IV IMPORTANT COMMENTS ON THIS INVESTIGATION BY JICA ENVIRONMENTAL EXPERT

1. COMPARISON BETWEEN THIS INVESTIGATED DATA AND PAKISTAN EMISSION STANDARD

1.1) OVER THE EMISSION STANDARD PARAMETERS

1) ORGANIC CONTAMINATED PARAMETERS

After looking at the investigation result, it is found the organic measurement parameters such as BOD, COD values are extremely high. Especially high COD sources are Leather Industry which was over Standard 44 times bigger, Paint Industry was over 15 times and Petroleum Refinery, Steel Pipe/Steel Manufacturing factories were over 10-12 times bigger than the Industrial Emission Standard.

On the other hand, BOD values were also recorded in high concentration, in case of chemical industry was over 20 times bigger and Leather industry are also 11 times bigger than the Emission Standard (LIES: Liquid Industrial Effluent Standard).

Those specific high organic contamination by the factory effluents are often brought two reasons, the one which might be come from characteristic effluent including such a high organic contamination or the other those kinds of effluent are added domestic wastes and workers domestic wastes in the factories.

It is usually measured as BOD value of domestic wastes shown about 150-220 ppm internationally, however, the result of this investigation, the BOD data sometimes are over the 300 and reaching to 400 ppm. With a high concentration of Total Suspended Solid (TSS) also reaching to more than 4,000 ppm (Paint Industry), 2,000 (Tube light Industry) and 1,686 (Leather Industry) will be surely made big amount of the sludge sediments after flowing out to the sea area, which containing high concentration of toxic substances, might be occurred some affect for the sea products nearby that area.

2) TOXIC CHEMICALS PARAMETER

The most high concentration of toxic substances in this investigation was chromium, that was 109 times higher than the Standard (LIES) in the Leather industry and also 50 times bigger than the Standard in the chemical industry.

The second detected high value was Lead, such as emitted by Battery Industry was over 82 times larger than the Standard and also Steel Pipe and Chemical industries were more than 10 times larger than the Standard.

The third one in high Emission of toxic substances was mercury, those are not so high level of the Standard. Tube light industry was 5 times larger than the

Standard and Leather or Petroleum refinery emitted in 2-3 times larger quantity than LIES.

1-2 REVIEWING ON EMISSION STANDARD OF WATER QUALITY IN PAKISTAN

Table-39: ENVIRONMENTAL RIVER WATER QUALITY STANDARDS FOR LIVING ENVIRONMENT ITEMS (JAPAN)

Category	Purposes of water use	Standard values				
		pH	BOD	SS	DO	No. of Coliform groups
AA	Water supply, class 1 conservation of natural environment, and uses listed in A-E	6.5-8.5	1 ppm or less	25 ppm or less	7.5 ppm or more	50 MPN /100ml or less
A	Water supply, class 2 fishery, class 1 bathing and uses listed in B-E	6.5-8.5	2 ppm or less	25 ppm or less	7.5 ppm or more	1000 MPN/ 100 ml or less
B	Water supply, class 3 fishery, class 2 and uses listed in C-E	6.5-8.5	3 ppm or less	25 ppm or less	5 ppm or more	5000 MPN/ 100 ml or less
C	Fishery, class 3 industrial water, class and uses listed in D-E	6.5-8.5	5 ppm or less	50 ppm or less	5 ppm or more	_
D	Industrial water, class agricultural water and uses listed in E	6.0-8.5	8 ppm or less	100 ppm or less	2 ppm or more	_
E	Industrial water, class conservation of the environment	6.0-8.5	10 ppm or less	Floating Matter such as garbage should not be observed	2 ppm or more	_

(BOD : Biochemical Oxygen Demand, SS : Suspended Solids, DO : Dissolved Oxygen)

Notes : 1. The Standard value is based on the daily average value. The same applies to the Standard values of lakes and coastal waters.

Table-39, shows Japanese Environmental River Water Quality Standard for living environment. The values are most severe than Pakistan Water Quality Standard of BOD values, such as water supply for drinking water or bathing purpose in Japan required less than 1 ppm or 2 ppm of BOD and also Coliform groups (MPN, Most Probable Number are less than 50 in 100 ml of drinking water source and 1000 MPN in same unit required in Category A).

Therefore, Pak-EPA is planing to make a Environmental Quality Standard for each category of river area (upperstream, middle and downstream), lake especially for usage of drinking water resources, agricultural usage and underground Water Quality.

1-3 WATER QUALITY STANDARD FOR DIFFERENT USAGE

Environmental Agency of Japanese Government determines the environmental quality Standard for the river and the lake water. Depending on that Standard which comes from table 4 being made on the several different kinds of investigation data which are coordinated by experienced scholars and investigators by the budget of Ministry of Agriculture in 1970.

These Standard values were set up for the purpose in showing permissible limited concentration that has not occurred any damage on the rice field, and by each polluted parameter. The Standard level was set for consideration of different kind of rice, cultivation method, condition of environment, counter action of each pollutant's effect to the rice field and does not effect any, decreasing in quantity of crop's.

Table-40: WATER QUALITY STANDARD FOR DIFFERENT KINDS OF USAGE

No.	Parameters	Pakistan Emission Standard	Tokyo Sewerage Acceptable Standard	Agricultural Standard Values	Drinking Water Standard
1.	**BOD**	< 80	< 300		
2.	**COD**	< 150		< 6 ppm	< 3
3.	**SS**	< 200	< 300	< 100 ppm	
4.	**DO**			< 5 ppm	
5.	**T-N**		< 120	< 1 ppm	
6.	**Electrical Conductivity**			< 0.3 mΩ/cm	
7.	**As**	< 1.0	< 0.1	< 0.05 ppm	< 0.05
8.	**Cu**	< 1.0	< 3.0	< 0.02 ppm	< 1.0
9.	**Zn**	< 5.0	< 5.0	< 0.5 ppm	< 0.01
10.	**Cd**	< 1.0	< 0.1		< 0.01
11.	**Hg**	< 0.01	< 0.005		< 0.005
12.	**F**	< 10	< 15.0		< 0.8
13.	**Cr^{+6}**	< 1.0	< 0.5		< 0.05
14.	**CN**	< 1.0	< 1.0		< 0.01
15.	**Pb**	< 0.5	< 0.1		< 0.05
16.	**Mn**	< 1.5	< 10.0		< 0.05
17.	**Phenol**	< 0.1	< 5.0		< 0.005

Table-40, showed the Water Quality Standards for different kinds of usage, such as Japanese Sewerage Acceptable Standard, Agricultural Water Standards and Drinking Water Quality Standard to compare with the Pakistan Emission Standards discharging to the river.

Concerning Environmental Quality Standard for the river and the lake body was determined by Environmental Agency of Japanese Government and also the Agricultural Standard was made with coordinated by experienced scholars, investigators which issued by the Ministry of Agriculture in 1970.

Those Standard values are set up for the purpose of showing permissible limited concentration that have not occurred in any damage for the rice field, by each polluted parameter.

Tokyo Metropolitan Government issued Sewage Acceptable Standard, the Standard means to accept the Water Quality for introducing the sewage treatment plant so that reason, the organic pollutants parameter values are set up very high concentration.

On the other hand, the toxic substances Acceptable Standard are rather strict values, because of those toxic substances may effect to the function of purification, for instance, using in biological treatment process, especially activated sludge method which has been widely using in advanced countries have easily been effected on their purifying function damaged by those toxic substances.

Reviewing the Emission Standards in Pakistan, required more detailed and classified the Emission Standards for domestic and industrial effluents and also is necessary to set up the Environmental Water Quality Standard.

Those Standards are very closely related to keeping in good living water circumstances and also usage for Water Quality in different purpose of demanding, considering these aspects, it should be discussed with when the Environmental Authorities is making those Standards in collaborating with organic substances and toxic chemicals together which might be effecting more dangerous health damage in living circumstances.

Therefore, it is not determined by individual parameter of the Emission Standard, paying enough attention to the synergism among them for making more harmful phenomenon in multi components reactions which is stood for the scientific studies and investigations that analyzing existed data.

Table-41: COASTAL WATERS

Category	Purposes of water use	Standard Values				
		pH	COD	DO	No. of Coliform Groups	n-hexane Extracts (oil content, etc.)
A	Fishery, class 1 ; bathing conservation of the natural environment, and uses listed in B-C	7.8-8.3	2 mg/l or less	7.5 mg/l or more	1000 MPN/ 100 ml or less	Not detectable
B	Fishery, class 2 industrial water and the uses listed in C	7.8-8.3	3 mg/l or less	5 mg/l or more	_	Not detectable
C	Conservation of the natural environment	7.0-8.3	8 mg/l or less	2 mg/l or more	_	_

(COD : Chemical Oxygen Demand, DO : Dissolved Oxygen)

Notes : 1 . The permissible number of Coliform groups in fishery class 1 is for the cultivation of oysters shall be 70 MPN/100 ml or less.

Table-41, showing the Water Quality Standard for coastal zone, which can be taking the imagination of Karachi coastal zone where are polluted by the 2 Nallas (Lyari and Malir rivers) near both at the discharging points. This table will be useful for considering about Seawater Quality Standards in coastal area, the Standard of BOD value are shown very strictly between 2 ppm – 8 ppm in comparison of actual contaminated condition in Karachi area.

Category A :

Is for the sea bathing and keeping in natural environment.

Category B :

Is an industrial usage Water Quality and the uses list in C means keeping natural environment. Those 2 categories are not detected any oil and organic solvent measured by normal Hexane extract method.

Table-42: REGULATION OF THE NUMBER OF COLIFORM IN THE WATER BODIES

Category	Purpose of water use	Standard Values	
		Total Nitrogen	Total Phosphorus
I	Conservation of the natural environment and uses listed in II-IV (excluding fishery classes 2 and 3	0.2 mg/l or less	0.02 mg/l or less
II	Fishery class 1, bathing and the uses listed in III-IV (excluding fishery class 3)	0.3 mg/l or less	0.03 mg/l or less
III	Fishery class 2 and the uses listed in IV (excluding fishery class 3)	0.6 mg/l or less	0.05 mg/l or less
IV	Fishery class 3, industrial water, and conservation of habitable environments for marine biota	1 mg/l or less	0.09 mg/l or less

Notes :

1. Standard values are set up in terms of annual averages.
2. Standard values area are applicable only to marine areas where marine phytoplankton blooms may occur.

Table-42, showed the judgement of Water Quality, which polluted by the human living wastes and animal excreta is easily finding out by the bacteriological test, that's why to make more important to detect these numbers of Coliform is not only indicated for the drinking Water Quality, but also to be judged for the Water Quality which not suitable for natural environment and neither bathing purpose in river, lake and sea water in this country.

For the important parameters in living circumstances of Water Quality, E-coli or numbers of Coliform examined method should be made more popularity and required more accuracy measurement method, keeping in the cross-checking of bacteriological measurement exercise are punctually carried out and also confirming the accuracy of this test in this country.

2. RECOMMENDATION ON PROGRESS OF WATER QUALITY CONSERVATION

Recommendation on environmental enforcement program for improving the better Water Quality. On account of promoting environmental Water Quality enforcement will be adopted several adequate procedures by the Environmental Ministry, Pak-EPA and Provincial EPA's.

It is a most important implementation by the Governmental Environment is to establish and carry out the Water Quality measurement which are including in manual sampling, analysis them in the laboratories and also, in the future, is expecting to install water monitoring network system in this country.

Looking at the laboratories belong to public organizations, Pak-EPA has their own laboratory and necessary water measures equipment are already installed and also sampling apparatus are undergoing to arrange in near future, there is one chief chemist and 4 assistant inspectors, they are ready to analyze the parameters of the drinking water, irrigation and polluted Water Quality.

Punjab EPD has the laboratory and Air Monitoring Mobile Stations, analytical equipment for Water Quality at this moment is not sufficient but now undergoing to arrange the necessary equipment, 2 experienced chemists are working air and water analysis, however it is necessary to get wider space for laboratory. Sindh EPA has a new building for laboratory and also the necessary new equipment are already installed. At this moment, there is only two chemists there, so it is necessary to get 2 ~ 3 more experienced persons for utilizing the equipment.

Baluchistan EPA is undergoing to make their laboratory and arranging the equipment for water analysis.

Concerning NWFP-EPA has a function for measurement on BOD, COD, Heavy metals parameters and several operators in water analysis.

1) WATER QUALITY INVESTIGATION SYSTEM

On the other hand, Water Quality monitoring network system has not established yet in this country.

It is clear according to this result of investigation, inspite of lacking the contaminated data, it will be requested to establish stationary water sampling point to get the sample punctually, the parameters such as pH, DO, Electric Conductivity, Turbidity and Color will be measured by automatic analyzing installation at sampling points, and taking water samples to carry them to each EPA's laboratories by cooling systems equipped in the water testing car.

It can be clearly by those water measured data which reaching to the critical contaminated area, for instance, River Ravi, Nallah leh, Lyari River and Malir River where we had investigated those water qualities are necessary transmitted to the data collection units which installed in each EPA and also all data should be transmitted to data collection center in Pak-EPA in the future.

Pak-EPA will have the function of Water Quality surveillance and control center to get the polluted data from each EPA and a making program what is the most high priority matter to be taken an action for improving their polluted condition by the central government.

2) DATA BASELINE SERVICE

Collecting baseline data concerning any kind of Environment in both national and international wide should be input to the computer with determinated format which arranged by the Pak-EPA. Among those collecting data, the most important data should be measured by each EPA's and Pak-EPA, and also included another organizations such as PCSIR, Geoscience (Geological Survey of Pakistan: GSP). After getting those data will start in data information service to cope with by user's requirement, Next step, those are not network systems, but has a more wider communication system in getting those more easily among nationally and internationally.

3) EDUCATIONAL TRAINING PROGRAM

Pak-EPA will be also required to have the function of training program on water analysis, water sampling, data analysis, enforcement of control and countermeasures technologies in a future for the public sectors, private sectors (including Emission sources of enterprises, and consultant company), University and NGO.

4) AWARENESS

It is a very important matter concerning environmental information should be published by environmental public organizations periodically and using mass media for informing not only to the public units but also private sectors, by using visual media, holding workshops, seminars, presentations and also those are required in environmental faculties of Universities.

If it is necessary to inform the important environmental issues to the public, the Ministry of Environment or Pak-EPA make some environmental improving concepts for the people included some successful or interesting stories of episode which making short term issues by broadcasting on Television to the public. For making a better environment education is most important matters which we can leave minimum level in living circumstances for children and next successive generation. Furthermore, teaching to the school children that the concepts of keeping in good environmental means don't bother other person's circumstances.

V INTRODUCTION OF PRODUCT TEAM

1) JAPANESE COOPERATION ON ISSUING THIS REPORT

Japanese Environmental Ministry asking (through OECC) to Pak-EPA for making the Karachi Industrial Effluents Investigations, Pak-EPA was engaged in asking to actual investigation to be taken by Global Environmental Laboratory and also JICA supported to issue the expenses for Water Quality analysis and JICA Environmental Expert made the whole investigation program.

On receiving the Global Environmental report at a draft version, JICA Expert did feel strongly the necessity of making over it, and then arranging the contents of report and editing revised version. It was started to correct their contents and describe the explanation for each Table and Chart. And commented on the meaning of those data in additional explanation sentences and strengthen the concerning necessary references that need to understand the contaminated level of data were put together there.

Furthermore, the values of Emission Standards which we (JICA and OECC) strongly intended to get the Questionaire's answers on this report that the first time to apply in this country for getting the data of toxic chemicals which the factories side are usually hesitating or refusing by the answer of their emitting conditions. However, this Questionaire are supported by the Emission site with very cooperative to answer them.

Those kinds of very valuable data have not touched on the draft version of the report by Global Environmental Laboratory. Then we required to Global Environmental to get those analytical data, it took a long time for making graphs of answers, finally we could get those graphs on this report because of Japanese Environmental Ministry asked three times through to OECC to get those answers of Questionaire on the report. It is very glad to have some level of complete version, along to this purpose of the investigation.

This report can be achieved that for the sake of fully cooperation by Ms. Usma Munawara, Technical Assistant to JICA's Environmental Expert.

2) INTRODUCTION OF GLOBAL ENVIRONMENTAL PRODUCT TEAM

Achieving this investigation successfully, which Dr. Sami-Uz-Zaman has the widely human resources pipe in connection of each investigated factories, that's why Global Environment Laboratory could take a samples and get the high percentage of answered even though in such difficult questions of Questionaire's. I appreciate very much for his fully cooperative mind on this investigation.

In the final part, we can introduce the Global Environmental project team members has been well done to taking samples and analysis for this report, especially they are showing very good visual Graphs and Tables concerning analytical Water Quality data.

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