

maintain and improve its position with respect to urban and rural water supply.

2. A major effort is needed in relation to rural excreta disposal and urban sewerage which will require a strengthening of national priorities to provide needed support.
3. Preparatory work through development of programs to achieve objectives in Water & Sewerage together with provision and training of professional and sub-professional staff as for example in the Ministry of Health Sanitation, Environmental Health, Epidemiology and Health Education Sections needs reinforcement.
4. There is need for a National Environmental Quality Control Agency to draw together and give direction to the many fragmented partial and poorly supported agencies involved in activities affecting Environmental Quality. As the great bulk of these activities directly relate to the Health and well being of the people such an Agency should preferably be established under the Ministry for Health.

A considerable volume of subsidiary legislation and regulations will be also needed but generally this needs to await analysis of the problems and development of trained people for management of activities.

5. Recruitment and Training of Professional Level Environmental Specialists is perhaps the greatest single need in this field. Competant leadership is a factor that cannot be dispensed with.

REFERENCES

1. "Proposed Sewerage Program for West Malaysia, 1972 - 2000".
Ministry of Health, Environmental Health & Engineering Section, August/72.
2. "Position Paper - Water Supply and Sewerage in West Malaysia - 1970",
Ministry of Health, Environmental Health Engineering Section, March 1973.
3. "Report on Rural Water Supply and Sanitation Program - West Malaysia"
Ministry of Health, Environmental Health & Engineering Section, November 1972.
4. "The Sewerage Backlog in West Malaysia - National Program Requirements" - Robert E. Stafford, BSc.C.E., R.A.S.C.E. World Health Organization,
Ministry of Health/Kuala Lumpur.
5. "Water Quality Objectives - General Policy Guidelines",
Ministry of Health - Environmental Health & Engineering Section - 1971.

The state of environmental pollution in the Philippines today

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INTRODUCTION

The satisfaction of man's basic needs depends upon his efficient manipulation of his own environment and its natural resources. In so doing various

forms of environmental degradation of pollution result. In the beginning he may not notice the existence of such polluted conditions, but because of the cumulative tendency of pollution and the non-

unlimited capacity of the environment to absorb pollutants, he sooner or later starts to feel its consequential menace. It was only within the last decade that he began to give increasingly great attention to pollution.

At the beginning, only the highly developed countries were concerned about pollution. Today, it has become a worldwide concern and even the developing countries have commenced giving the attention it rightfully deserves.

A review of the history of environmental pollution shows that Great Britain first experienced the tragic effect brought by pollution. Later, the United States had the same experience. Other developed countries soon followed. The tragedy occasioned by the occurrence of uncontrolled pollution hastened the enactment and approval of laws, rules and regulations on environmental pollution controls all over the world.

In view of the widening coverage of pollution, the United Nations itself became interested. In a formal resolution adopted in 1968 and with the acceptance of the host country, the first UN Conference on Human Environment was conducted in June 5-16, 1972 at Stockholm, Sweden to discuss matters involving global programs for pollution control.

The sad experience on pollution of the developed countries became a lesson to the developing countries. In their attempts to industrialize as quickly as possible, they are now seeking means of preventing pollution since remedial or corrective methods are more expensive.

Before proceeding any further let me proceed with a few definitions in order to clarify what we are talking about. *Pollution* is generally defined as the fouling of man's surroundings. When something dirties or contaminates air, water or land and makes it unfit for useful purposes, pollution has been created.

In a technical sense, however, pollution refers to the introduction of physico-chemical agents, micro-organism or other substances which change characteristics of the air, water or land making it dangerous to health or resulting in the interference with the normal use of these natural resources by the people.

In our law, Republic Act 3931, known as the "Pollution Control Law," pollution is legally defined as "the alteration of the physical, chemical and/or biological properties of any water and/or atmospheric air of the country as well or is likely to create or

render such water and/or atmospheric air harmful or detrimental or injurious to public health, safety or welfare, or to domestic, industrial, agricultural, recreational or other legitimate uses or to livestock, wild animals, bird, fish or other-aquatic life".

In brief, the term pollution maybe considered to mean anything that causes a change in the appearance, quality, usage or enjoyment of the air, water and other resources of our country.

2. MEASUREMENT OF POLLUTION

Pollution maybe expressed in a qualitative manner by degree of intensity or the seriousness of its effect on the environment. This non-quantitative assessment, however, is not conducive to scientific and systematic analyses and therefore could not, alone by itself, be utilized in arriving at a meaningful and precise determination of the existence of pollution.

The amount of pollutant in the environment is very often expressed in units called *ppm* or parts per million. This is so because the amount of pollutants both in air and water are generally so minute that expressing them in percent concentration would involve many decimals and therefore would be cumbersome.

Among the more important indicators of pollution is the dissolved oxygen content of water. When impurities are present in water especially organic, they tend to absorb and deplete this oxygen present. Normally clean waters should contain not less than about 7-9 ppm of dissolved oxygen depending on temperature. When this goes down below about 3 ppm fish and aquatic life forms start to die although there are some fish that can live for short durations even in polluted waters. When the dissolved oxygen drops to zero, septic conditions set in and the water begins to "demand" more oxygen. This amount needed by both chemical reactions and biological micro-organisms that break up organic matter into simpler forms, is called bio-chemical oxygen demand usually abbreviated into BOD.

Domestic sewage, on the average has about 100 to 300 ppm BOD but certain organic waste coming from distilleries, for example have as high as 4000 ppm BOD. Total solids are another indicator of pollution, the higher content denoting more pollution. Mine tailings, for example, can produce as high as 20,000 ppm total solids whereas the value in clean waters seldom reach 200 ppm.

In order for any water to be considered polluted, its content of certain elements or chemical, its BOD and its acidity or alkalinity must exceed certain standards which by previous experience have been shown to be acceptable as unpolluted. Thus the need for research in order to establish realistic standards.

Unlike water, contaminants in the air are expressed either in ppm by volume, ppm by weight or in micrograms per standard cubic meter. Clean mountain air, free of pollution, normally contains about 50 micrograms of particulates per cubic meter whereas city air in areas with average traffic and paved streets might have up to 200 micrograms per cubic meter. Another way to indicate atmospheric contamination is the amount of dust over an area and this is usually expressed in tons per square kilometer per month.

3. PRESENT POLLUTION LEVELS

A. AIR

From the surveys, investigations and inspections conducted by the NWAPCC, it was found that air pollution usually exists in urban areas and at factory sites.

In Metropolitan Manila, a continuing survey of the motor vehicles indicated a total of about 271,000 in 1970 and 280,000 in 1971. Estimates show that about 3,200 tons of particulate matter were emitted by these motor vehicles in 1970. Air samples from different traffic congested areas were also taken. Laboratory analyses indicated that in Plaza Miranda the monthly average from February to May 1971, a period of four months corresponding to the dry season exceeded the allowable carbon monoxide concentration of 30 ppm. Hourly observations show that this allowable concentration is exceeded during the rush hours in the morning and in the afternoon. Lead in the air covering from gasoline of motor vehicles, averages about 0.5 mg. per cubic meter.

Particulates in the air have been observed exceeding the allowable concentrations of 200 micrograms per cubic meter about 3 days a week. The monthly averages however shows that the allowable limit is not exceeded even during the summer months. Dustfall in the Manila area average about 14 tons per square kilometer per month. Surveys and air sampling on more factories are presently being conducted together with dustfall measurements. The study is still in progress and there are no complete figures yet to warrant conclusive results. However, one should consider the following factors which inevitably

tend to increase air pollution in the Metropolitan Manila atmosphere. (1) Less than 5% of about 500 factories surveyed and inspected have installed air pollution control devices like cyclones, scrubbers, filters and precipitators. (2) The sulfur content of most bunker oil fuel used by industry reaches as high as 3% thereby exceeding the NWAPCC standard of 1.5%. As a consequence the 67 factories in Metropolitan Manila already sampled for smoke emission have been estimated to be discharging 42,000 lbs. of sulfur dioxide in one day.

In Iligan City, air pollution has started to become a serious problem because of the increasing number of industries taking advantage of the proximity to cheap sources of electric power. Throughout the Philippines 13 active cement factories and 26 sugar centrals are contributing significantly to air pollution. The 13 sugar centrals in Negros have been complained of as causing both air pollution in the form of soot and fly ash, and water pollution caused by discharge of excess cane juice, waste molasses and other central related wastes. Most of these factories, however, are causing only localized air pollution problems.

B. WATER

There are some thirty (30) rivers that are or have been reported as polluted by industrial operations. The problem is most critical in the Greater Manila Area, notably the Tinajeros River, in Malabon Pasig River including its principal tributaries, San Juan and Marikina Rivers and numerous esteros in Manila proper; Calumpit and Balagtas in Bulacan; San Pedro River in Laguna and the Agno and Bued Rivers in Pangasinan. It is quite fortunate that the Philippines has a rainy season which tend to wash out into the sea during this period the accumulated pollution of these rivers.

In a recent examination of the quality of river water found in Metropolitan Manila, it was found that 60% to 70% of the total pollution load of the rivers is due to raw and partially treated sewage produced by the two million people in the Pasig River drainage area. The remaining 30% to 40% come from about 300 factories and industrial firms dispersed throughout the area. Of the factories there are 50 that are discharging approximately about 30,000 pounds of organic solids into the Pasig River.

In terms of pollution potential, the NWAPCC has classified industries in the Greater Manila Area in the order that they contribute to water pollution.

Textile mills are the heaviest polluters, the pulp and paper mills second and food processing plants, third. These are followed by the chemical industries, steel processing and glass manufacturing plants.

Although the Pasig River system is big, it can carry only so much pollution load, depending on the time and season of the year. During the wet season it can take care of the total pollution load discharged to it at present. However, during the dry months it can carry only less than half of this load. When this happens, the river becomes murky and gives off odors — the physical signs of heavy pollution. The Tinajeros-Tullahan River system, on the other hand, is comparatively small. Its capacity is inadequate to carry the tons of organic solids which more than 20 industries discharge to it in addition to the domestic sewage contribution from the general public. Thus, it stays polluted throughout the year and its polluted state only slightly decreases during the rainy season. The pollution of this particular river course is further aggravated and complicated by the illegal diking and reclaiming of river banks for real estate purposes leading to narrowing considerably and seriously affecting the flow characteristics.

All over the country, there are some fifteen (15) mining companies which process approximately 120,000 tons of raw ores a day. From 95 to 98% of this is thrown back into the nearby streams as mine tailings resulting in the siltation of farm lands, irrigation systems and fishing areas. Repair and maintenance of irrigation canals as a result of siltation have been estimated at almost a million pesos annually.

Silt is also carried down by heavy rains from denuded mountains. According to newspaper reports, our forests are being denuded at the rate of something like 3,000 hectares a day resulting in severe erosion of mountain-sides and siltation of watersheds.

4. CONTROL EFFORTS OF THE GOVERNMENT

In the Philippines, urbanization and industrialization had their beginning just after World War II. However, the pollution that results from industrialization did not create awareness on the public until the early sixties. It was in 1963 that a bill was introduced in Congress creating a government agency to safeguard the environment from the ill effects of uncontrolled pollution. Numbered House Bill 3554,

it was signed into R.A. 3931 by the President on June 18, 1964.

Briefly this law which is commonly referred to as the "Pollution Control Law," created the National Water and Air Pollution Control Commission (NWAPCC) and defined its composition, functions, duties and responsibilities. The main functions of the Commission are to determine the existence of pollution, to establish water and air quality standards, to promulgate rules and regulations and to require industrial establishments and other polluters to put up the necessary control works. The Law also explicitly defined a basic national policy which is to maintain reasonable standards of purity of the water and air of this country with their utilization for domestic, agricultural, industrial and other legitimate purposes".

Since the NWAPCC was organized in 1966, it has been continuously functioning and has maintained a continuing dialogue with the industry. Surveys and investigations of complaints against existing factories have been the routine and continuing work of the Commission and in which factories are assessed of their actual and potential pollution contributions.

Specific complaints received by the Commission against factories are given preferential attention and always an on-the-spot investigation of each case is conducted. Every survey, inspection and investigation made results in the preparation and submission of a report by the investigating engineer.

Based on the report, the Commission summons the respondent and complainant and to a formal public hearing to hear both sides. In the public hearing the complainant presents evidence in support of his complaints in the form of oral testimony and other documentary or material evidence, if any. The Commission in addition presents its own findings and report of its representative and offers the testimony of said representatives. Respondent is then given the opportunity to challenge and cross-examine the witnesses, including the complainant and the representatives of the Commission in accordance with the judicial doctrine of due process. This is then followed by the respondent offering its own evidence or rebuttal to impeach complainants assertions and to support its own defense. The records of the case are then consolidated and considered by the Commission sitting en banc. After a due deliberations, a decision in the form of an appropriate resolution is rendered.

If, as born out by the records, it appears that

there is actual existence of pollution, the Commission will resolve to issue an order requiring the respondent to construct adequate pollution control measures to reduce pollution to levels acceptable to the Commission within a reasonable period. While the required pollution control devices are under construction and installation, the industry is ordered by the Commission to stop discharging its untreated wastewaters into the river or to stop emitting air pollutants as the case maybe. The industry is directed to put up the temporary control works, if they wish to continue operation. In this connection the Commission has circularized local executives such as City and Municipal Mayors especially those in Greater Manila Area and the immediate neighboring provinces, requesting their cooperation in the implementation of the order requiring industries to put up necessary pollution control works. Follow-up inspections are conducted by the NWAPCC engineers from time to time and corresponding reports submitted.

If within the period specified in the Order, the respondent has not abided therewith or failed to install necessary control measure as shown by follow-up investigation report, the Commission refers the matter to the Office of the Solicitor General and/or the City or Provincial Fiscal's Office for the necessary legal and court actions.

A factory that is found and proved to be polluting the environment can't be forced by the Commission to summarily close shop because the Commission is devoid of this power. It is the local officials that could revoke the company's license to operate, since they are the one's issuing it.

The Commission has therefore circularized provincial governors and city mayors especially those in and around Manila requesting their close operation in requiring industrial establishment to put up the necessary pollution control works.

Some officials have responded well but some are reluctant or silent in enforcing the order-to-stop discharge probably due to political or economic reasons since firms employ men in the locality and pays taxes to the municipality. The Commission hopes that all officials whether local, provincial or national should for a while focus equal attention to the environment, lest it becomes a political issue against him.

Environmental control is similar to many other social problems of this age. It is a problem too important to be left only to the experts nor only to the politicians. An effective way to combat environ-

mental pollution is to attack the entire problem of environmental sanitation in the broadest possible terms. It thus becomes a truly social and economic problem requiring the informed concern of all citizens. It is important that the people realize that industry is not the single culprit in this environmental mess called pollution. It is therefore a matter of proper coordination of all sectors of the society — the public to be concerned and contribute concerted efforts to control pollution.

5. PROBLEMS AND PROGRAMS

The ability of state regulatory agency to enforce positively the laws, rules and regulations on pollution is the key ingredient to ultimate success in all programs of pollution control. The obvious need of sufficient funds and trained personnel determines such capability of the agency.

The NWAPCC is dealing with the rising pollution problem which started long before the Commission was organized. The lack of funds and personnel, however, slows down the momentum of the efforts and may result in the increase of pollution levels. It is earnestly hoped that the Commission's FY 1972 budget of 416,000 will be increased in the succeeding years so that more personnel can be hired and the much needed equipment be procured.

The cost of controlling pollution is a sum added to the industries expenditures. Most often the pollution control devices are operated without material benefit to the industry except the comforts of living in a better environment. As such, the industries are reluctant to put up water treatment plants or air pollution control devices. The Commission would be most happy to support any move by industry to secure tax incentives in the form of accelerated depreciation, long term government loans, tax-credits on pollution control infrastructures and joint pollution control works for adjacent factories or industrial establishments.

In the final analysis pollution control is everybody's concern. Arguments on the subject tend to exhibit the fallacy of all or nothing. Some advocates tend to feel that environment should be restored to its pre-industrial purity; others agree with the statement that if you want a town to grow its got to stink and to have smoky problems. Neither view is acceptable. Rather we must honestly try and answer the question: *How clean do we want our environment to be and how much are we willing to spend for it?*