Sava River, 600 meters above the sea level, was two times less polluted than 5 years ago. At Dobovec on the right bank of the Sava River when the slope of Kum rises to 750 meters above sea level the air pollution has only been reduced to one-half but it was never particularly bad there.

In 1971, when we realized that Zasavje was facing destruction, the concentration of sulfur dioxide continuously exceeded 1 milligram for 11.5 hours. In 1976 this time was reduced to 5.5 hours. It should also be noted that in 1971 a cubic meter of air contained 10 milligrams of sulfur dioxide, while the 1976 concentration never exceeded a value slightly over 1 milligram. It should also be noted that the actual effectiveness of the smokestack is difficult to establish because the old thermoelectric power plant is not connected to the new smokestack. Data taken at the time when either only

Trbovlje thermoelectric power plant No 1 or Trbovlje thermoelectric power plant No 2 was operating show that the lower strata of air are now being polluted only by the old thermoelectric power plant. When this power plant ceases to operate the air in the valley will be considerably cleaner.

All these data hold only for the summer months. What will the situation be like in winter? The meteorologists expect that the air pollution in the valley due to thermal inversion attributed to the power plant No 2 will be diminished even further with the pollution in the higher altitude layers, depending on higher altitude inversions. If these occur, local pollution will take place. Critical places are mountain ridges and passes where the smoke from the valley flows to the other end of the hills. It is not expected, however, that the smoke will spread over so large an area as has hitherto been the case.

The valley has been saved. It is no longer facing a catastrophe because of erosion. Vegetation, too, is beginning to return. On the experimental farm of the agrometeorological service near the Dolinsek farm at Praprotno above the Sava River, where the air pollution used to be so heavy that the Dolinsek family had to move to the valley because nothing could grow on their land, peas grew again last year and spinach grew to seed, something that has not occurred ever since power plant No 2 was put in operation. The potato harvest which was 13,200 kilograms in 1973 increased to 21,800 kilograms in 1976. Corn and even buckwheat grew again and the cabbage which was not edible before attained a weight between 1.5 and 2.3 kilograms. In places where the underbrush had disappeared it began to grow again while the existing growth became even stronger. Most encouraging of all is the fact that there was no second foliation and belated blooming. Only the most sensitive plants were burned and this only on 15 percent of the surface while the deciduous trees shed their leaves considerably later than in the previous years.

The valley is thus saved from destruction but we must not be satisfied and remain inactive with folded arms. With the new smokestack we have not eliminated the air pollution, it has only been moved to higher strata of the air. Some even think that we have made matters worse. The smoke, they say, will indeed no longer engulf the narrow valley of the Sava River but will instead ruin the hop groves in the Savinja River Valley where the wind will carry the sulfur dioxide from Trbovlje. Are we then facing a threat similar to that in Scandinavia, where fish in the lakes are dying because of the rain from the clouds blown by the wind from the Ruhr region in Germany?

What is the opinion of the experts at the Meteorological Institute of the SRS on this problem? Professional Engineer Bojan Paradiz is convinced that any threat to the effect that the smoke from Trbovlje might pollute the Savinja River Valley is exaggerated. High in the atmosphere the sulfur dioxide decomposes into harmless components and is returned to the ground with the rain. If the ground is acidic, as is the case in Scandinavia, such rain is harmful, however, for alkaline ground there is no danger. Because

the ground is alkaline for quite some distance from Trbovlje, becoming acidic only in Pohorje, we need not fear that something similar to what happened in Scandinavia would occur here.

Regardless of this, however, the people at the Meteorological Institute of SRS agree that the smokestack represents only a partial solution. The sulfur dioxide has indeed been banned above the clouds but it has not been removed from the air altogether. Accordingly, the second phase of the clean air program also provides for a filtering installation for which a site has already been designated. If the inversion appears above the smokestack the residents of Zasavje will again feel the taste of sulfur in their mouths. And, if it were known all along that the new smokestack would not in itself represent the solution of the Zasavje air pollution problem, why have we then not constructed an air-cleaning installation instead of the 70-million-dinar smokestack?

"Of course, we considered air-cleaning equipment first," said Professional Engineer Bojan Paradiz. "Air-cleaning equipment would certainly be the best solution for saving the Zasavje air from pollution. But at this point in time we still do not have a completely developed technology of air-cleaning equipment. People do not understand that such equipment would actually be a huge 'air cleaning plant.' To protect the endangered regions 85 percent of the sulfur dioxide would have to be removed. This means that at a power output of 275 megawatts, which is the total output of the Trbovlje thermoelectric plant, the cleaning installation would have to clean 1,700,000 cubic meters of smoke. This would be the volume of a column with a base of 10 square meters and a height of 17 kilometers."

A cleaning installation of this kind would be no smaller than the power plant itself and very expensive to boot because of its size. Its yearly operating expenses alone would exceed one-half of the cost of the smokestack, while the cost of electrical energy would double. Although an air cleaning installation is an ideal solution, it is, for the time being, not included in the air pollution abatement program. Sooner or later, however, it will also be necessary to protect the upper layers of the air. We can only hope that scientists may soon be able to offer technologically perfect and not too expensive filters.

12070

CSO: 5000

YUGOSLAVIA

CELJE POLLUTION ABATEMENT MEASURES INADEQUATE

Ljubljana DELO in Slovenian 8 Jan 77 p 26

[Article by Drago Hribar]

[Text] Although the last few years' air pollution abatement efforts in Celje, particularly the 1976 campaign, are encouraging, we cannot consider them satisfactory. Two monitoring stations of the Meteorological Institute in Tovarniska ulica [Tovarniska Street] in Bukovzlak and the measurements performed by the zinc-plating factory are, of course, not enough. A true picture can only be formed on the basis of continuous measurements over the wider city area. Moreover, the instruments should be capable of registering the presence of all other pollutants present in the air in addition to the sulfur dioxide. Thus, for instance, it is known that very strong concentrations of producer gas frequently occur at night but it is not known exactly from what source they emanate.

Equally critical, if not more so, is the problem of water pollution. According to the republic Water Resources Survey which has so far performed 118 inspections, the rivers in Celje are the most polluted bodies of water in the entire country. The polluters are discharging their effluent into the already lifeless tributaries. Adding to the lethal industrial effluents is the communal sewage enterprise which discharges raw sewage into the Hudinja River at Store, whence raw sewage flows to the Savinja River and eventually disperses by the time the river reaches Lasko or Rimske Toplice. This is a matter of public health requiring installation of sewage treatment equipment which, however, is not provided for in the intermediate-term plan.

The political action group discussed the problem of air and water resources pollution abatement in the opstina and, in accordance with the requirements of the SAWP opstina conference presidency, citizens, republic and opstina trade authorities, and the Republic Executive Council's Committee on Environmental protection sent a letter to the working organizations entreating them to take the urgently needed action. The political action group demanded a toughening of political responsibility of all trade, supervisory, and self-managing organs and political organizations within the

OZD [Organization of Associated Labor] and TOZD [Basic Organization of Associated Labor] that despite clear provisions of the law and adopted agreements have hitherto failed to do all they could to bring about an improvement of the situation.

Risto Gajsek, president of the opstina's Executive Council, told us that a realization has finally prevailed in Celje that the problem is also important for a wider area and that the time has come for a firm commitment on making certain planned investments such as a new sulfuric acid plant and a plywood factory. In compliance with the resolution of the political action group the Executive Council appointed a large commission constituted of representatives of various trade and other republic and opstina organizations. This commission will study the situation and determine the location of the sources of pollution. The present findings of the Meteorological Institute and the reports of the working organizations disagree because the latter do not admit that they are causing pollution of the environment to such a great extent. There are no instruments available which could prove this, as there are no instruments that could establish heavy metals poisoning.

In the conversation we learned that the efforts to normalize the situation are obvious and connected with enormous expenses. Accordingly, it is a high time to decide on a systemwide solution which is indicated by lower customs duties, more favorable credit arrangements and greater participation of banks.

The air in Celje is also polluted by the boiler rooms and the chimneys of apartment houses since, according to certain data, 80 percent of households are still using coal for heating. According to evaluations of experts, inexperienced stoking can increase air pollution by up to 50 percent. So far as the boiler rooms and the tendency toward a uniform system of stoking are concerned, the ecological aspect seems to be more important than the legal considerations. Coal cannot simply be replaced by fuel oil because chimneys that were not designed for such use would be destroyed by the conversion. Therefore, it is well worth considering the possibility of heating at least the new apartment buildings in Celje with steam from the Sostanj thermoelectric power generating plant No 4 or deciding to construct the heating plant proposed by the Drava River hydroelectric power plants. A study on the energy budget for the city of Celje up to the year 2000, which is being prepared, is expected to indicate some directions for solving the air pollution problem.

The appeal of the political action group requiring the potential environmental polluters to have their worker's councils appoint trade-political groups charged with responsibility of removing the sources of pollution as they arise, monitoring the ecological situation, and cooperating with the commission attached to the Executive Council is accordingly directed primarily to the associated labor. Whenever the ecology of Celje is discussed, the names of the zinc-plating plant, the Store iron works, and the EMO factory invariably come up.

The Store iron works was the first enterprise that seriously approached the problem of pollution abatement. According to Professional Engineer Niko Zakonjsek the waste water purifying equipment and the smoke and exhaust gas filters were put in operation in 1972 and in March 1976 respectively. The two installations are in the rolling mill and the electric steel works. The Iron Works No 1 has, accordingly, complied with the air pollution control requirements. The plant has established relations with the West German firm Rheinstahl and became its representative in Yugoslavia for the sales of its purifying equipment. Negotiations for the purchase of water purifying equipment were conducted with the firm Bran-Lubbe. In addition a technology bureau is being set up in Store which will also be concerned with filtering equipment.

Because of the obsolescent technological processes and partially obsolete installations and equipment, the purifying of waste water will be considerably more involved in the old part of the iron works. In the last 2 years the preparatory work was performed, a decision where to place the common purifying equipment was made, construction was brought to its final stage and the equipment was purchased. A system of installations for purifying the effluents and for supplying customers with water for industrial use is expected to be completed by the end of the next year.

According to data provided by the ecologist Professional Engineer Roza Ciglar, the EMO factory plans to purify the phenolic and other effluents by installation of cooling towers and a closed water-circulating system. This is planned to be accomplished by next spring. Continuous monitoring of water samples before and after the discharge to the Hudinja River consistently shows excessive concentration of phenols. Here, too, it is difficult to establish the sources of pollution because of the obsolete machinery.

Somewhat more time will be required to purify the polluted air from the melting operation where volatile fluorine compounds and nitric gases are being released. The measurements will be performed by the Maribor Institute of Health. The Djuro Djakovic enterprise is offering the purifying equipment. According to Professional Engineer Ciglar, the situation is not very critical this year because only one or two furnaces out of eight are presently operating. The facts enumerated in an interview of Professional Engineer Franjo Klinger, director of the zinc-plating plant, indicate that the complaints about air pollution directed at the zinc-plating plant are not always factual. Thus, for example, last winter the monthly average of the sulfur dioxide at the zinc plating plant amounted from 0.17 to 0.49 milligrams per cubic meter of air while the concentration in the city center was 0.69 milligrams per cubic meter of air.

It is known that the problem of particulates (ferrosulfates) in the titanium dioxide plant was solved by constructing a smelting plant which is the first in Europe and cost 50 million dinars. For purifying the liquid wastes a semi-industrial installation was devised for recycling of the water used in

the process which is of great importance because the annual cost of water consumed by the zinc-plating plant amounts to 10 million dinars. The situation will further improve when use of the generator is discontinued.

In view of all this the local residents are receiving with mixed feelings the news that the planned new plant of sulfuric acid will result in a multiple improvement of the ecological situation insofar as the zinc-plating plant is concerned. This is a rather unusual event and somewhat in disagreement with the requirements that will have to be met before the new construction is given a green light.

12070

CSO: 5000

WATER CORPORATION ADVISES BOILING WATER BEFORE USE

Kampala VOICE OF UGANDA in English 7 Feb 77 p 3

/Article by Asuman Nakenda: "Boil Your Tap Water Before Use/"

/Text/ The National Water and Sewerage Corporation has advised consumers to boil water before drinking it. The corporation area manager, Jinja, Mr D. W. Nsubuga said "although water receives a lot of biological treatment at the main pumping stations the corporation does not boil it at any one stage."

The corporation deals with water and sewage. Impure water from Lake Victoria is first pumped to the alum mixing tanks where impurities are coagulated. Water is then passed into the sedimentation tank where clear water remains on the top while the impurities settle on the bottom.

When the sedimentation tank is filled up water is allowed to flow rapidly through either the gravity filters or the microstrainers system where water is filtrated. It is then passed into the chlorinating system where water has to receive a dose of 0.5 parts of chlorine for every 1 million pounds of water.

This is to kill any bacteria left during water filtration. There are, however, some occasional breakdowns in the chlorinating plant. Due to such unavoidable circumstances consumers should boil water before using it.

Once water reaches the clear-water well after it has been chlorinated it is stored up. The storage process helps further control /words illegible/ chlorine and any organs which may have escaped at the chlorinating point.

The corporation has variations in the designs for the water pumps. There is for instance the direct installation of high-lift pumps at the clear-water well. Another design is where pumps may be installed further away from the clear-water well. The former is, however, said to be better since it is easier and cheaper to construct.

Water is pumped from the clear-water well to the reservoirs. There are two types of reservoirs. One is the high level and the other is the low level. The two differ in that the high level reservoir supplies consumers located in elevated areas of towns and cities while the low level supplies to those in low-lying areas.

It is, however, inevitable for consumers in elevated areas to experience water shortage. Mr Nsubuga said this was due to the fact that in the high level system more pressure is needed to push water while in the low level system only a little pressure is required. In both cases, however, consumers' supply is by gravity.

Once water has reached the consumers the corporation increases its interest by caring for the sewage from the customers' premises. These are collected through the network of sewer-system to the sewage treatment works. After the wastes have been treated and the impurities have been moved the final effluent is discharged back to the lake.

Before water goes back to the lake it has to be purified so as to remove as much impurities as possible. The impurities contained in used water appear in two major forms. Thus the floating matter and the dissolved impurities.

Accordingly, the sewage treatment plant operates in two major streams whereby the suspended matters are treated first and then the dissolved matters.

All the sewage enter the sewerage works at the inlet works. In the course of primary treatment the floating matters are removed by screens or comminutors. This is followed by the removal of grit--the heavy matter which appears like sand. Then the flow goes through the recorders to the sedimentation tanks where the floating matter, mainly organic, settles down by plain sedimentation.

The matter which settles down at this stage is known as sludge. This is where the treatment system also divides into two streams.

The sludge is discharged to the digestion tank where it is decomposed by the anerobic bacteria. In due course the methene gas, carbon dioxide and water are removed. The methene gas produced has the British Thermal Unit (BTU) in the order of 750 per cubic foot.

After digestion the sludge is dried for a period of 3 weeks and then it is processed with elephant grass to produce composite manure which is said to have more manural value than the ordinary artificial fertilisers.

The sludge which is not processed is sold as sludge-manure but of inferior quality. The water coming out of the sedimentation tanks at this stage known as tank effluent, is discharged over biological beds. The beds consist of loosely stacked granite stones which enable light and air to pass through.

Inside the filter body is a biological film with numerous micro-organisms such as earobic bacteria. The tank effluent is evenly sprinkled over the surface of the bed by rotating the distributing arms. As the water percolates through the filter media the micro-organisms oxidise the dissolved impurities thereby purifying the water.

The purified water is discharged to the humus tanks. The humus sludge which might have been washed from the filter beds is removed so as not to pollute the receiving waters. The final affluent which has been purified is charged to a water course many miles away from the main pumping station.

CSO: 4420

USSR

PROPOSAL FOR ALL-UNION INTER-SECTOR CENTER TO DEAL WITH WATER POLLUTION

Moscow VODNIY TRANSPORT in Russian 25 Jan 77 p 2

[Article by G. Dolgov: "Departmental Reefs in Port Waters. For Successful Work To Protect the Water It Is Necessary To Create an All-Union Inter-Sector Center"]

[Text] Every city has preserved a few small, quiet lanes in which you find wooden cottages with three or four windows, nestled among thick stands of lilac bushes. In addition to their architectural and museum interest, they have also retained the old style way of life. Every homeowner there is responsible to clean the sidewalk and road in front of his house. When you walk along such a lane it's almost as if you were meeting the people who live there. In this house, for example, lives a fastidious and diligent person: he has cleaned the snow away down to the pavement, and the sidewalk is swept. Yet his neighbor has not even started on the job, and so you have to trudge through snow drifts. The owner of the next house, evidently, does not have a scraper: the upper layer of the snow has been shoveled, but underneath there is a layer of ice. To be frank about it, such lanes are only rarely cleaned up as they should be. It is just like on the job: the individuality of the approach toward the work, the technical equipment level, and the availability of manpower constitute objective factors.

Something like that is taking place today on our blue roadways and areas--the rivers, lakes, sea ports and river ports. Our country is focusing considerable attention on environmental protection, including protection of the water, rivers, seas, and lakes. In recent years a large number of governmental decrees have been adopted aimed at resolving the problem. During this five-year plan alone measures relating to environmental protection have been allotted 11 billion rubles by the state. A substantial portion of this amount is earmarked for the protection of water from pollution.

However, the return on the use of allocated funds is not yet very high. This is primarily because the present system of organizing the protection of water is suffering from a large number of serious shortcomings. It must be admitted today, unfortunately, that the protection of the water in our ports from pollution is structured on the principle of those quiet

city lanes. Thus, the Zolotoy Rod of Vladivostok Bay is divided into sections, each of which is under the supervision of a certain department. All of them have special technical equipment, but it is being used at barely half capacity. The extent of equipment used depends entirely on which way the wind is blowing. If it is from the south, the merchant port's petroleum waste boats come out to take care of their section. If the wind shifts and comes from the north, the sailors tie up to shore and the fishing port's "janitors" head out onto the water, because then the pollution comes into their segment. Incidentally, fines are also imposed on the various organizations depending on the direction of the wind.

In Vladivostok the masters of the bay are the relatively large enterprises which are capable of acquiring the necessary technical equipment. Moreover, in many ports even small organizations have access to the water. So they do pollute it, but they cannot help clean it up: they do not have the equipment. For them, as a rule, measures aimed at protecting the water environment are unprofitable; naturally, this does not help them to expand.

But even for the "rich masters" conducting an effective campaign to prevent water pollution is not so simple. The amount of technical means being produced is not sufficient to meet their rising needs. Such equipment is not basic to the plants which manufacture them, and for this reason, to put it mildly, they are not enthusiastic about it. Last year, for example, the Arkhangel'sk sea port was supposed to get a bilge water collector from the Baku Plant imeni Vano Sturua. Yet an entire year has gone by, and the northerners are still waiting for the promised vessel.

Not having much faith in planned centralized deliveries, many enterprises are undertaking to develop and build various kinds of protection equipment using their own resources. But doing so is the same as having specialists spend their time on, so to speak, "acquiring a bicycle." Thus, the engineers of the Vladivostok merchant port have independently designed and put into operation floating barriers, a vessel to pick up dry waste and sewage from ships, and a bilge water collector. Naturally, specialized equipment developed in this home-made fashion is far from perfect, and it costs a great deal to manufacture. And yet there are plenty of ready-made designs which the Far Easterns could use. It is, however, extremely difficult to get them, because there is no smoothly functioning system of scientific-technical information exchange in this field.

At the present time there are a number of departments engaged in developing technical means and measures relating to the protection of water resources. Primarily these are sectors that are directly related to the operation, construction, and repair of water transport facilities: the Ministry of Maritime Fleet, the Ministry of Fishing Industry, the Ministry of Ship Building Industry, the Ministry of Timber and Woodworking Industry, and the Ministry of the River Fleet. Every one of these has one or several organizations which are handling practically the same tasks; they are duplicating one another's efforts. At present no one is involved in

coordinating their efforts and formulating directions of scientific research uniform for all. As a result, material and technical resources are being frittered away, and the sphere of application of the equipment being developed is becoming too narrow. The petroleum wastes collector design No 2550 which was developed by the designers of the Black Sea TsPKB [Central Planning and Design Bureau] had a number of serious defects. It is true that later on the design was substantially improved, but the latest model, which is already in production, does not yet match the standards of the best world samples.

The dissipation of manpower and funds channeled into water protection is affecting more than just the development of the technical base. No less important is the problem of supervising the condition of port waters. At present the number of organizations engaged in this vital and crucial mission is extremely large. In Leningrad, for example, there are more than a dozen. At the risk of boring the reader, I will nevertheless attempt to list them: the Leningrad Oblast Committee of People's Control; Leningrad City Soviet Executive Committee for the Protection of the Environment from Pollution; the Northwestern Basin Inspectorate for the Protection of Water Resources of the USSR Ministry of Land Reclamation and Water Resources; the Spetstran [Specialized Transport Administration] of the Leningrad City Executive Committee; the Northwestern Basin Administration for the Protection and Reproduction of Fish Stocks and the Regulation of Fishing; the Basin Sanitary-Epidemiology Station; the Northwestern Sanitation Inspectorate of the USSR Ministry of Fishing Industry; the Leningrad City Executive Committee Permanent Commission for Land Use and Environmental Protection; the Leningrad City Council Executive Committee Administration of Water Management; the All-Russian Society of Environmental Protection; the Leningrad Oblast Council of the Scientific-Technical Society Committee for the Protection of Water Resources; Main Administrations and Ministries on the Basis of Affiliation; Rayon Executive Committee of the Soviets of Workers' Deputies; and the Port Authority. And all of these organizations, while doing practically the same work, have established practically no creative or business ties among them.

With this large amount of supervisors, the working time of the specialists is being spent unproductively--both those who do the checking and those who are checked upon, because all of these organizations are in general duplicating one another. But despite the fact that we have so many guardians of our water, up to now there are practically no objective means of checking on or methods of determining those who are guilty of pollution. And this is because no one is seriously involved in working them out. All of the concerns of the supervising organizations boil down in essence to two problems: obtaining various reports and imposing fines and penalties. But even here there is no coordination among them. Every organization requires accounting on its own forms, and every one imposes fines and penalties only in terms of their own guidance materials. As a result, specialists of enterprises fronting on port waters every year write up an

enormous quantity of various report documents, and at that they never know which organization will fine them next time, when, for what, and in what amount.

But the problem is not just a matter of the number of supervising organizations. The trouble is elsewhere: for all the excess authority there is no organization or institution which can provide effective help to production and transport organizations in combating water pollution. Water transport enterprises have no such specialists at all. And not a single school is training them for water transport work.

The problems relating to the organization of protection against water pollution are not in general new to the specialists who are involved in this matter. Such problems have frequently confronted the staff members of the social experimental design bureau, which functions in affiliation with the Leningrad Basin Scientific-Technical Society of Water Transport. At the initiative of the bureau's director V. I. Yarosh a thorough analysis was made of the situation with respect to preventing water pollution in the sea ports and river ports; the basic shortcomings in the organization of such effort were determined. The data obtained served as the basis for a proposal formulated by the Leningrad workers to resolve this most vital problem. In essence it involves setting up a powerful scientific-production association to take over the functions of a single, all-powerful, conscientious, and diligent boss of all the waters.

In order to check on the correctness and timeliness of the proposal, the Leningrad Basin Administration of the Scientific-Technical Society of Water Transport sent out letters to the interested organizations, institutions, and enterprises. In Leningrad I was shown a thick bound file of letters in answer to them. Dozens of letters from maritime and river shipping lines and ports, scientific-research institutes, main administrations and administrations of the Ministry of Fishing Industry, and ship repair plants. Every page in the file confirmed the importance and urgency of the problem, and expressed agreement and support for the proposed solution. I should like to quote from several of them.

"The management of the Murmansk merchant seaport believes that the creation of an All-Union Inter-Sector Scientific-Production Association is extremely essential and it is already high time such an authority was set up."

"The realities of the situation dictate that decisive changes be made in the system of protection against water pollution, transferring the entire complex of these problems to a single All-Union Inter-Sector Scientific-Production Association," comes the answer from the Irtysh River Shipping Line.

"The Black Sea Shipping Line is in agreement with the Leningrad Basin Administration of the Scientific-Technical Society of Water Transport and believes that the time is long since ripe for combining the efforts of the various organizations and departments to combat water pollution."

"The Klaypeda Department of Giprorybflot [State Planning Institute of the Fishing Fleet], which within the system of the USSR Ministry of Fishing Industry is the base organization for the prevention of the seas by ships, is in complete agreement about the necessity of combining the efforts of various ministries and departments to effectively combat the pollution of the water basins."

It would be possible to quote many such statements. But all of them boil down to one thing: it has become high time to set up a unified all-union center to protect against water pollution. The proposal of the workers of Leningrad is also supported by the USSR Academy of Sciences commission for the formulation of problems of protection of natural water resources.

This unanimity of opinion is no accident. The remedy proposed by the workers of Leningrad to resolve the situation is a genuinely effective and workable proposal. The creation of an All-Union Inter-Sector Scientific-Production Association to protect water resources from pollution would make it possible to immediately resolve a number of problems. It would become realistically possible to conduct serious scientific research into this problem, and on that basis to design technical means to combat pollution and develop equipment to check on the condition of the waters. The supervising authorities of the association would be given the functions of all of the organizations now engaged in checking on the condition of the water. Naturally, at the same time they would retain the right to impose fines and penalties. The scientific-production association would also be involved in cleaning up the surface of the water, the shore line, and the sea floor in the case of accidental pollution, also organizing the exchange of information and advanced experience, publicizing the tasks involved in combating water pollution, and training specialist cadres.

The creation of a single all-union center would make it possible to put an end to the dissipation of funds and material resources allocated at present to combat water pollution, to raise such efforts to a higher scientific-technical level, and to make them more genuinely effective.

And the main thing that the creation of such an association would bring about would be clean water in our basins. Having at its disposal experienced specialists, modern equipment, and up-to-date devices, such an association could solve problems of water protection in an integrated and long-term fashion. It is perfectly clear that with the present organization of such efforts it is hardly possible to successfully resolve the problem of water resource protection. And the sooner it is changed the greater will be our contribution to the cause of environmental protection, to the cause of resolving one of the most vital tasks of our day.

GREECE

ELEVSIS AREA POLLUTION SEEN VERY SERIOUS, SOLUTIONS SOUGHT

Athens TA NEA in Greek 27 Jan 77 p 7

[Article by Khara Kiosse]

[Text] For some bureaucratic reason, a pollution-measuring station has not yet been established in Elefsis! The area in question is that in which the greatest number and the heaviest industries are concentrated, and which contains the most labor-intensive city in the country. This delay is occurring despite the fact that the outlay for both the equipment and the scientific personnel has been included in the budget of the municipality of Elefsis since last year.

The state itself ought to have taken the initiative on the measure in question, inasmuch as it declares that it is the maker of social policy. Such a station should have been established on the initiative of those ministries which have direct responsibility for the health and quality of life of the residents of this city which has the country's heaviest industries.

It shows a lack of seriousness to talk about the protection of the environment, when the appropriate ministries refuse to admit (or perhaps they have not yet thought about it?) that they ought to first of all measure the poisons in the air and in the sea around Elefsis.

Admittedly, the implementation of measures for the control of industrial pollution on the part of the state is a difficult task, and it is a task which will meet with obstacles.

Absurd Behavior

Let us not forget that an analogous effort made by the municipality of Piraeus to keep down industrial pollution in this city had been characterized by a spokesman of the industrialists as a "piece of candy which we are giving to the people to suck on."

There was a similar reaction to the first timid measures which the government tried to impose for the protection of the environment from industrial wastes--the charge had been made at that time by a spokesman for the Chamber of Industry that "the government is possessed by a mania for social reform."

Nevertheless, it is absurd to earnestly discuss the issue of the protection of the environment and the prospect of our entry into the EEC, and yet not to make a public-health study--by the University, for example--on the consequences of pollution to the population of Elefsis, and to delay for bureaucratic reasons the installation of equipment for measuring pollution here. If we do not measure the pollution at Elefsis, where will we measure it--in Kifisia?

Proposals Described

In order to propose practical ways for dealing with pollution in Elefsis and so as to take immediate steps to reduce this evil, a large meeting took place yesterday evening at the Elefsis town hall, to which representatives of the church, the government, and the political and intellectual communities were invited.

The mayor and the municipal council of Elefsis, in collaboration with Polytechnic professor Valkanas and his scientific staff, have since last year been mobilizing their efforts to keep down the further dirtying of this most heavily-polluted city in the country.

For the sake of the immediate curtailing of this evil, the municipal council of Elefsis is proposing certain practical measures, which are the following:

The Elefsis area should be considered to be an "exceptionally polluted" area, and measures should be decreed analogous to those being implemented around the world.

An anti-pollution station should be opened up immediately--a station which, in cooperation with the Polytechnic and the appropriate departments of the Ministry of Social Services, should publish regularly a bulletin on pollution data.

Pollution and Industries

The decision of the government on the non-establishment or extension of industries in the Attiki area which have power requirements greater than 50 horse-power should be implemented.

At this point, the municipal council specifically requests Mr Katsaounis, deputy minister of industry, to refuse to grant a permit for establishing a soap-making plant to the Viomikhanía Elaíourgiki company, and to annul the expediency permit which was given to it under the dictatorship.

It likewise is asking for the closing of the Kouramani kernel oil plant in the Sarandapotamos area, all of the wastes of which are being discharged untreated into the stream, and these are creating a dark and fetid lake filled with mosquitoes.

Finally, it is requesting a check on whether the Alouminoplastiki company is dumping wastes into a well 80 meters deep, creating the danger of poisoning all the underground water in the area.

Measures should be taken for the protection of the environment by the Khalyvourgiki company. Reports from various reliable sources state that the engines of the Mirage and Phantom airplanes located at the Elevisis airport are experiencing damage from the pollution in the air.

Surely it would be advantageous if the municipality, or the appropriate ministry, were to carry out a check in connection with this matter, given that issues both of safety and of tremendous expenditures are involved.

Contract Revisions

Another measure which the municipal council of Elevisis is proposing is the revision of the agreement with PETROLA and the unconditional revocation of the ceding of new land areas for the expansion of its refinery.

Once again, this involves an agreement with the dictatorship which in the 2 1/2 years of democracy has not been revised, and on the basis of which 2,000 stremmas of dry land and 900 stremmas of rock fill in the sea are being ceded to PETROLA for expanding its facilities. At the same time, it is being requested that crude petroleum come to Elevisis via a special pipeline, and not by ship, from this same company's refineries located in Pakhi.

Removal of Plants

Finally, the council requests that the Bodosaki gunpowder factory be moved away from Elevisis, in that it is an exceptionally dangerous industry for a city of many inhabitants. It should be noted that the Bodosaki gunpowder factory is located next to the facilities of the PETROLA company, where there are 200,000-ton oil and gasoline tanks.

Two months ago, there was a fatal accident of a 20-year-old worker from a mortar shell explosion, and just last week there was another, likewise fatal, accident of a worker due to an ammunition explosion, in which another person was injured.

The nearness of a gunpowder factory to an inhabited area is dangerous, but this danger becomes a frightful one when close beside it are gasoline tanks as well.

In his concise advisory report, the chemical engineer G. Ambatzoglou, scientific advisor to the municipality of Elefsis, stated that despite the fact that the large industries of the area (Aspropyrgos refineries, PETROLA refineries, Khalyvourgiki company, Khalyvourgia A. E., Titan, and Khalyps) had declared that they desired to be of assistance in solving the problem of the pollution of Elefsis, they have so far not even responded to a simple information questionnaire sent out by the municipality.

Present at yesterday's meeting was a representative of the metropolitan of Megara-Salamis, the deputies N. Papailias (EDIK [Democratic Center Union]), G. Katsigiannis (ND [New Democracy]), and N. Farrakos (KKE), and a representative from PASOK [Panhellenic Socialist Movement]. Also taking part in the meeting were the mayors of Aspropyrgos, Mandra, and Magoula, and the deputy mayor of Megara. Likewise present were representatives of the environmental department of the Ministry of Merchant Marine, of the Technical Chamber, of the Metsovion Polytechnic, and of the ERYEA [Greek Research Association for the Control of Water, Land, and Air Pollution], as well as all the officials of the city.

12114
CS0: 5000

GREECE

PROPOSALS MADE TO CORRECT ATHENS POLLUTION

Athens TA NEA in Greek 21 Jan 77 p 13

[Text] The Ministry of Social Services has made 39 proposals for the reduction of pollution. These proposals are included in a study which began to be undertaken in September 1973 and which will be completed in about 2 years.

Cooperating in the making of this study--the findings of which up to date have been published in a four-volume report which has been distributed to ministries and other agencies--have been the Greek government (represented by the Ministry of Social Services) and the United Nations (represented by the UNDP--that is, the United Nations Development Program--and by the World Health Organization). This study has four chief sections: Atmosphere, Water (sea), Wastes, and Noise.

These proposals, which are preliminary and are based on an initial evaluation of the data, are divided into two parts.

The first 11 proposals concern the taking of immediate measures for reducing the levels of particulates, and they do not require any additional expenditures of public appropriations.

These proposals are:

1. A gradually-imposed ban on the use of mazut, and its replacement by diesel oil or by a special "heating fuel" having a reduced sulfur content (less than 1 percent).
2. Proper operation and regular maintenance of combustion systems.
3. A ban on the burning of scrap materials and by-products in outdoor areas.
4. The taking of measures in the industries (for example, the cement industry) to avoid the creation of dust in the course of storage, transport, and use of materials.

5. Strict implementation of regulations having to do with the installation and operation of industrial dust-collectors and filters.
6. Regular cleaning of the streets and squares with brooms so that they do not give rise to dust, and washing them down.
7. Systematic wetting-down of work areas where there are demolitions, road excavations, and generally on projects which create dust.
8. Immediate removal, following the termination of projects, of the deposits of materials or products of excavation from roads and other public-use areas, and their sweeping and washing down with water.
9. Transporting of particulate construction materials and excavation products away from projects by means of covered trucks.
10. The covering of sand, gravel, and other construction materials which are stored in open-air areas.
11. Strict control of quarrying operations, and the banning of the most adverse ones with respect to dust emission and proximity to inhabited areas.

Costly Measures

Aside from these "immediate measures" for the reduction of pollution in the atmosphere, a number of other measures are being proposed which, as is stated in the report:

"are deemed to be more costly, and whose implementation is considered to be more difficult from the technical, economic, and political points of view."

And these measures are:

1. Adoption of an inspection system for the proper installation and operation of fuel burners.
2. Replacement of the existing system of heating, according to a fixed timetable, by a thermostat system which will take into account the external atmospheric temperatures.
3. Observing of reasonable maximum temperatures in heated areas (18-20 degrees Celsius for residences), and automatic regulation, preferably with thermostats.
4. Improving the thermal insulation of buildings.

5. Enactment of emission standards, and systematization of the inspection of heating facilities.
6. Encouragement of the use of solar energy for the heating of water and for many other feasible uses.
7. If it is permitted by economic conditions, the use of natural gas or electric power for heating is recommended.
8. The construction of general heating systems, on the basis of entire building units, instead of individual systems for each residence.
9. Introducing into the construction ordinances of provisions which are aimed at the better insulating of buildings.
10. The setting of standards for the emission of combustion gases, the passing of relevant legislation, and the development of an enforcement system.
11. Obligatory equipping of all vehicles with suitable exhaust gas control devices.
12. Reduction of the lead content in gasoline to the levels of the Common Market countries (0.4 grams per liter).
13. Development of a regional traffic system (regional highways, approach roads, cloverleaves, and so forth).
14. Gradual construction of a complete network of metropolitan underground railways (metros).
15. By enactment, making it obligatory that newly-imported vehicles (including two-wheeled and three-wheeled vehicles) measure up to the specifications of the countries of the Common Market, from the point of view of quality of emitted exhaust gases.
16. Drastic reduction (allowing traffic on alternate days) or even banning of private automobile traffic in the Omonoia-Syntagma Square zone during peak hours (primarily from 600-900 hours).
17. The setting of differing times of commencement and ending of work for employees of civil services, organizations, and private businesses.
18. Enactment of emission standards for air-borne wastes, and effective checking of the observance of them by specially-trained teams.
19. The legislating and implementing of regulations which require the installation and operation of effective pollution control devices on the part of all industries.

20. Extension of incentives for the use of industrial production methods which cause minimal pollution.
21. Gradual introduction of environmental considerations in land-use planning, for the purpose of moving industries which cause pollution to areas where this problem can be dealt with more easily.
22. Gradual paving of the roads, and keeping them in good condition.
23. Covering with blacktop the outdoor automobile parking areas.
24. The planting of trees and covers of greenery on bare public-use areas.
25. The general planting of trees on public lands in the Athens basin.
26. The asphaltting of all roads, and the regular maintenance of them.
27. Systematic measures for cleaning up urban public-use areas and bare private building-lot lands.
28. Elaboration of a study on the advisability of utilizing other fuels as alternatives (for example, gas) for public transportation vehicles within urban areas, taking into consideration the technical and economic factors, as well as safety factors.

The sulfur dioxide pollution in downtown Athens for the 7-day period from 9 to 15 January was calculated at 218 micrograms per cubic meter.

It should be noted that international specifications for sulfur dioxide concentrations, according to the guidelines of the World Health Organization, are 60 micrograms per cubic meter of air as an average value, and only once a year is a maximum value of 365 micrograms per cubic meter to be permitted.

For the same week, the maximum value for sulfur dioxide in Athens was 345 micrograms per cubic meter.

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GREECE

PROPOSE AREA RESTORATION FOR PENDELI QUARRIES

Athens O OIKONOMIKOS TAKHYDROMOS in Greek 13 Jan 77 p 30

/Article by St. P. Drosos/

/Text/ The decision forbidding the operation of the Pendeli /mountain/ marble quarries should be rescinded and the 40 concerned companies should assume the obligation a) to remove at their expense and within 2 to 3 years the immense quantities of latypi (by-product of marble quarrying) which have been piling up for decades and have given Pendeli an ugly appearance, b) to completely restore the landscape by planting trees at their own expense and c) to continue the exploitation of the quarries through underground borings with the most modern machinery and in a way that will not harm the environment.

The above categorical statements-proposals were made during a press conference on 16 December by Athens Chamber of Craftsmen /VEA/ President K. Voyiatzis and Marble Quarrymen's Association "Pendelikon" /ELM/ President I. Kalandzis. Both said that these proposals are based on a 1975 and heretofore unpublished comprehensive study by the National Institute of Geological and Mineral Research (now the Institute of Geological and Mineral Research /ETHIGME now IGME/)--an organization which is under the absolute jurisdiction and control of the Ministry of Industry and Energy. They added also that these proposals were submitted to Minister K. Konofagos in writing who did not pursue the matter further and that the 40 concerned Pendeli enterprises made it clear in their proposals that they are ready to give tangible guarantees that they will carry out their obligations.

In response to a question with regard to the cost of removing the latypi (including the construction of approach roads) and to the restoration of the landscape, the two presidents said the following:

An economic-technical study shows that the outlays /for implementing these proposals/ will be more than covered by the exploitation of latypi which is an invaluable material. More specifically, the marble powder produced by crushing latypi with special crushing machines besides being used as

a basic material by the glass industry can be used also for plastering. On the other hand, the marble powder, especially the one derived from the Pendelic latypi, is used in producing lime carbonate which is an invaluable raw material used by the chemical industry. Already some Pendeli marble quarrying enterprises are using to best advantage such latypi by producing lime carbonate which they sell in the Greek market at 800 drachmas per ton compared to the manifold price of the imported product.

It was also pointed out that many enterprises would have undertaken such exploitation of the Pendelic latypi had it not been for the monastery which considers Pendeli its property and which prevented them from doing so up until a while ago. It was said, moreover, that the gravel produced when latypi is crushed is being used by the industry for making various construction materials.

It was subsequently pointed out that the Pendelic marble is unique in that it contains a miniscule quantity of iron, a fact which makes it extremely durable against time and unaffected by weather conditions. It is for this reason that its demand abroad is tremendous--a demand which can ensure the influx of tens of millions of dollars in foreign exchange annually.

By way of illustration, it was mentioned that eight Pendeli marble enterprises received last year and thus far in 1977 orders from abroad valued at 2,036,000 dollars and that those of the orders which are due for delivery next year and valued at 8 million dollars may be cancelled because of the decision forbidding the operation of the quarries. Of interest are the following highlights from statements made by the two presidents:

- a. The Pendeli marble reserves are enormous and the relevant deposits very deep.
- b. The marble on that side of the Pendeli mountain which cannot be seen from Athens is of much poorer quality and of limited quantity.
- c. Almost all economically exploitable deposits of this section of Pendeli are controlled by two enterprises--the "Dionysos," which is a private company, and the Ellinika Marmara (Greek Marbles), which is state owned (and a subsidiary of the Hellenic Industrial Bank).

The two speakers claimed on the other hand that both VEA and ELM have been ignored up until now by Minister Konofagos who did not pay attention to their demands and failed to establish a dialogue. They added that the 40 Pendeli enterprises are willing to participate in any public discussion with any authorities.

Finally, the two speakers said that they will appeal to Premier Karamanlis to meet with representatives of the enterprises who will explain to him their problem because they believe that the premier as well as the deputies

and public opinion have been misled on the whole question--a question which Deputy Ippokr. Savouras who was present during the press conference promised to introduce in the Chamber of Deputies.

Before closing this article we should add that the mistreatment of the Pendeli question has been attracting the attention of the press for many years now--an attention which reflects the concern of a great part of public opinion (which is constantly increasing) about the destruction of the landscape in Attiki (the Pendeli mountain constitutes an important lung and area of greenery and recreation) as well as in other various parts of the country.

However, the analysis of the Pendeli and the marble quarries problem during the press conference adds a new dimension. More specifically, the preceding formal, responsible and categorical statements which are based on a study made by a responsible state agency--the then ETHGME--could perhaps, if not for certain, give a solution to this burning and chronic problem, a solution which could satisfy all parties concerned. On the one hand it will completely restore the landscape (we see no other solution for such restoration) and on the other hand it will ensure the operation of the 40 quarrying enterprises which employ hundreds of workers and employees and the export of the "white gold" as the unique Pendelic marble is called.

The restoration of the dialogue between the Ministry of Industry and Energy and the marble quarrying enterprises which consistently have been asking for such a dialogue (but which the authorities declined) is dictated by the very nature of the democratic regime which functions (even if presumably) in our country. But the overall interests of the Greek economy also dictate such a dialogue. The same is true about a "round-table" public discussion which the enterprises and VEA are consistently demanding. "Something good rather than bad" can come out of such a discussion in which representatives of the former ETHIGME (now IGME), of cultural societies, etc., should participate along with government officials. The appropriate authorities should take into consideration these proposals and should take the proper steps. The issue is very serious and no decisions should be taken haphazardly and lightly.

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GREECE

THERMAIKOS GULF POLLUTION MEASURES UNDER DISCUSSION

Article O OIKONOMIKOS TAKHYDROMOS in Greek 27 Jan 77 p 16

[Article by Nikos Samaras]

[Excerpt] The pollution of the environment is a problem which should concern not only the city planners but the municipal authorities as well. And by sea pollution we do not mean only the pollution of the sea by oil leakages from ships but also by industrial and residential wastes flowing into the port waters and by the escape of dangerous gases over the port area.

The pollution of Salonica's natural environment for instance is a very serious problem according to a study by A. Filippou, a member of the Northern Greece Ministry Council for the Protection of the Environment. The very location of the city favors pollution. The bay's waters are easily polluted from various wastes since it is a closed bay. About 950 tons of waste are poured into the bay daily (according to 1975 statistics) excluding the industrial refuse. The impact of the pollution is unfortunately not limited only to the bad smell from the sea nor to the lack of swimming during the summer and the lack of shellfish and fish from the Thermaikos Bay. The oil leakages cause on the one hand the disappearance of plankton which is known to produce 80 percent of the oxygen in the atmosphere [sic], and on the other hand they form a thin film on the sea surface which delays evaporation. This in turn leads to less rainfall with serious repercussions: gradual change in climate, warmer summers, more humid winters and more illnesses. Salonica has 200 days of complete air stillness annually. Thus the polluted and unhealthy air remains over the city 200 days a year. In the past we had the famous "Vardaris"--a strong cold wind which blew over the city from the island and filtered its air. But because of bad zoning this wind does not blow any more.

A man can live 40 days without food and 5 days without water. But he can last only 48 seconds without air. The problem therefore is serious. The pollution is not limited only to air but is extended to fresh and sea waters. The responsibility of the industry is known. But this responsibility and its regulation by legislation is not sufficient. The pollution problem from the point of view of the seaports should also be taken into consideration.

NETHERLANDS

ATOMIC WASTE DISPOSAL POSES NO PROBLEM

Amsterdam ELSEVIERS MAGAZINE in Dutch 22 Jan 77 pp 27-31

[Article by Pierre Huyskens: "Storage Mine for Nuclear Waste: Solution Which Is Not (Yet) Acceptable -- Who Is Afraid of Nuclear Energy? (V)"]

[Text] Scientists at the Energy Research Center in Petten are convinced that an exploratory boring in North East Netherlands, under Groningen and Drente, will reveal a salt dome in which, for a period of 40 business years, the Netherlands will be able to dispose of the highly radioactive wastes from its highly developed nuclear energy industry, easily and very safely. Waste disposal is no longer a problem. The problem is that nuclear energy is not acceptable while the burning of coal for energy stations is. The experts find this incomprehensible.

Aside from the fear which makes people shudder at "nuclear fission," as if unscrupulous scientists with little respect for either the purity of the biosphere or the balance of nature were recklessly releasing cosmic, uncontrollable forces capable of destroying the whole world, the main stumbling block for the development of nuclear energy is the so-called "problem of radioactive waste." Many think that this problem is not sufficiently solvable. The creation of nuclear energy from the essence of matter does indeed not go unpunished in that once nuclear fission has been set in motion, it will continue to be radioactive for years and even centuries and, consequently, the need arises to store it, without damaging any kind of life, in a place where it will do no harm. Where is considered a foregone matter by the experts.

It is deep in the earth, somewhere "within the Geological Time Scale" at levels where -- as far as North East Netherlands is concerned -- 220 million years ago rock salt was formed, where the Tertiary and Quaternary, the Upper and Lower Cretaceous, the Triassic and Jurassic prevailed: "movements" which can no longer be measured in ordinary time periods but only in eternities, which have determined the appearance and nature of the earth. If radioactivity is to be exorcised and made harmless, it will have to return

to that "past": back thus, as a poet might put it, to the essence of the matter from which it was called forth. It is at a depth of approximately 800 meters, a level which is easily reached with modern mining technology, that the partially stripped Carboniferous formations -- under Limburg -- can be found, and that the rock salt domes of the Zechstein period -- under Groningen and Drente -- lay "sleeping." In that salt, once a tropical sea, now dried out, because where there is salt there cannot be any water, radioactive waste shielded from the biosphere by gigantic packings of hundreds of meters of insulating earth layers could become tranquil even if its ionizing activity lasts tens of thousands of years. "It is the solution," said J. Hamstra, a scientist at the Energy Research Center in Petten and drafter of a "safety analysis" for this kind of disposal.

While compiling his 1975 report for the Health Council, together with Dr Harsveldt and Dr B. Verkerk, he proceeded from the following realistic assessments:

- that a salt dome can be found in North East Netherlands, made up of good quality rock salt and large enough to be able to store the kind of radioactive waste which the Netherlands might produce during the next 40 years. The waste would have to be "consolidated," i.e. poured into insoluble glass blocks or metal and screened off by lead casings;

- that such a salt dome is also screened off from the hydrologic cycle (the ground water) by covering strata of rocks, and that its top is at least 250 meters below ground level;

- that the radioactive "solid" waste will be stored at a maximum depth of 1000 meters and at a distance of at least 200 meters from the top and from the "flanks" of the rock salt mass;

- that highly radioactive waste (hava [expansion unknown]) and nuclear fission waste will be stored only after a deterioration period of 10 years, and that waste with medium or low levels of radioactivity (mava [expansion unknown] and lava [expansion unknown]) will be stored after a period of at most 30 days.

The report concludes that "if it proves to be administratively feasible to assign one of the suitable salt domes for the disposal of radioactive solid waste, then it will be possible, by using established techniques, to build storage facilities which would guarantee a long term confinement of radioactive waste outside the biosphere." As far as the solidified nuclear fission waste, which is expected to be returned to the earth 10 years after having been used up, is concerned, a storage mine has been conceived in which drums of nuclear fission waste would be stored at a fixed distance apart from each other and, in the first instance, in a single plane of rock salt. Assuming storage at one level, approximately 800 meters below ground level, it would be possible to have an area of 2 million square meters available, in which 20,000 storage holes could be built. If a single 50 liter container of nuclear fission waste is dumped in each storage hole,

and if one considers a production of 90 liters of solid nuclear fission waste per ton of fissionable material and a yearly consumption of 27.5 tons of fissionable material per nuclear station of 1000 megawatts electricity, then that single storage plane would provide enough space for all the nuclear fission waste produced by 10 nuclear stations of 1000 megawatts during a period of 40 business years. And more "storage planes" are conceivable.

Three natural barriers, the rock salt covering itself (rock salt is one of the few totally impervious rocks in which "water encroachment" is impossible), the specific gravity of rock salt brine (which could result from the dissolution of rock salt in water, but which would then protect the underlaying rock salt in which the nuclear waste is stored against further corrosion) and the rock layers which lie on top, prevent the return of radioactivity into the biosphere. The long term confinement -- 20,000 years for technetium and at least 150,000 years for the transuranic elements and subsidiary nuclides such as plutonium and radium -- ensures that radioactive waste is no problem. The safety analysis further states: "To be noted, not as a barrier, but rather as a negative and at the same time useful secondary phenomenon, is the brinification of the ground water which results when a salt dome is affected underground. A certain reduction in the salinity can be achieved through mixing with sweet ground water from the top soil. By building a salt well at the place of the underground waste storage, any corrosion of the salt casing would be signaled many thousands if not tens of thousands of years before any radioactive pollution of the briny ground water would take place."

The report concludes that human operations and human failure would cause only an incidental and limited spread of radioactivity in the area surrounding the underground waste storage facilities, "and not a steady stream of radionuclides returning to the biosphere." Therefore the analysis was limited to "natural causes" which could weaken the durability of the salt cover and it assumed "pessimistically" that the salt dome used for waste disposal still is and will remain mobile, that breakage will occur in the underground immediately after the waste storage facility has been put out of operation, resulting in the water corrosion of the rock salt which would continue up to and including the dissolution of the radionuclides, which are present in the stored waste. The analysis showed that even then storage facilities in a salt dome can be considered "an acceptable radiologic risk," based on the many hours which would be needed to dissolve the radionuclides stored underground into drinkable ground water available for human consumption and based on the low concentration in which this would take place.

The safety analysis took into account extreme climatic changes which, after long periods of time, could have a disastrous effect on the biosphere. The possible corrosion of the durable salt cover through the impact of a heavy meteorite at the site where radioactive waste is stored was even considered: very large meteorites (throughout its history the earth has experienced four such massive impacts, the best known example being the 1600 meter diameter Barringer Crater in Arizona, caused by the impact of an 8 million ton meteorite travelling at a speed of 15,000 meters per second) could "crack" the

durable salt cover surrounding the stored radioactive waste. However, the probability that during a given period of 100,000 years a meteorite weighing 10 million tons or more would strike an underground storage facility at a depth of 400 meters, is only 1 in 1 million.

The authors added that "the preparation of this safety analysis and the calculation in terms of tens of thousands and hundreds of thousands of years to make it plausible that the storage of radioactive waste in an underground salt dome represents an acceptable risk even on a longer term, was done with full understanding of the relativity of applying currently prevailing standards to a society and a biosphere, the long term development of which cannot be surveyed."

In another publication ("Atoomenergie en haar toepassingen" [Atomic Energy and its Applications], July-August 1974) Hamstra again pursued the subject of the possible melting of nuclear waste contaminated rock salt into ground water: "The only way for ground water to come into contact with the nuclear waste stored deep in the salt formation would be if a more than 100 meter thick layer of rock salt were to be dissolved in that ground water. As a result of the prolonged contact with rock salt, the ground water would have turned into a saturated brine with a NaCl [Natrium Chloride] content of 300 grams per liter. If part of the stored waste materials were to become dissolved in this brine, then the increased specific gravity would be a plus because it would cause these brines at a greater depth practically to withdraw from any further ground water movements. Only through human intervention would it be possible for that salt water to return to the biosphere. This would require a difficult and costly pumping operation. The improbability of such an operation is best illustrated by pointing out that this salt water formation is useless for humanity, compared to the much more readily accessible shallow ground water and the much less saline seawater which is available in large quantities." In other words: if water from rock salt formations were to become contaminated with radioactive brine, it would not be fit to tipple. It would turn out totally undrinkable.

"I am not a man without a conscience," said Hamstra to the ELSEVIER reporter, while clarifying the model of a storage mine for radioactive waste. "I am neither for nor against nuclear energy, but it would be unreasonable if we were to be kept from pursuing our research on rock salt in North East Netherlands, especially since it has become known that it holds a solution for the waste problem." Further research is necessary because exploratory borings are supposed to reveal whether the preselection of these salt domes best suited for the storage of nuclear waste has indeed come up with the right "specimen." The boring cores which are brought up have to be analyzed geologically and in terms of their rock structure, and measurements have to be taken in the bore hole. If the result is negative, then another salt formation will have to be "pricked," according to a predetermined preference ranking. If the result of the exploration is positive (if the quality of the rock salt proves to be adequate and the underground situation of the salt dome is favorable for the projected goal), then a thermal analysis will still have to be made and a final division of the project, underground and

above ground, will have to be worked out. The building of the storage mine itself -- with two shafts, each 4.5 in diameter [as published] -- will be started with the "hollowing out" of a demonstration area, where a number of storage techniques will be tested with low and medium strength radioactive waste. The large scale development of the mine will produce a very large salt harvest, 1 million cubic meters. "The construction of the shafts will be paid for by the salt which is extracted," said Hamstra, and, including the contracting of the mine project, will provide 200 to 300 jobs.

Do the people in Petten really have no idea why Groningen and Drente, in whose areas the salt domes are located, are opposed to just such an exploratory boring and to the construction of a storage mine for radioactive waste? Does the negative administrative decision (which at this point could only be reversed by the government) involve some ill-will because the billions of guilders netted from natural gas barely profit the region which "holds" it, while it is considered good enough to serve as a dump for "the rotten stuff from that nuclear waste?" The experts from Petten do not know that. They could imagine protests against damaging half a hectare of agricultural land which has to be sacrificed for the above ground accomodation of the mine (but which can be nicely reforested again later) or against the burden on the roads caused by extra nuclear transport vehicles (but transportation by railroad could be looked into because it should be preferable). However, it would also be possible to imagine that precisely in North East Netherlands an increase in job opportunities might justify such small damages to the environment. "But, of course, that is not the core of the problem," said one of the staff members of the Energy Research Center. "People do accept our assurance that nobody will get killed, but, the thinking goes, we are cooperating on something which -- however peacefully it may be used and however carefully the risks involved may have been planned and scientifically declared acceptable -- does involve plutonium and, consequently, carries the possibility of bombs and destruction. In short, we are trying to provide space for nuclear energy underground. But we cannot. Because apparently nuclear energy is not acceptable. However, the burning of fossile fuels does not appeal to the imagination. And that we cannot understand."

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