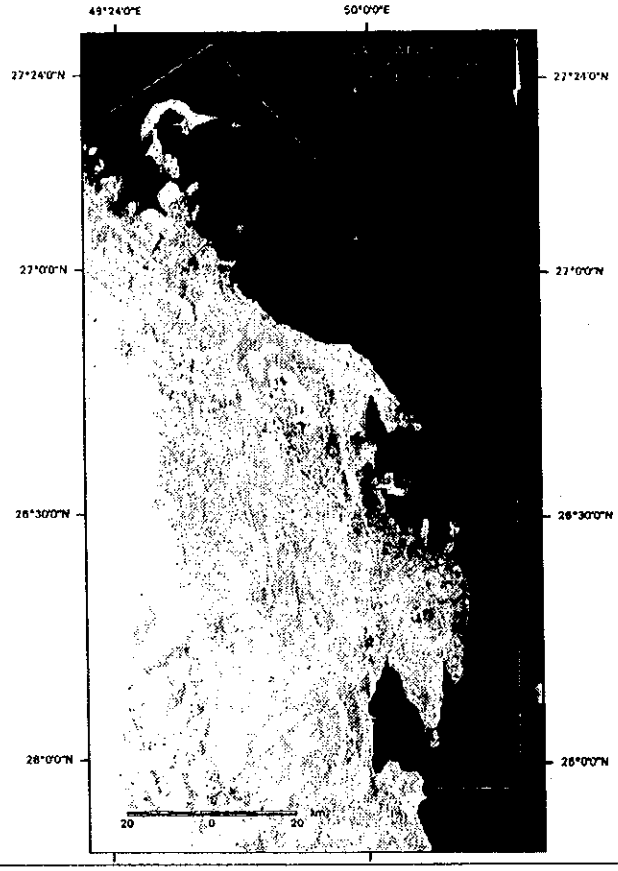
Intensive Study Area - Arabian Gulf, Saudi Arabia

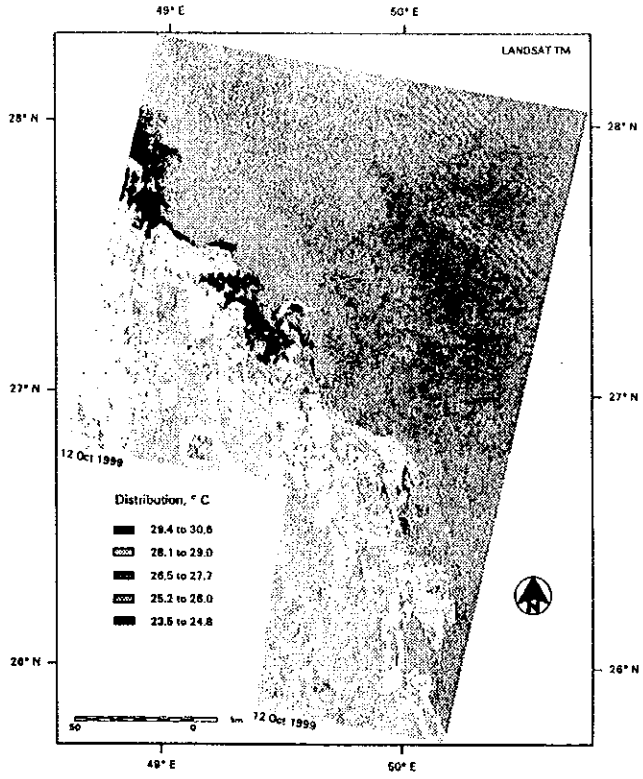


Meteorology and Environmental Protection Administration

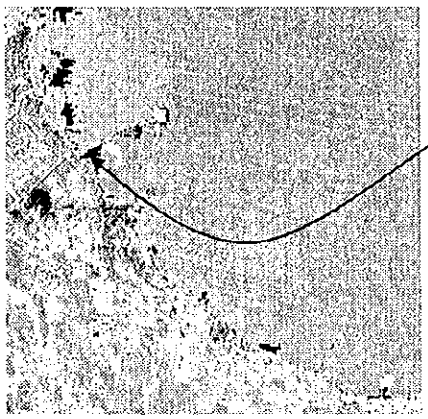
Sampling Locations

Utilization of GPS Observations

Temperature Distribution - Arabian Gulf, Saudi Arabia



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
METEOROLOGY AND ENVIRONMENTAL PROTECTION ADMINISTRATION (MEPA)



Site Code J5

Lat (N): 27° 07.6', Long.: (E) 49° 38.2'

Water Quality of shared industrial outfall – point of discharge

Distribution, ° C

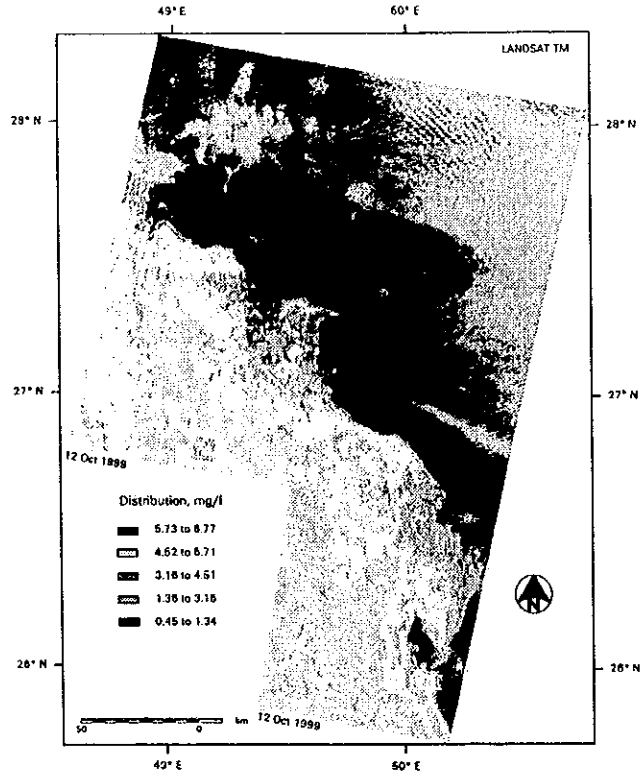
- 29.4 to 30.6
- 28.1 to 29.0
- 26.5 to 27.7
- 25.2 to 26.0
- 23.5 to 24.8

Site Code K2

Lat (N): 26° 24.0, Long.: (E) 50° 11.0'

Small patches of higher temperatures were distributed primarily in shallow areas & along the vicinities of the coastal regions where more industrial & residential activities are located.

Suspended Solids Distribution - Arabian Gulf, Saudi Arabia



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
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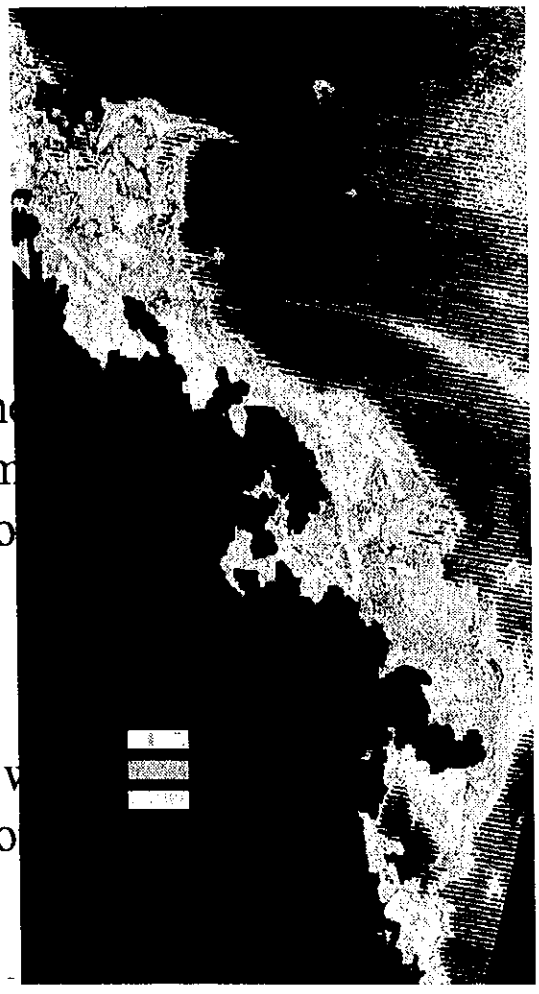
Meteorology and Environmental Protection Administration

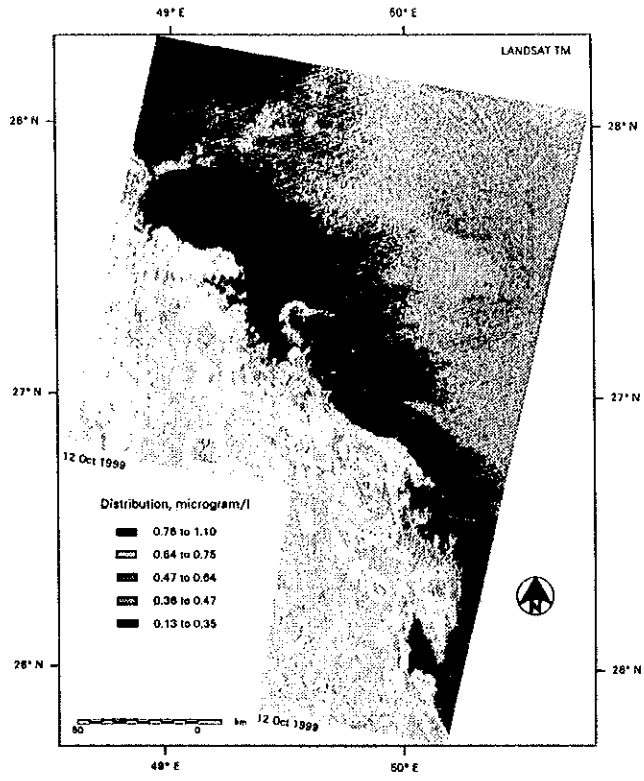
ed Solids
on



ribution values along th
ons (e.g., 3.16 to 4.51 m
st common in the shallo
re areas).

on of 1.36 to 3.15 mg/l v
ributed in mostly offsho

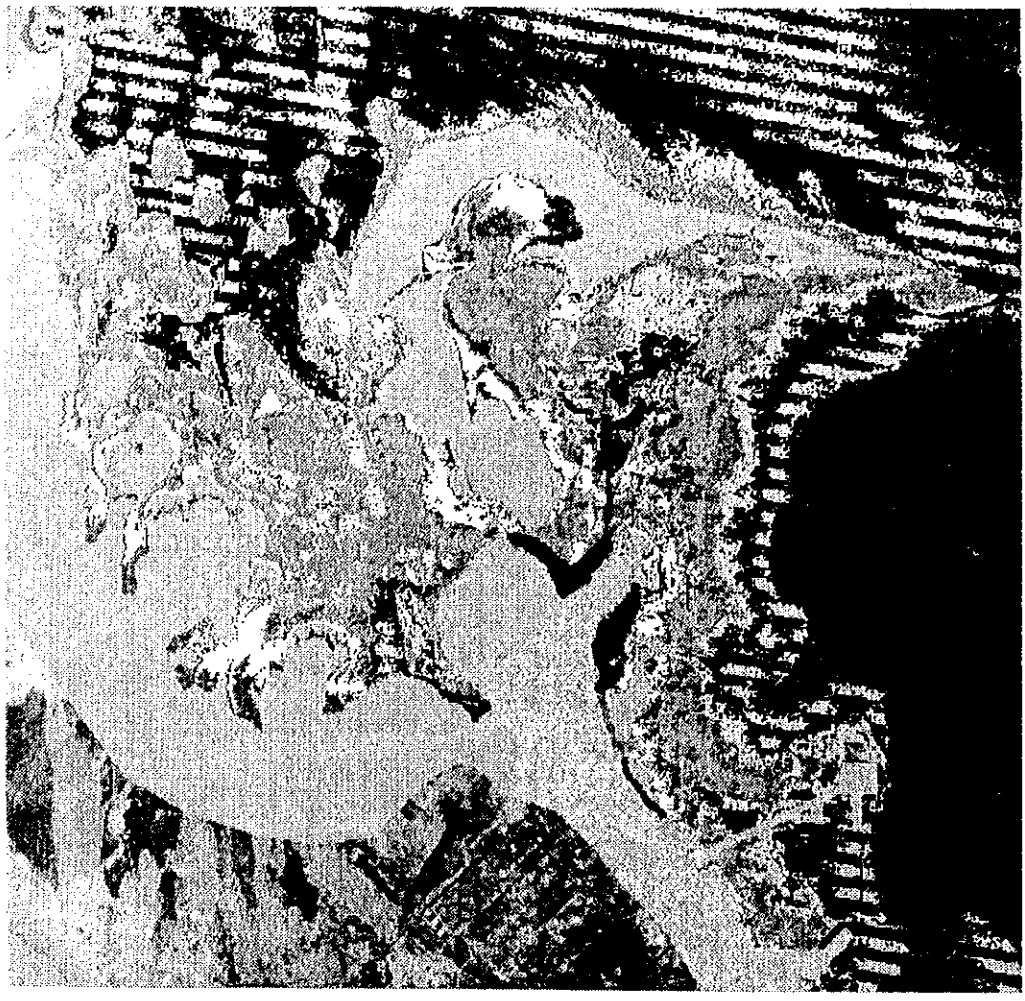
Chlorophyll Distribution - Arabian Gulf, Saudi Arabia



JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
METEOROLOGY AND ENVIRONMENTAL PROTECTION ADMINISTRATION (MEPA)

Meteorology and Environmental Protection Administration

Spectral Enhancement & Information extraction

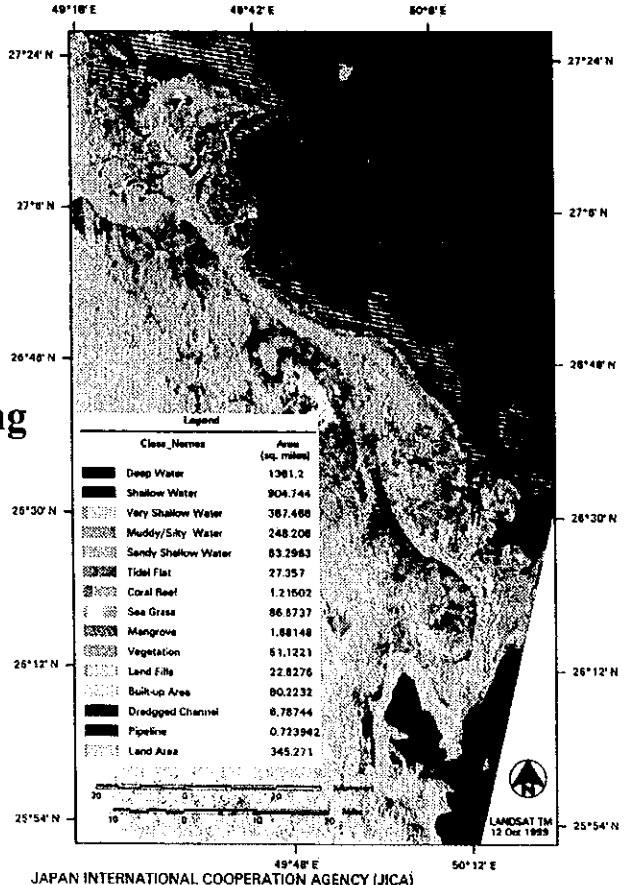


Existing Situation

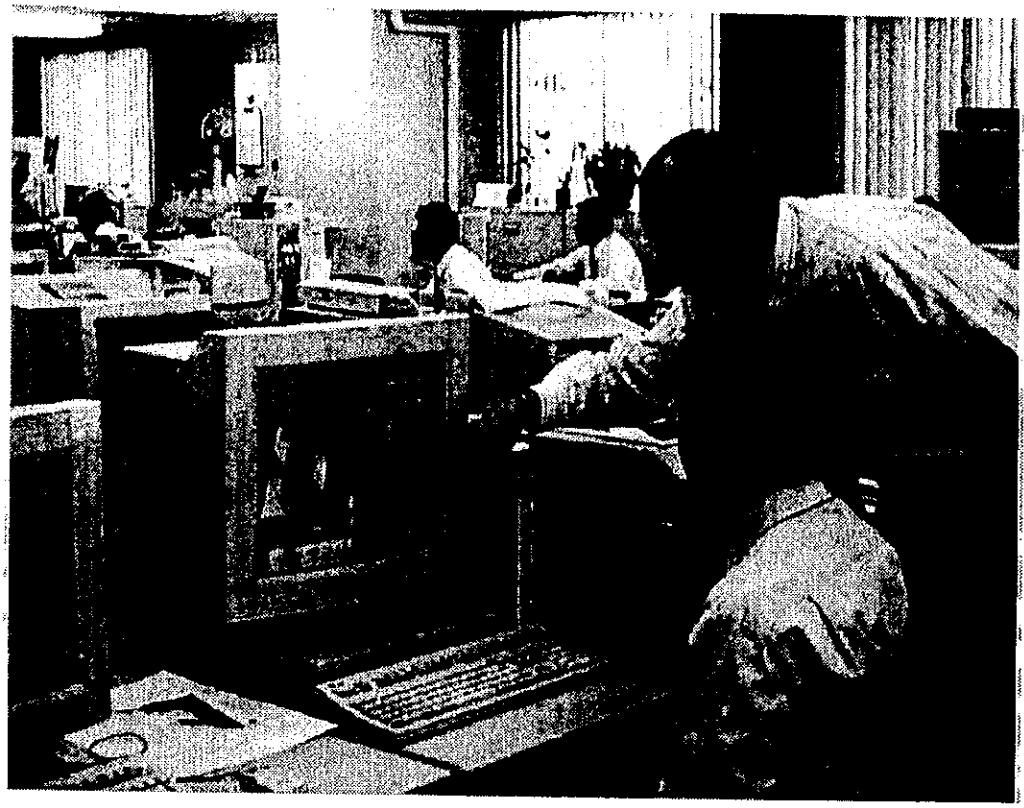
- Deep Water
- Shallow Water
- Very Shallow Water
- Muddy/Silty Water
- Sandy Shallow Water
- Tidal Flat
- Coral Reef
- Sea Grass
- Mangrove
- Vegetation
- Land Fills
- Built-up Area
- Dredgged Channel
- Pipeline
- Land Area

Coastal Mapping

Coastal Mapping - Intensive Study Area, Arabian Gulf, Saudi Arabia



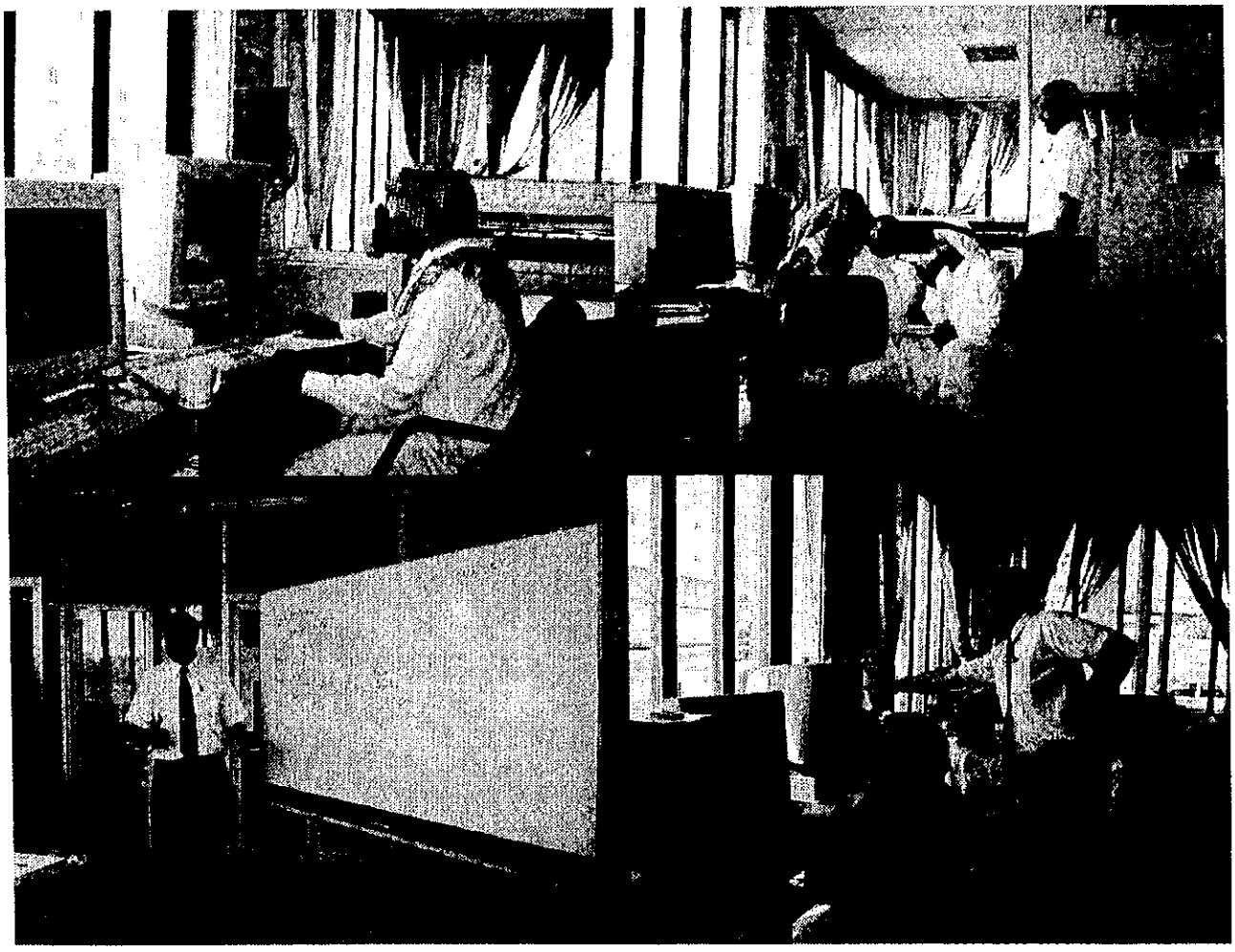
Data Processing in Japan



3rd STAGE

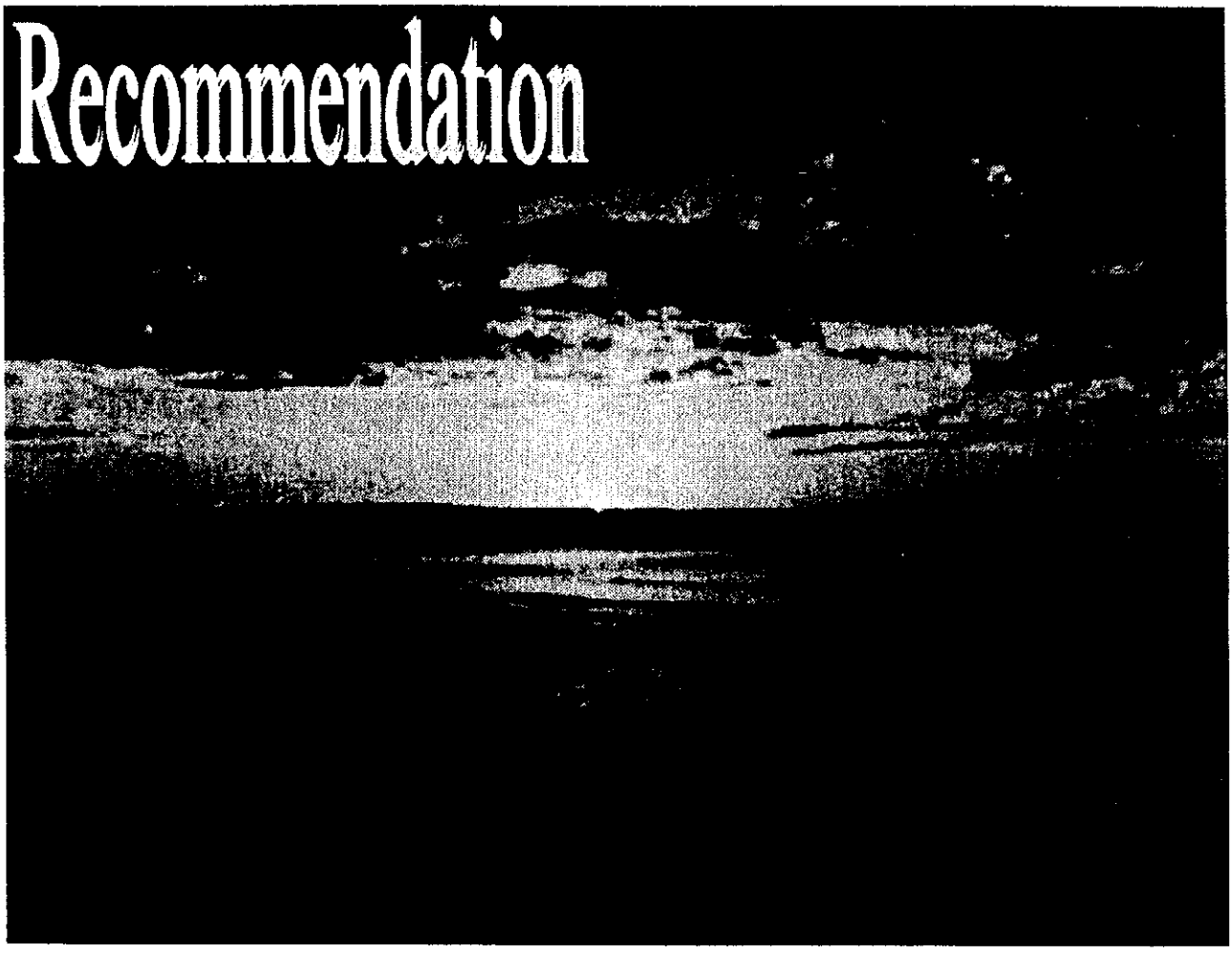
Data Processing in MEPA, Jeddah

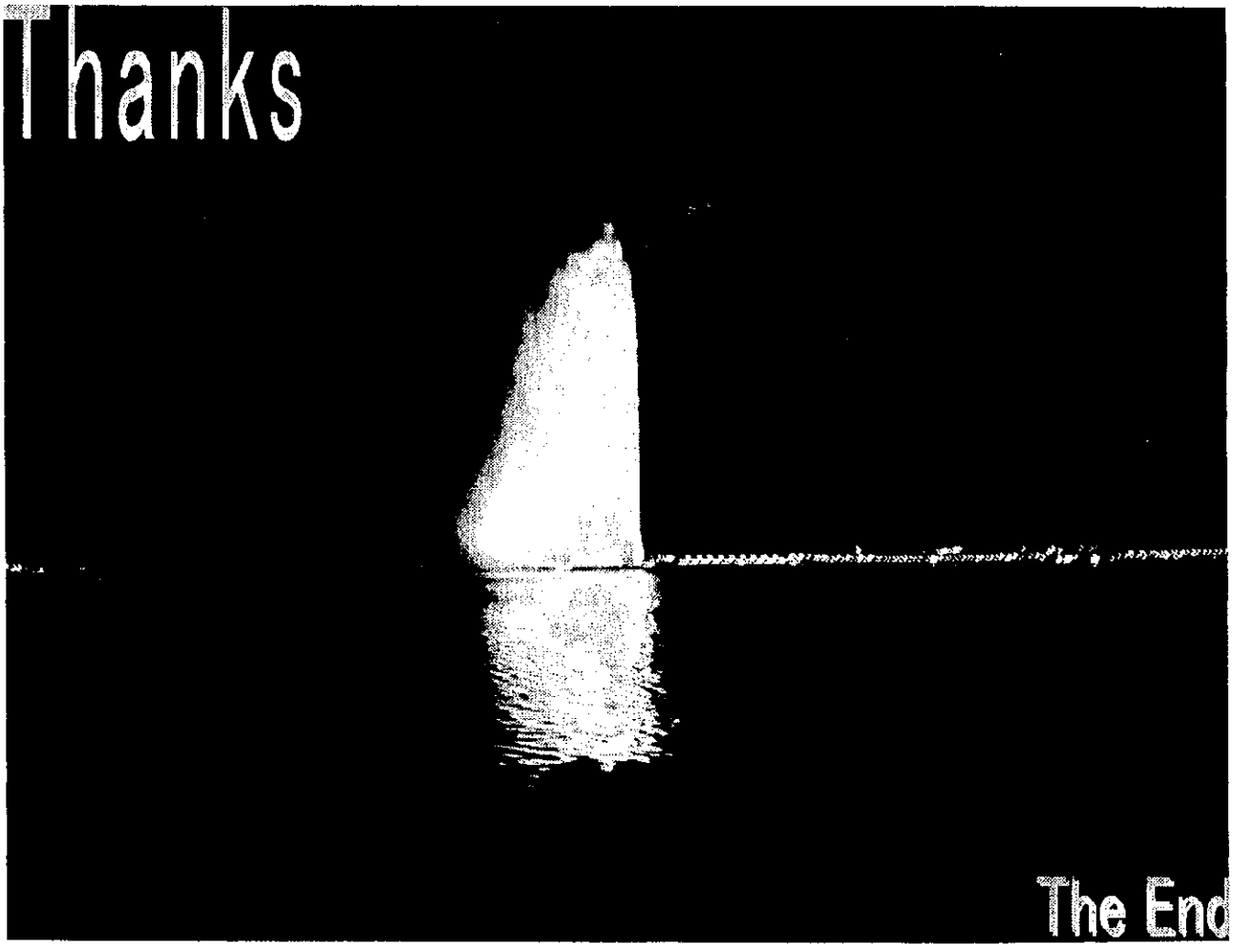
4th STAGE



Conclusions

- TM images showed the variability of the selected water quality parameters
- Analyzed results provided useful information for identifying regional pattern in the temperature, suspended solids, chlorophyll & coastal areas distribution
- Effectiveness of the satellite data for providing a synoptic & quantitative overview of the water quality in the intensive study area
- Utilization of satellite remote sensing can be a feasible means for regular monitoring on seasonal or temporal basis. Moreover, increased spatial & spectral resolution of sensors of different satellites should be tried to help expand the opportunities for monitoring the Arabian Gulf Environment


Recommendation


Thanks
The End

JICA/MEPA Workshop III

"Phased Approach to Future Seawater Monitoring Plan"

Tomohiko Ike

JICA MEPA

Marine Monitoring and Management of the Gulf Coast Waters

Phased Approach to Future Seawater Monitoring

Tomohiko IKE
Member, JICA Team

JICA MEPA

Contents of Presentation

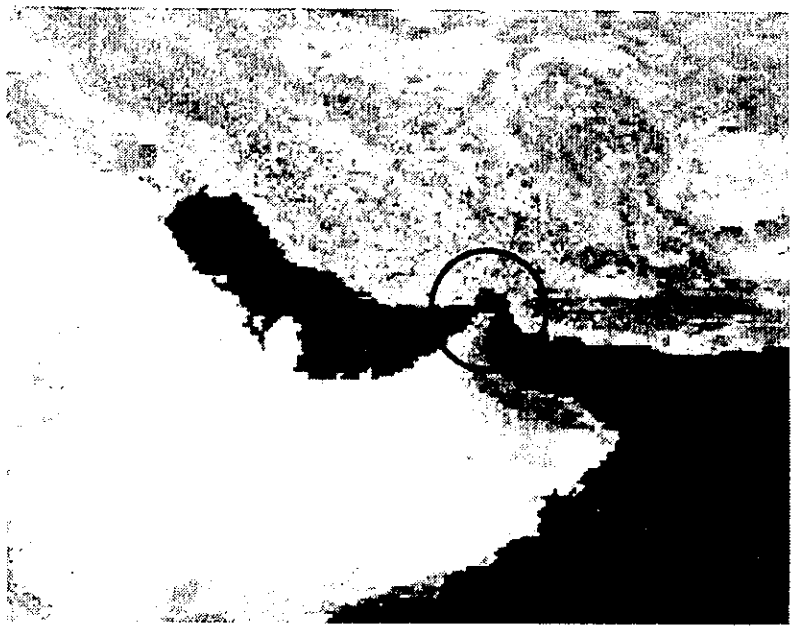
Topic 1

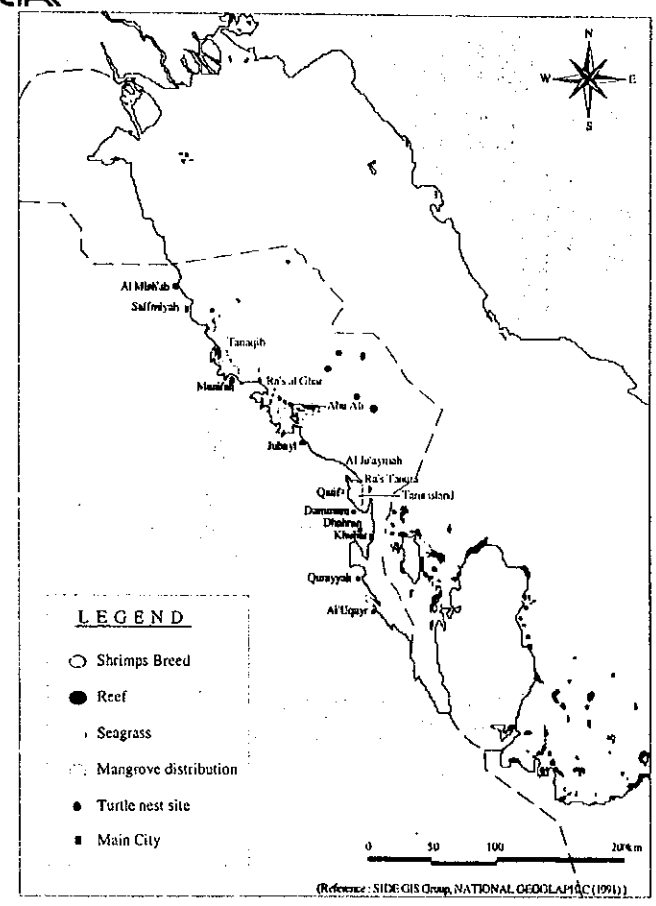
Necessity of the Monitoring Activity in the Gulf

The Reason for the Vulnerability of the Gulf

- Shape: Long Time for Water Exchange
- Plenty of Significant Nature
- Water Related Resources
- Industrial Activities including Oil production etc.

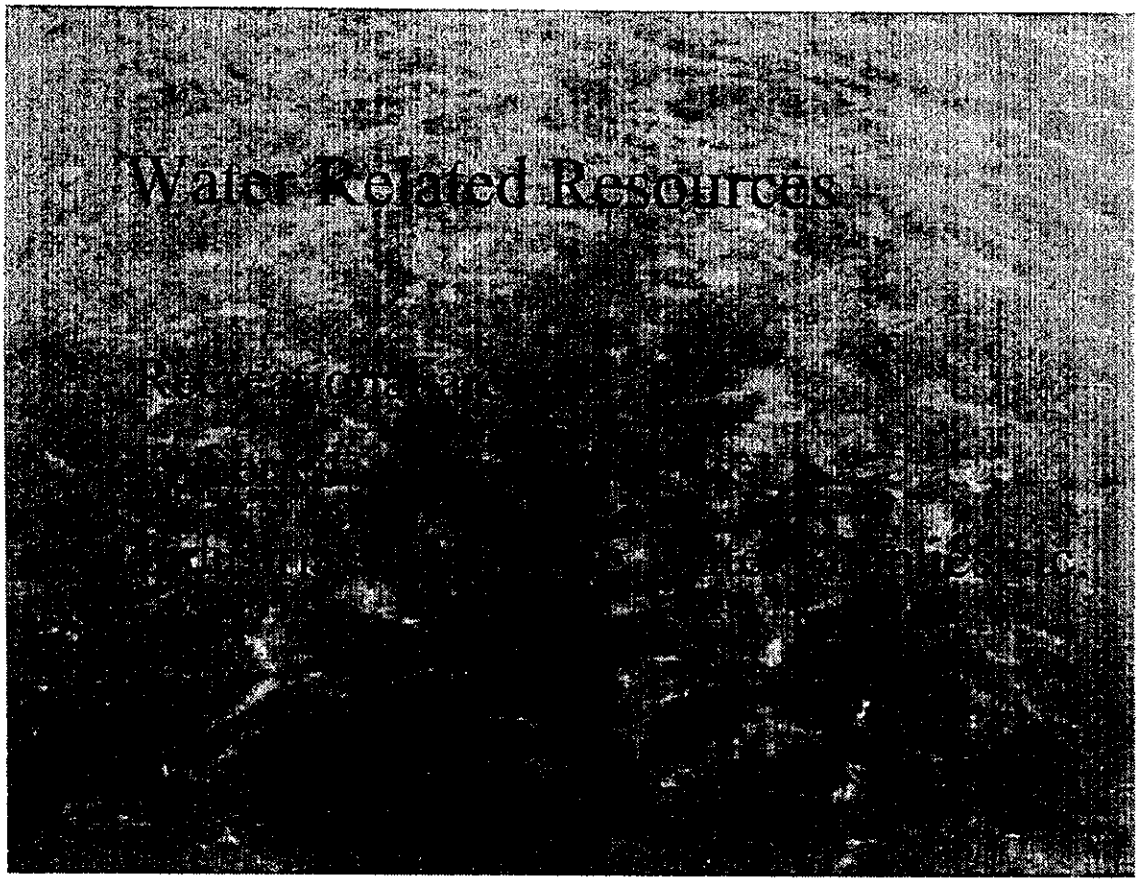
Shape: Narrow Mouth
: Long Time for Water Exchang

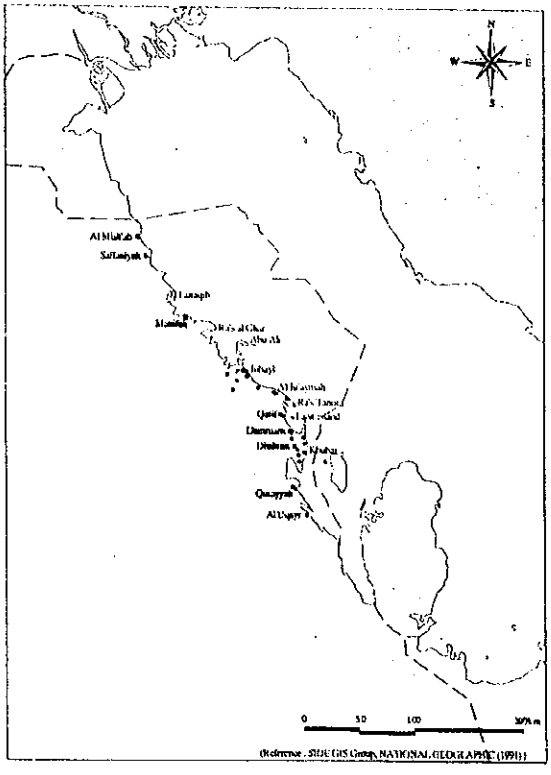




Distribution of Significant nature

Plenty of Significant Nature





Industrial Activities including Oil production

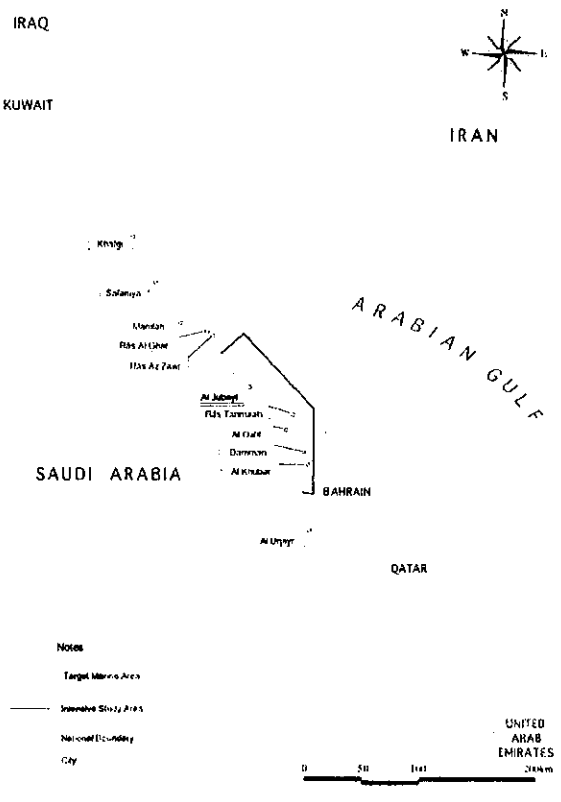
LEGEND

- Refinery
- Petrochemical Plant
- Gas Plant
- Tank Farm
- Power Plants
- Desalination Plant
- Seawater Treatment Plants
- Major Waste Sewage Treatment Plant
- Major Complex of Primary Industry
- Major Complex of Secondary Industry
- Fertilizer Plant
- Main City

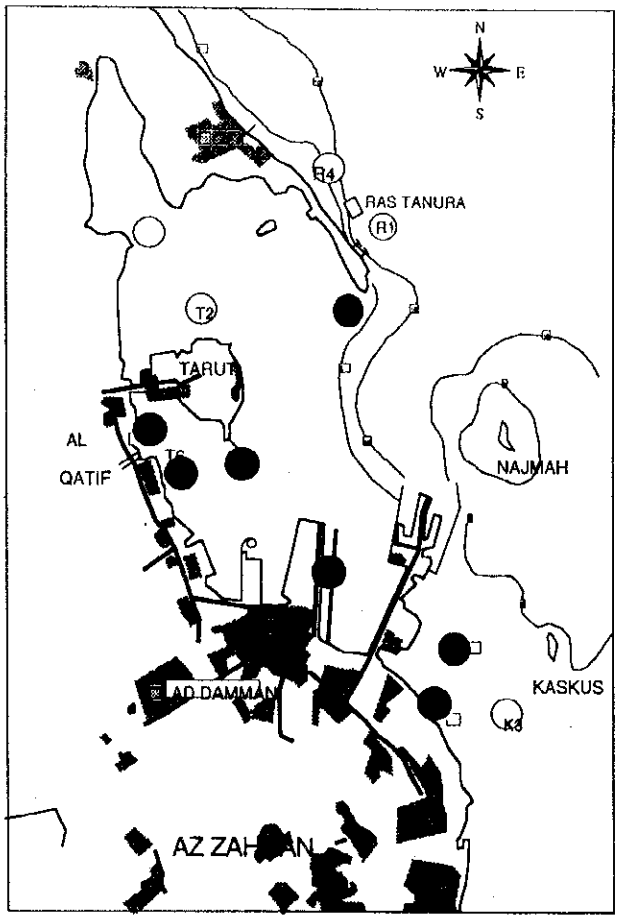
Distribution of Main Industrial Activities along the Gulf

Topic 2

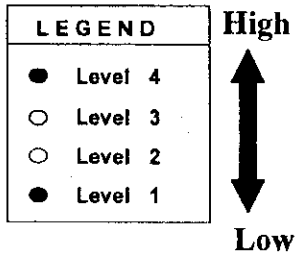
Present Status of the Gulf



Intensive Study Area



Present Pollution Condition



Significant Land-based Sources

- Industrial outfalls
- Sewage System

Significant Pollutants

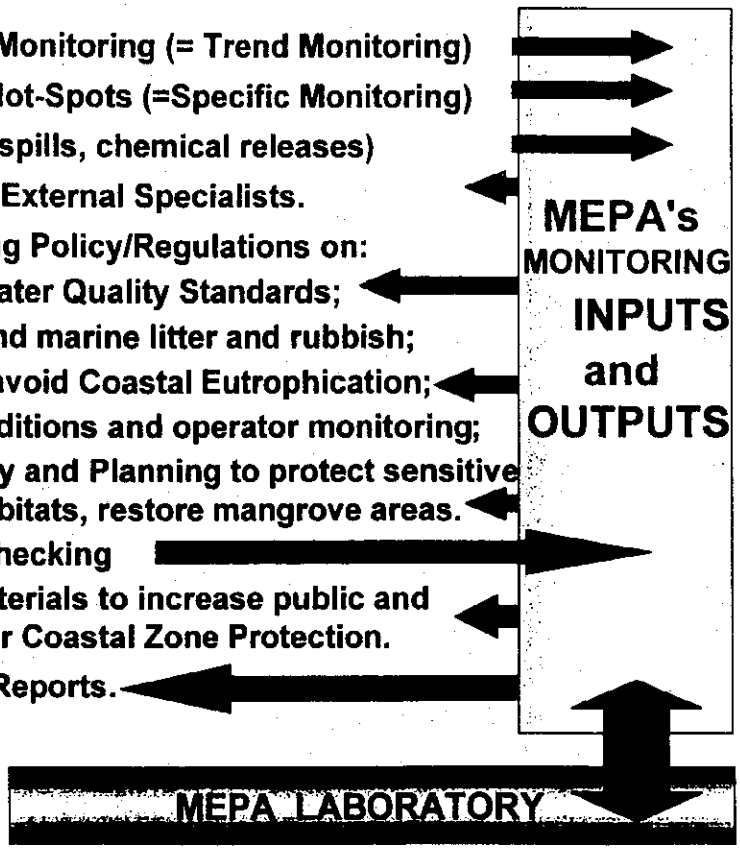
- Water : Eutrophic substances (N,P)
- Sediment : Metals (Cr, Cd, Cu, Hg, Ni, Pb, V, Zn),TPH

Topic 3

Basic Policy of Future Monitoring Plan

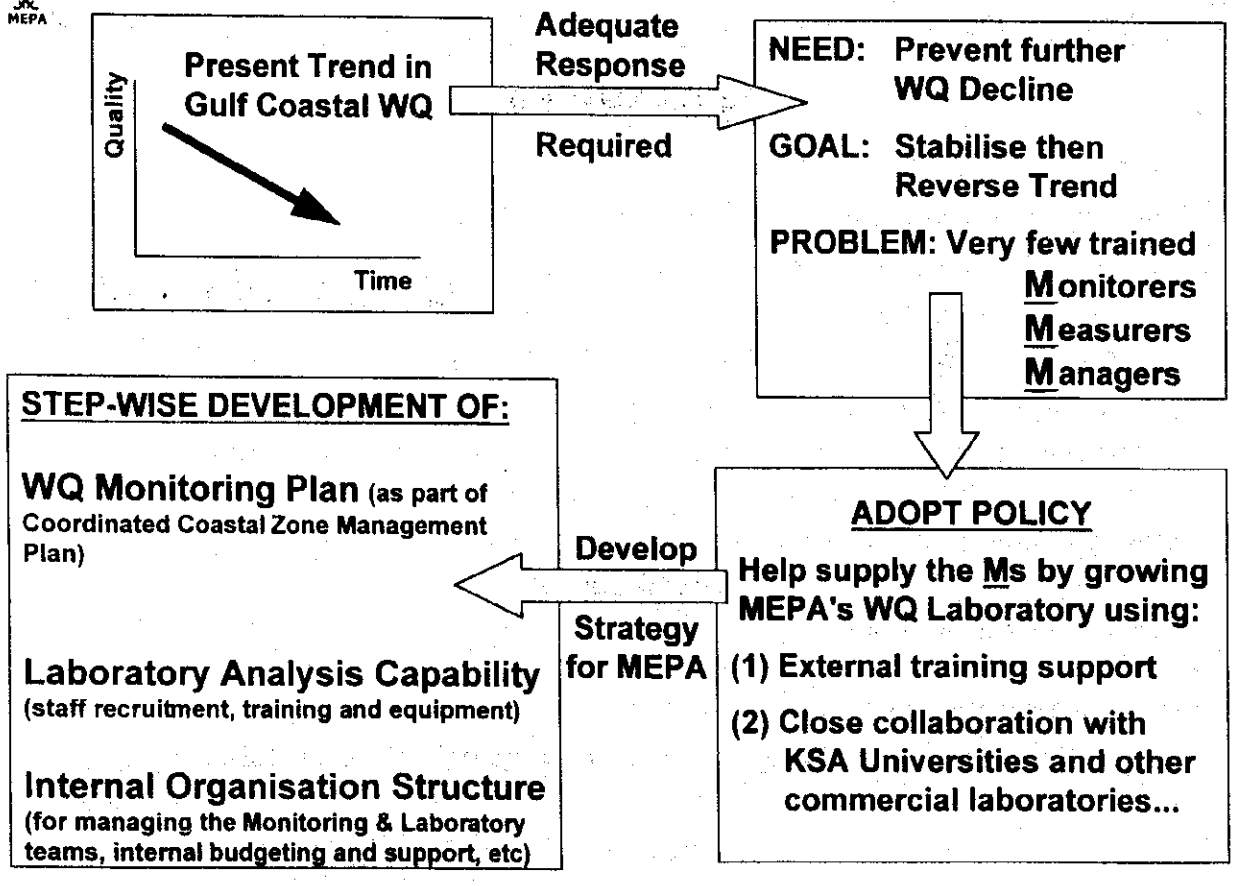
COORDINATED COASTAL ZONE MANAGEMENT

- Routine Baseline Surveillance Monitoring (= Trend Monitoring)
- Characterise Problem Areas / Hot-Spots (=Specific Monitoring)
- *Emergency Response Unit* (oil spills, chemical releases)
- 'Gap-Filling' Research needs by External Specialists.
- Advise Government on updating Policy/Regulations on:
  - Content and application of Water Quality Standards;
  - Reducing inputs of coastal and marine litter and rubbish;
  - Control of nutrient inputs to avoid Coastal Eutrophication;
  - Outfall licensing, licence conditions and operator monitoring;
  - Coastal Development Strategy and Planning to protect sensitive areas, conserve important habitats, restore mangrove areas.
- Inspections and Compliance Checking
- Promotions and Educational Materials to increase public and industry awareness on need for Coastal Zone Protection.
- *'State of Coastal Environment'* Reports.



Purpose of Future Monitoring System

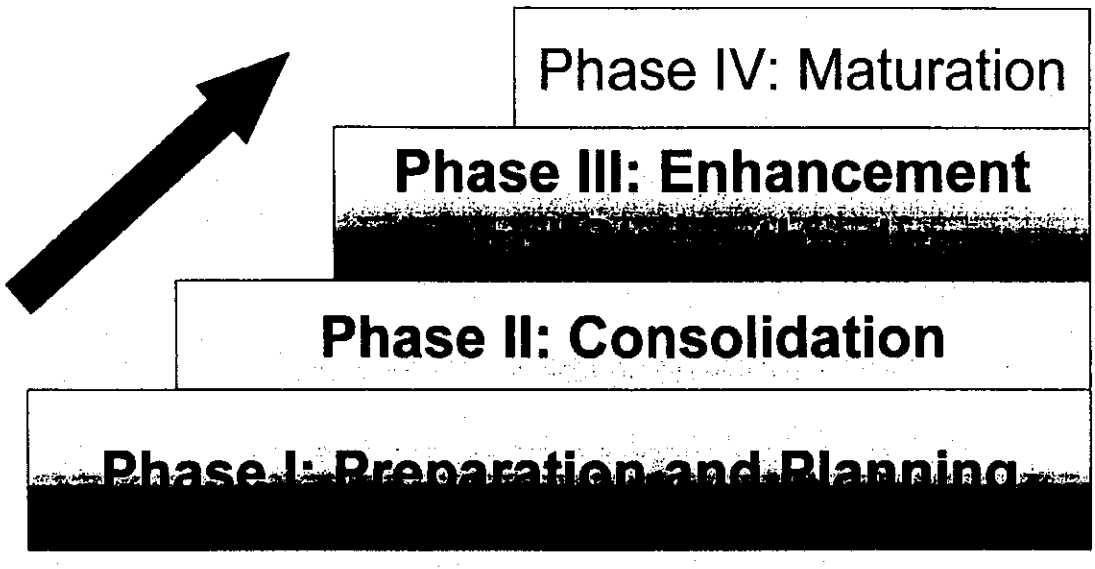
- To Provide a Regional Early-warning System to the Pollutant
- To Check compliance with outfall license conditions
- To Evaluate Public Health Risks
- To Improve Understanding of Coastal Ecosystems
- To Refine Impact Prediction to Develop the Management Strategies
- To Promote Practical Environment Quality Standards
- To Evaluate the Effect of Pollution Prevention Programs



Topic 4

Step-wise Strategy to Realize the Monitoring Plan

Step-wise Approach



Phase I

Preparation and Planning Period

(Completed)

Establishment of the Foundation
- Field Survey
- Laboratory Analyses
- Equipment Upgrade

Planning
- Future Monitoring Plan

Phase II

Consolidation Period

Routine Baseline Monitoring
- To Investigate Regional Baseline Water Quality and its long-term trends

Specific Monitoring
- To Investigate the Affect of Land-based sources

Phase III

Technical Enhancement and Strengthening

Expansion and Reinforcement of Monitoring Program

- Re-examination of Baseline monitoring system
- Investigation of Pollution mechanisms
- Application of Replicate Sampling & Statistical analysis

Planning of Coastal Zone Management

(based on the results of monitoring)

Phase IV

Maturation and Focus Phase

Establishment of Networking and Collaboration for Coastal Zone Management

- Information and Technology Exchange

- Cooperation with Outside Organizations for More Focused/Comprehensive monitoring Survey

- Further Expansion of Database system


Thank you

JICA/MEPA Workshop III

"Importance of the Extending Seawater Monitoring along all of the Eastern Coast of Saudi Arabia"

Adel Qusti

Importance of the Extending Seawater Monitoring along all of the Eastern Coast of Saudi Arabia

Adel Kusti
MEPA, Eastern Province

MEPA JICA

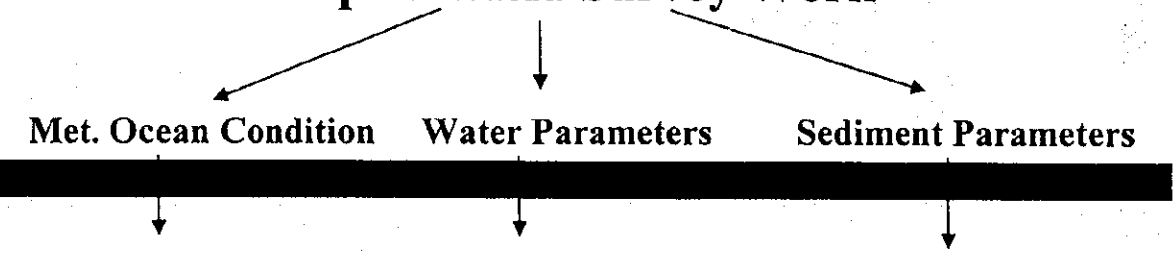
PROJECT

Study on environmental assessment and monitoring of Arabian Gulf in the Kingdom of Saudi Arabia

Objectives of Future Baseline Surveys

1. To examine the seawater quality and to identify causes of water quality degradation
2. To develop an appropriate water quality monitoring program for all the Kingdom's Gulf Coast
3. To continue strengthening MEPA's capability for managing environment through technology transfer

Scope of Field Survey Work



Met. Ocean Condition	Water Parameters	Sediment Parameters
•Air Temperature	•pH	•Color
•Cloudiness	•DO	•Odor
•Wind direction	•Salinity	•Texture
•Wind Speed	•Water temperature	•Sediment (temp)
•Wave Height	•Turbidity	•ORP
•Tide	•Water Clarity	•Sampling for laboratory
•Depth (m)	•Water Color	
•Water Current Direction	•Rubbish	
•Water Current Speed	•Res.. Chlorine (total& free)	
	•Sampling for Laboratory	

Laboratory Analysis of Seawater and Sediment parameters

- TSS
- NH3-N
- TKN
- CN
- Chlorophyll
- T-P
- Coliform
- Loss on Ignition
- PSA

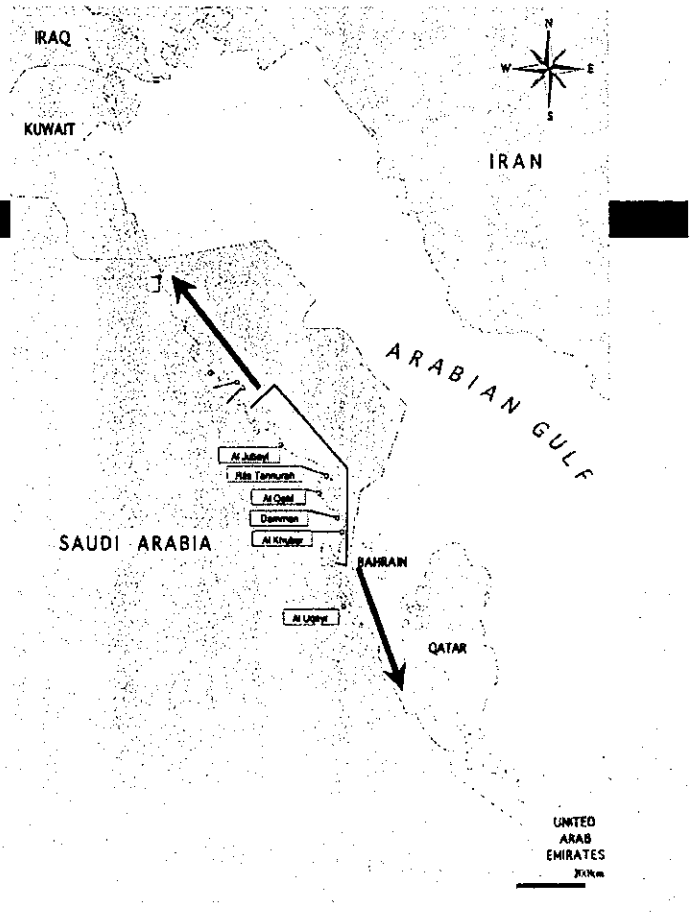
Metals

- As
- Cr
- Hg
- Mg
- Cd
- V
- Cu
- Ni
- Zn
- Pb
- Co

Organic

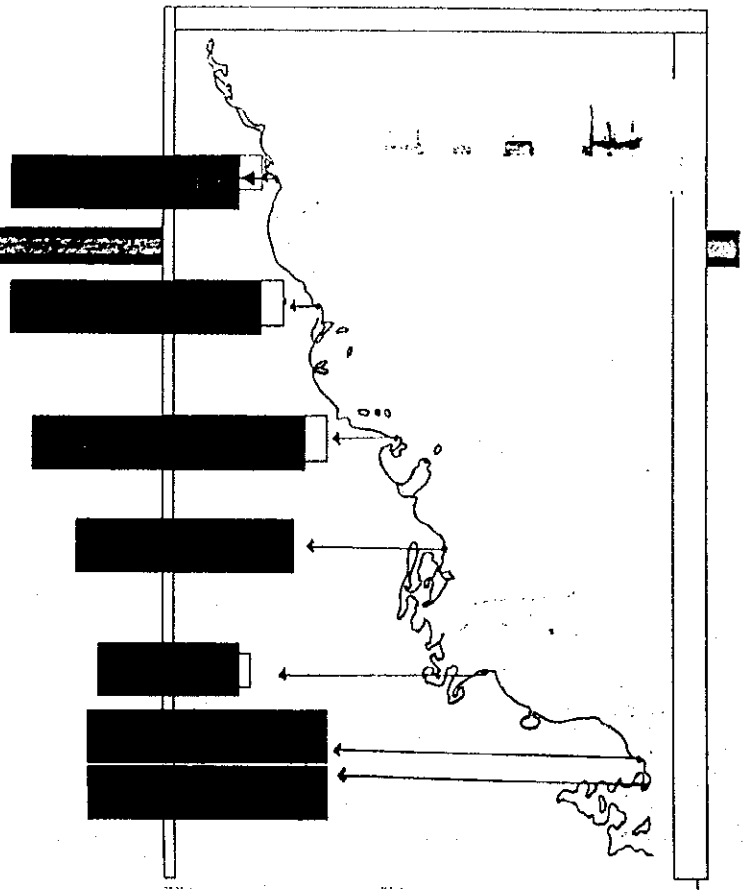
- Oil & Grease
- TPH
- BTEX
- Phenol
- Organo chlorine
- TOC
- PCBs

Extension of Study Area to the North and South Regions of the Kingdom's Gulf Coast



North
Region

Al-Jubail
to
Al-Khafji



South
Region

Al-Qurayah
to
Gulf of Salwa

Conclusions

- Along the coast from north of Al-Jubail to Al-Khafji and south of Al-Qurraiyah to Gulf of Salwa, there are few industrial facilities and land based sources of pollution, but oil production and export activities are common in the north region.
- Low currents, especially in the sheltered south region, can enhance the accumulation of pollutants because of poor mixing and dispersal.
- Both regions contain important areas for wildlife for feeding and breeding, especially the South region which supports many sea cows.
- Therefore, Base line Surveys are needed for both the north and south regions.

Result of

Sea Water Analysis

Site Name	Parameters*	Result (mg/l)		MEPA Reg. Limit (mg/l)
		Third stages	Fourth stages	
SAFCO Outfall Dammam	NH_3-N	90.0	71.0	1.0
	TKN	130.0	100.0	5.0
	Colifrom	34000 pcs /100 ml	9200 pcs /100 ml	1000 MPN/100 ml
Khober STP outfall	NH_3-N	0.4	2..4	1.0
Qatif/ Anak Urban Drain	TSS	7.0	25.0	15.0
	NH_3-N	4,2	9,8	1.0
	TKN	5.0	12.0	5.0
	Colifrom	7000 pcs /100 ml	11000 pcs /100 ml	1000 MPN/100 ml

Parameter: TSS: Total suspended solid
NH3-N: Ammonia Nitrogen
TKN: Total Kjeldhal Nitrogen

Result of

Sediment Analysis

Site Name	Parameters*	Result (mg/kg)	
		Third stages	Fourth stages
Gumah Island	TPH	19	4400
Tarut Drain	TPH	31	178
Qatif/Anak Urban Drain	TPH	96	197
Refinery outfall	TPH	38	32
Khobar STP Outfall	As	1,1	14,2

Parameters: TPH - Total Petroleum Hydrocarbon
As - Arsenic

THE

END

JICA/MEPA Workshop III

"Laboratory Preparation for Environmental Monitoring"

Hiroyuki Ohi

Progress on the Study

MEPA Environmental Laboratory

Expectations in the Future

Role of Mr. Sato and Mr. Ohi
in the JICA Study Team

"A well-equipped environmental laboratory is required to make sure efficient and smooth conduct of the Study and technology transfer."

Minutes of Meeting signed by Dr. Nizar and Mr. Ohta in Jeddah on June 30th, 1998.

1. Selection and Installation of Laboratory Equipment

2. Issues and Expectations for the Future

Considerations on Parameter Selection

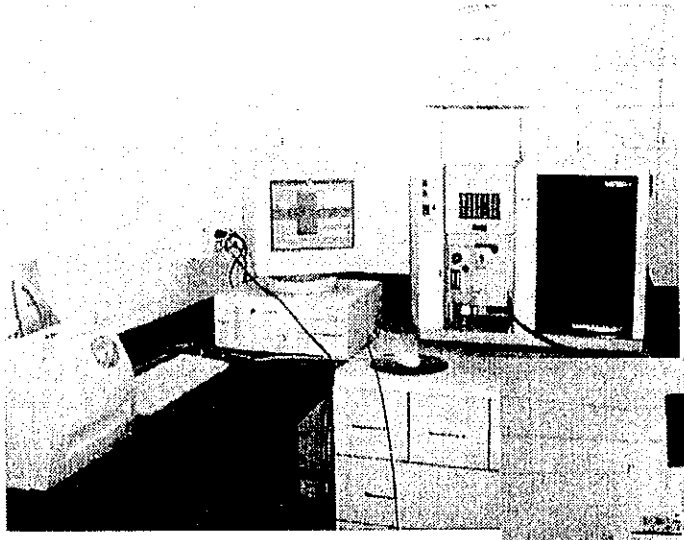
- Water Quality Standards provided by MEPA (Document No. H1409-01)
- Monitoring Parameters measured in Japan coastal area
- Local Characteristics of the Gulf Area

Laboratory Analysis Parameters

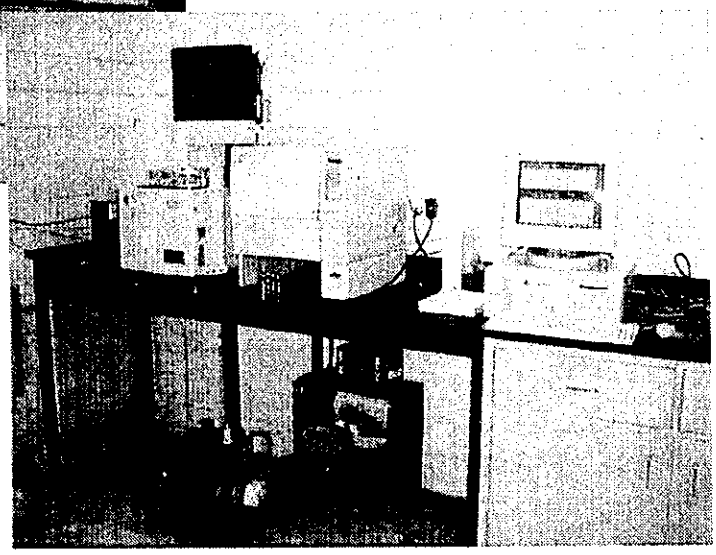
Analysis Parameter	Methodology
Physico-chemical	
TSS (Total Suspended Solids)	Gravimetry
Organic/Inorganic	
TOC (Total Organic Carbons)	Combustion/IR-spectrometry
TKN (Total Kjeldahl Nitrogen)	Spectrophotometry
NH_3 (Ammonia)	Spectrophotometry
Total Phosphorus	Spectrophotometry
Phenols	Spectrophotometry
Oil & grease	IR-spectrometry
Metals	
As, Cd, Pb, Hg, Cr, Co, Cu, Ni, Zn, V	Atomic absorption spectrometry
Petroleum origin	
TPH (Total Petroleum Hydrocarbons)	Infrared spectrometry
BTEX (Benzene, Toluene, Ethylbenzene, Xylen)	Gas chromatography
Microbiological	
Chlorophyll a	Spectrophotometry
Total Coliform	Membrane filter technique

Main Equipment Installed in MEPA Laboratory

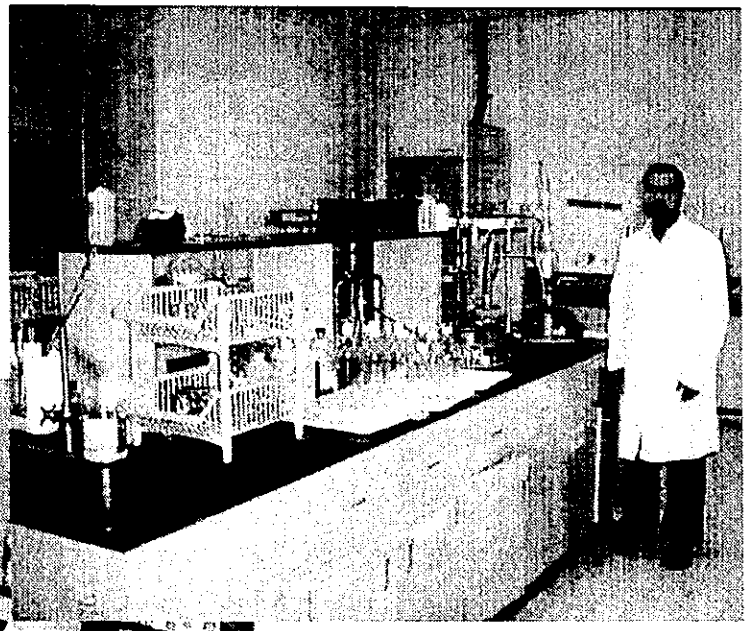
Equipment	Maker/Model	Analysis Item
Atomic Absorption Spectrometer	Varian Spectra 220	Metals
Gas Chromatograph	Shimadzu GC-17A	Volatile Hydrocarbons (BTEX)
Spectrophotometer	Shimadzu UV-1240	NH3, T-P, Phenols, Cyanogen, Chlorophyll a
TOC analyzer	Shimadzu TOC-5000A	Total Organic Carbons
Oil contents meter	Horiba OCMA-300	Oil & grease, TPH
pH meter	Metrohm 744	pH
EC meter	Entech CON-500	Electric Conductivity
Microbiological System	Millipore Milliflex	Coliform
Microscope	Nikon Alphaphot 2	Plankton identification

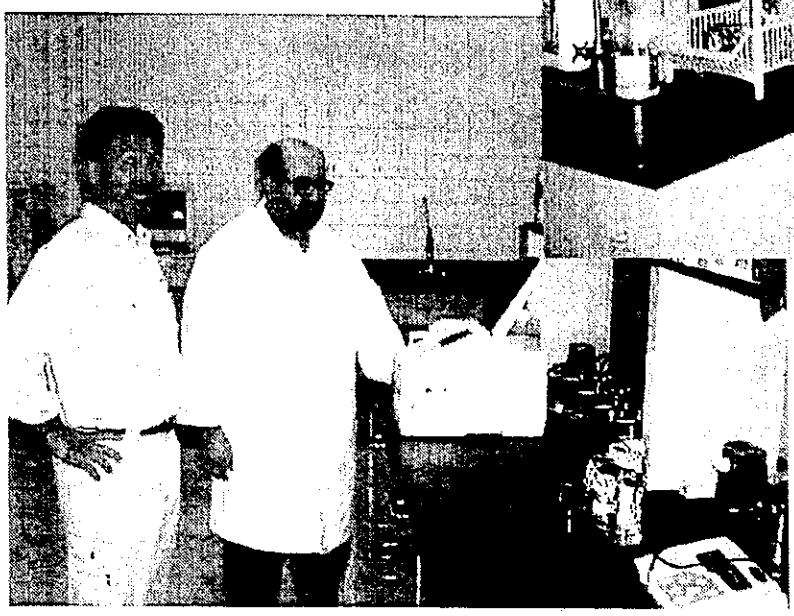


Atomic Absorption
Spectrometer



Gas Chromatograph
with headspace sampler





Outside Laboratories Visited

- BeeA'h, National Environmental Preservation Co.
- Research & Development Center of Saline Water Convention Corporation
- Rashid Geotechnical & Materials Engineers belongs to Royal Commission for Jubail
- Research Institute of King Fahd University of Petroleum & Minerals

Issues to be solved for MEPA Laboratory

- Development of Human Resource
- Establishment of Laboratory Management Plan
- Development of Annual Budgets for Laboratory Operations

Expectations for MEPA Laboratory

Step 1 : Continuous Operations of Environmental Analysis with adequate quality control procedure

Step 2 : Advancement of Analysis Capacity
e.g., Trace Metals, PCB, Chlorinated hydrocarbons

Step 3 : Establishment of nationwide QA/QC Systems for Environmental Measurement

JICA/MEPA Workshop III

"Strengthen MEPA's Capability"

Kazutake Tanaka

Strengthening MEPA's Capability

Kazutake TANAKA

Member, JICA Team

Strengthening Capability of MEPA Eastern Province

(Let's Work Together)

1. Introduction

2. What is the role of MEPA?

3. Who will be responsible for environmental protection?

4. Examples of Collaboration
   (1) Relation with Agencies
   (2) Relation with waste generators

5. Organization of MEPA, Eastern Province

Questionnaire to the attendants

1. **Do you think MEPA has power of prosecution?**
   If yes, does MEPA exercise the power?
   If not, what do you expect of MEPA?

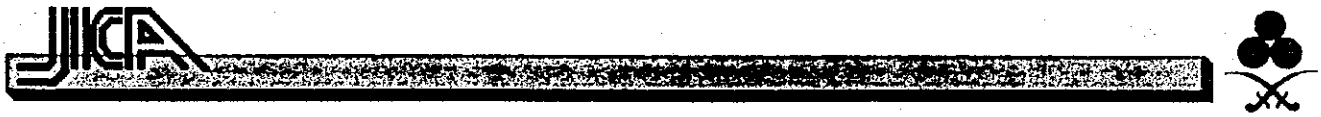
2. **Who will be primarily responsible for stopping pollution?**
   (1) A factory discharges water contaminated with a certain chemical in a river.
   (2) A tank lorry dumps untreated sewage water to a beach.
   (3) Villagers in farm lands usually wash their equipment for pesticide in a river nearby.
   (4) A desalination plant may do harm to a rare specie of coral with its effluent of high temperature and salinity .

What is the role of MEPA?

MEPA's Responsibilities (Royal Decree No.8903)

(1) **Conduct** environmental **surveys** & monitoring to define problems and **recommend** environmental **standards and measures.**
(2) **Recommend** practical **measures** necessary to deal with emergency situations affecting the environment.
(3) **Recommend** protection **regulations and measures** dealing with environmental problems and **do** environmental **assessment.**

(4) Assess existing environmental **pollution levels** and future variations (such information to be documented for easy retrieval).
(5) Keep abreast with development in the field of environmental protection on the **regional and international levels.**
(6) Establish environmental **standards and specifications** for pollution control and environmental protection, in a definite and stable form **to be considered by the appropriate authorities when issuing permits for industrial and agricultural projects** which may have an environmental impact.



MEPA's Responsibilities (Royal Decree No.8903)

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(3) Recommend protection **regulations and measures** dealing with environmental problems and do environmental **assessment.**
(4) Assess existing environmental **pollution levels** and future variations (such information to be documented for easy retrieval).
(5) Keep abreast with development in the field of environmental protection on the **regional and international levels.**
(6) Establish environmental **standards and specifications** for pollution control and environmental protection, in a definite and stable form **to be considered by the appropriate authorities when issuing permits for industrial and agricultural projects** which may have an environmental impact.

Who is responsible for Environment Protection?

Executive Roles of Government Departments

(Royal Decree No.A/90 dated 27/8/1412H)

- Ministry of Agriculture & Water
  pasturage, forest & agricultural land, & development of desalination plants, besides any permits related to agricultural water resources and fishing.
- Ministry of Finance and National Economy
  Funds for the environmental projects
- Ministry of Petroleum and Mineral Resources
  Environmental protection activities through Aramco

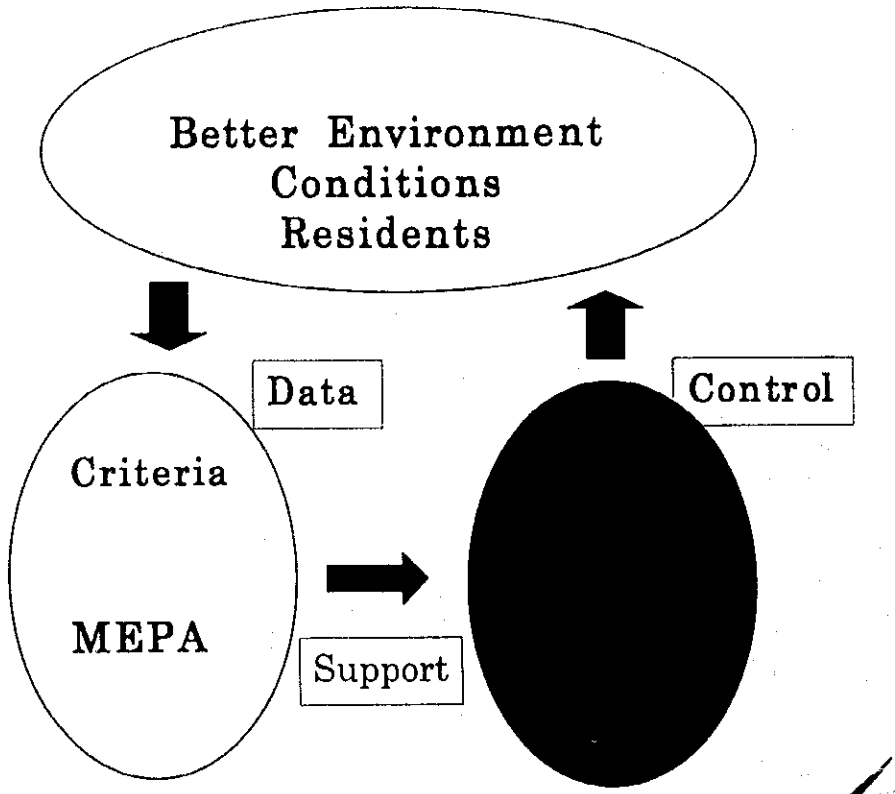
- Ministry of Health
  Provision of health care and control of environmental health conditions
- Ministry of Industry and Electricity
  Industrial projects licenses
- Ministry of Interior
  Evaluation of chemical, radioactive, military and natural hazards.
- Ministry of Transportation
  Transportation of dangerous wastes, besides prevention of oil spillage from ships and any sea pollutants.

- Ministry of Planning
  The objectives of the economic, social and environmental development through the Kingdom 5 year plans.
- Ministry of Municipal and Rural Affairs
  Water and sanitary systems, and disposal of solid wastes
- Ministry of Information
  Awareness of the nationals for environment protection.
- Ministry of Trade
  Standards for merchandise
- Royal Commission for Jubail and Yanbu
  Environmental protection in the industrial cities of Jubail and Yanbu

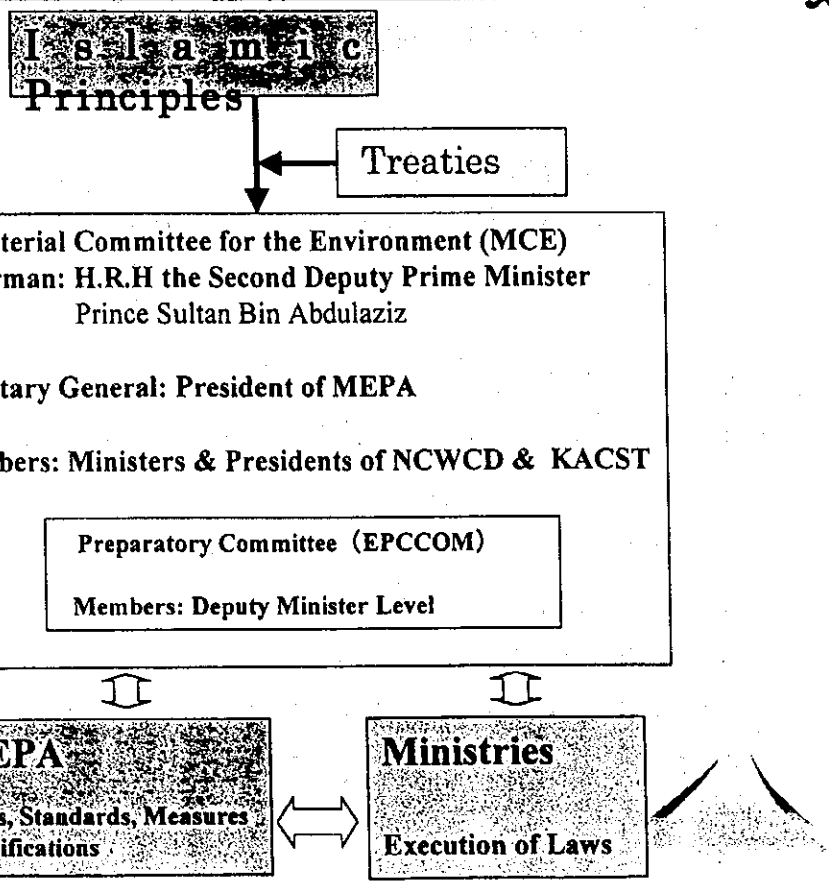
Questionnaire to the attendants

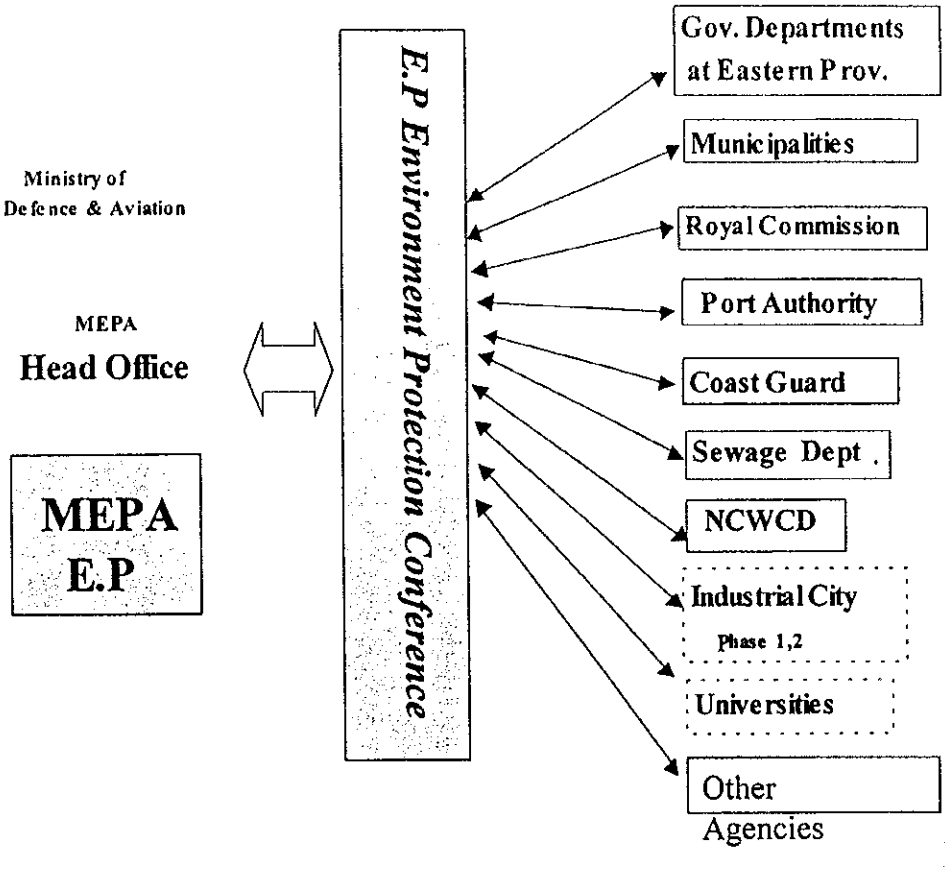
1. **Do you think MEPA has power of prosecution?**
   If yes, does MEPA exercise the power?
   If not, what do you expect of MEPA?

2. **Who will be primarily responsible for stopping pollution?**
   (1) A factory discharges water contaminated with a certain chemical in a river.
   (2) A tank lorry dumps untreated sewage water to a beach.
   (3) Villagers in farm lands usually wash their equipment for pesticide in a river nearby.
   (4) A desalination plant may do harm to a rare specie of coral with its effluent of high temperature and salinity .



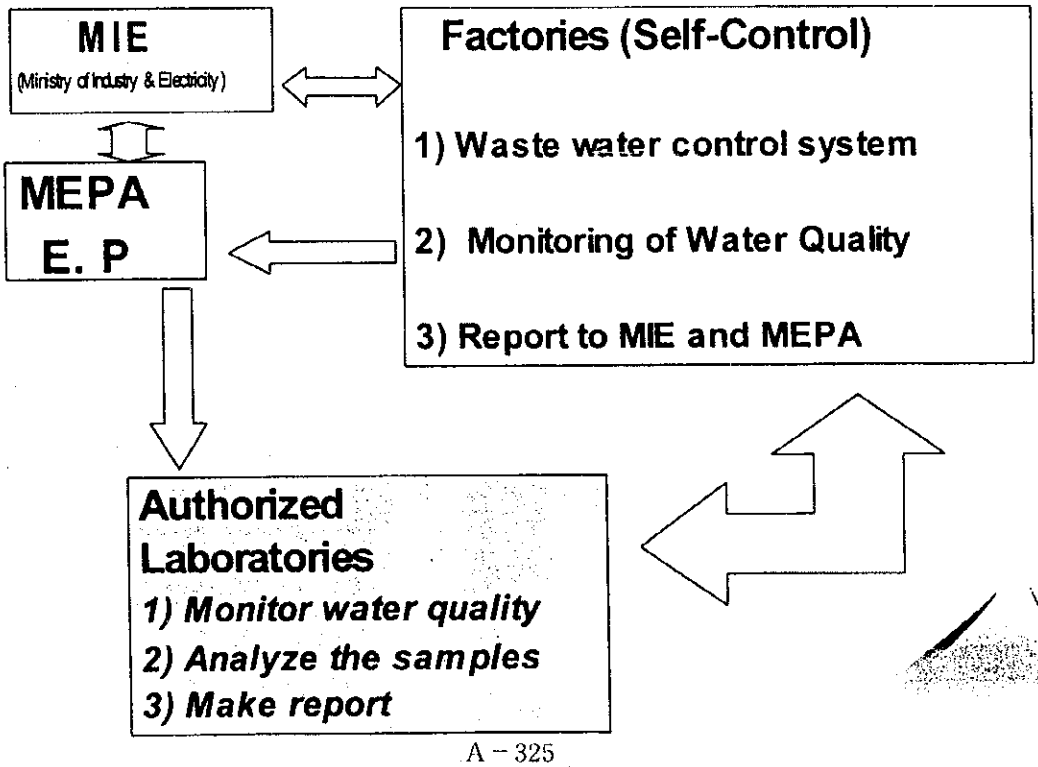
Environmental Protection System of Saudi Arabia





Relation with Waste Generators

(An example: case of waste water control)



JICA/MEPA Workshop III

"Present Situation and Future Consideration"

Hamdan Al-Ghamdi

Present Situation and Future Consideration

Hamdan S. Al-Ghamdi
MEPA, Eastern Province

Hamdan S. Al-Ghamdi
MEPA, Eastern Province

1

A Brief History of MEPA

- The beginning of MEPA occurred in 1370 H (1951) when an Aeronautical Observation Unit was established within the Ministry of Defense's Presidency of Civil Aviation.
- Four Meteorological Observation System

  - Riyadh - Jeddah - Medina - Dhahran

- In 1959, G.D. of Meteorology became a full member of WMO
- In 1966 MEPA's role was expanded when established as an independent administration within Civil Aviation
- In 1401H (1981) MEPA's became the central environmental agency within the Kingdom

2

MEPA's Responsibilities

Deals with issues of environmental Management, including;

- environmental monitoring and coordination responsibilities
- analytical duties pertaining to land, air and water
- prepare appropriate environmental standards and criteria to regulate urban and industrial activities,
- promotion of public awareness of environmental issues.

3

Environmental Protection General directorate (EPGD)

EPGD is responsible for matters related to environmental protection such as:

- **Issuance and implementation of the standards;**
- **Assessment of environmental status and proposing policies necessary to conserve and improve the environment shared by all levels of government and non-government organization;**
- **Co-operation and collaboration for protect human health;**
- **Reduction of the degradation of marine environment;**
- **Remediation of the damaged area;**
- **Promotion of the sustainable environment and resources;**

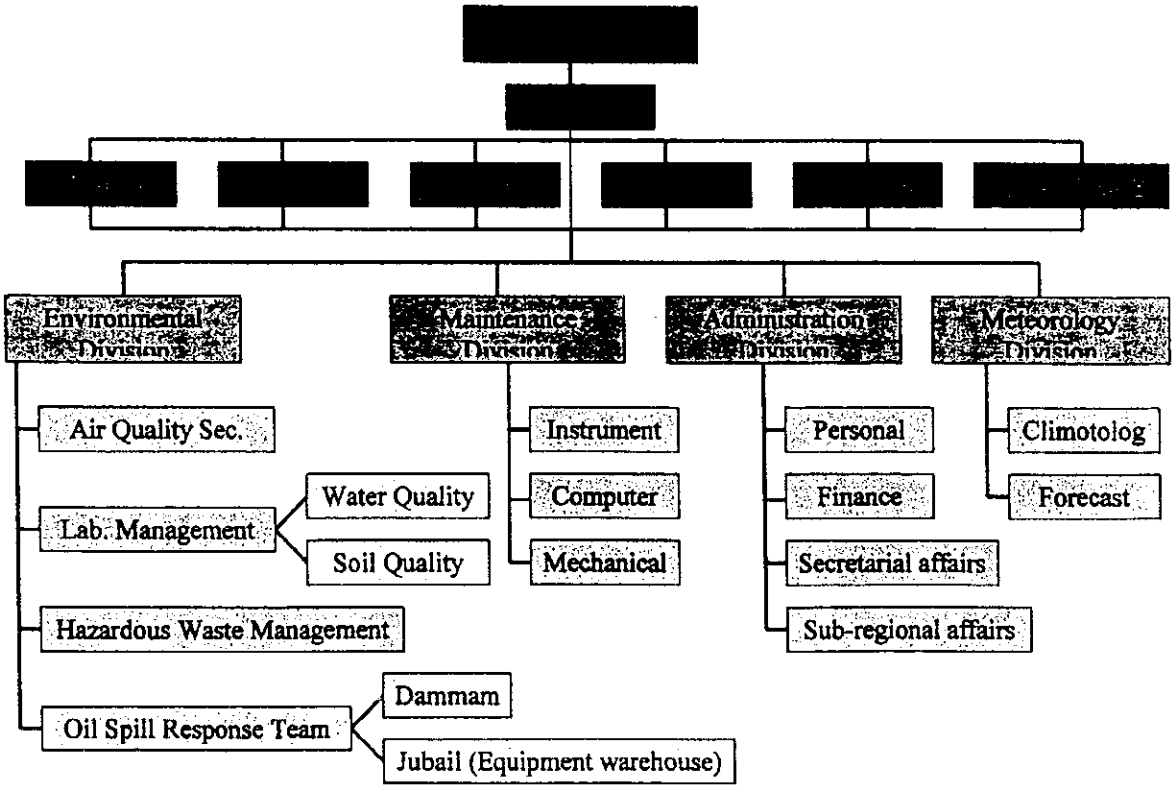
4

Specific duties of EPGD

- Proposes environmental quality standards for ambient environment and pollution sources as well as appropriate pollution control measures for implementation;
- Submit reports on environmental impacts for major industrial projects;
- Provides advice and technical consultation for industrial and agricultural activities in order that they meet environmental standards;
- Prepare reports on the status of environment;
- Propose solutions for resolution of conflicts between human activities and natural environment;

5

Meteorology & Environmental Protection Administration (MEPA)



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7

Eastern Province of Saudi Arabia

Total Area = **1,000,000 km²**

Total populations = 2,345,378

No. of cities = 27

No. of villages = 232

Length of coastal line = **790 Km**

Coastal populations = 1,818,000

Coastal Population density= 2,301 (person/Km)

Climatology:

Two Main Weather Seasons:

- Winter (December - March, cold , Ppt. Aver- 0.2-14 mm/month, temp 3 - 16°C)
- Summer (April - mid Sept., high frequency of sand storms in June-July, high humidity temp. 37 - 48°C)

Wind direction : North West (almost whole year)

8

Eastern Province of Saudi Arabia

Since 1930s

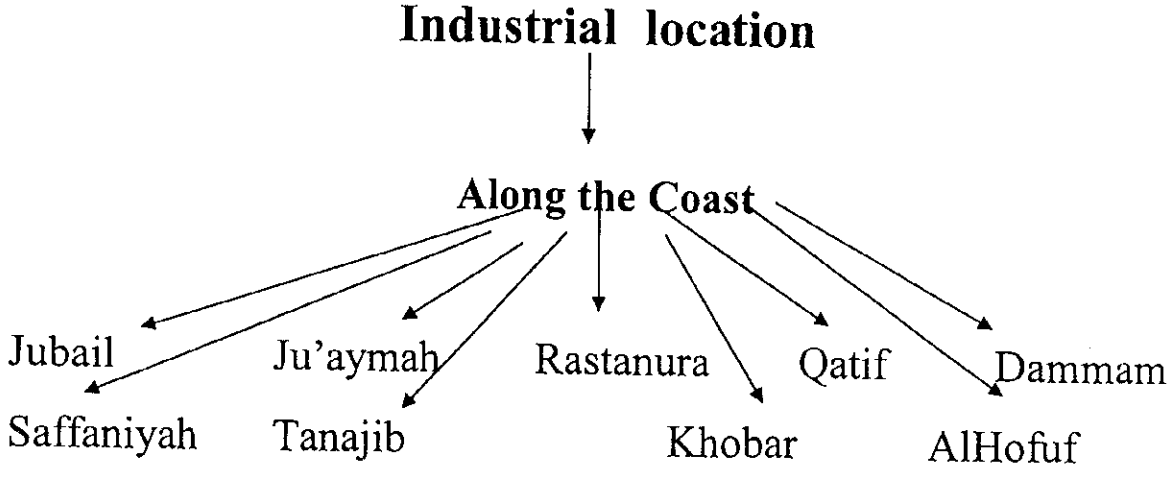
- •Development of Oil Production
- • Population of Kingdom shifted to Eastern Region
- • Major developmental activities in recent decades
  - • 4 industrial Cities
  - •725 Industries (Petrochemicals, Petroleum,Plastic & Chemicals etc).

All these development has great effect on environment air, land , sea and groundwater.

9

Present Situation

MEPA has developed National Standard to control the pollution from industrial activities.



10

MEPA rule to minimize the problems

- To encourage the private sector to invest in terms of treatment & reduction of waste
- Full control on private sectors in respect of disposal of waste
- Waste disposal must be according to MEPA regulations
- Industrial Questionnaire (Data Base on Microsoft Access)

11

THE

END

MEPA-JICA WORKSHOP III : 13-14 Nov 2000

QUESTIONS DURING DISCUSSION PERIODS

Monday 13 November [Chair of Discussion: Dr Zihad, Vice-President, MEPA]

1) Results indicate that team detected both free chlorine and coliform bacteria together at the same site - is this possible *(YES - bacteria escape chlorine if there is a lot of suspended organic particles).*

2) Is MEPA's GIS database ready for the Gulf Coastline - how complete is it?

3) Should industries increase the chlorine dose to ensure low coliform bacteria in their outfalls?

4) What metals and concentrations were present in the 'hot-spot' areas shown in the figures?

5) Are fish being affected by the heavy metals in the study area?

6) Statement from Al Khobar STP representatives: "We monitor the effluent and find no coliform bacteria in our samples."

7) Industrial sources of pollution - what steps are needed/being taken by MEPA to prevent marine pollution from large and small industry discharges?

8) What collaboration has been undertaken with agencies such as Royal Commission to ensure that sampling standards are the same or can be easily compared?

9) Is MEPA providing environmental 'Generalist' training to help Journalists and to improve Media Liaison and accuracy of Mass-Media reporting?

10) With respect to situation in Tarut Bay, has any hydrodynamic modelling been undertaken?

11) Question on Satellite image data

12) Further questions and discussion on eutrophication signs and symptoms in the Tarut-Dammam region.

End of First Discussion Period.

Tuesday 14 November [Chair of Discussion: Dr Zihad, Vice-President, MEPA]

1) What pollutants cause the red "Level 4" pollution shown at certain sites by Mr Ike?

2) Mr Kutsi's results show 14.1 ppm Arsenic in the sediments at the Al Khobar STP outfall - how serious is this finding?

3) Could Dr Abdul Al-Arfaj please ensure that his University's results for the shrimp metal data are published soon.

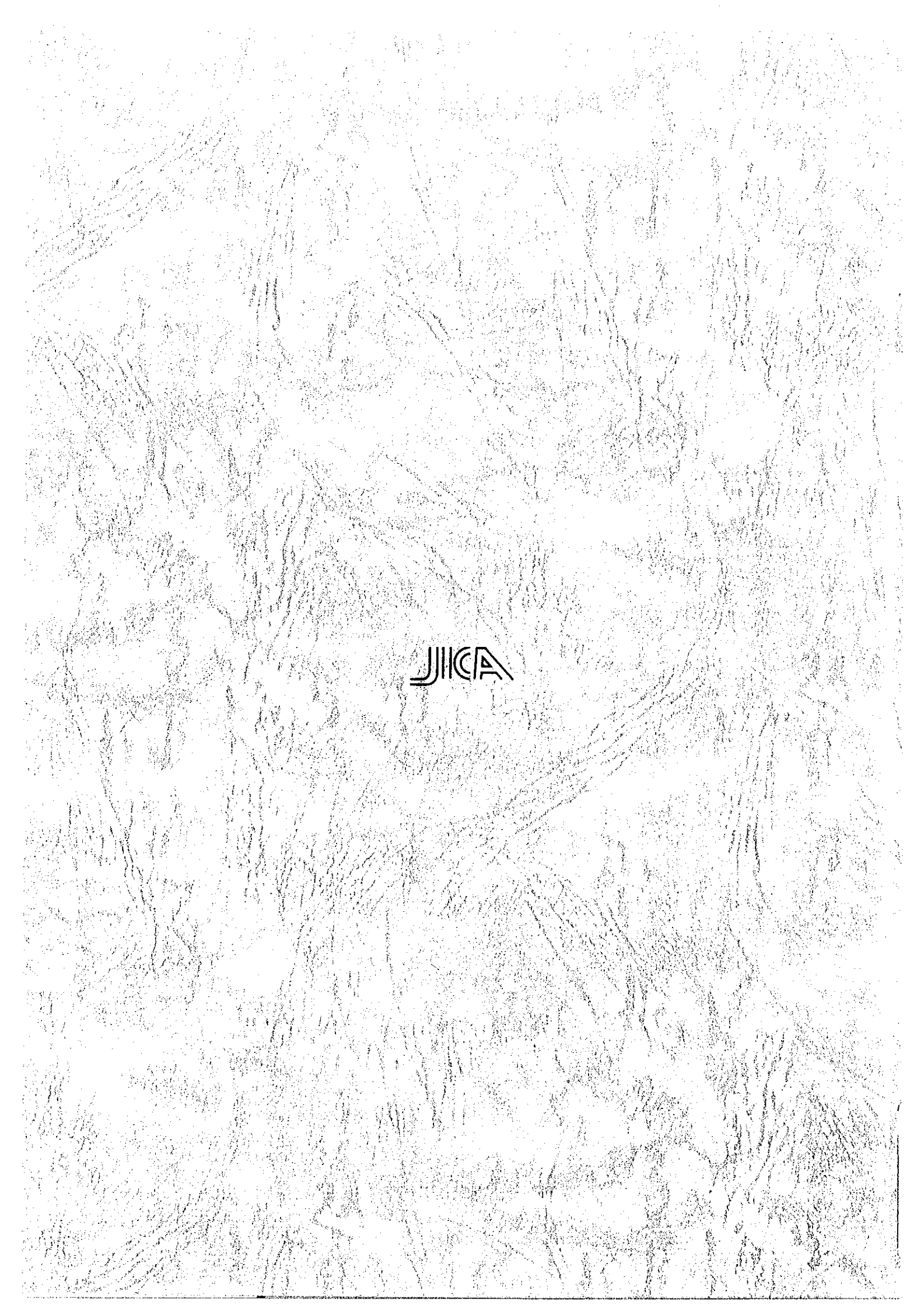
4) What are the units "PCS", as shown for the total coliform counts in Mr Kutsi's results table? Is it the same as MPN (the usual unit for bacteria counts)?

5) What is the time period for the recommended Phased Approach to future monitoring? Which point is "Zero"? The present study and previous studies should be included to ensure the program does not keep re-starting from "Time Zero".

6) Mr Tanaka's slides showed the present regulatory situation for MEPA and where there are weaknesses, but he did not provide recommendations about filling the gap. So what is the current situation at MEPA regards improving/implementing Coastal Water Protection and Management? How will it collaborate with industries, agencies and the people? In other words, what's the future perspective and how will it all be carried out?

7) MEPA must move from mere "encouragement" of industries to comply with standards, to "enforcement" of the environmental standards and guidelines.

8) In the shrimp and sediment heavy metal study presented by Dr Abdul Al-Arfaj, was: (a) the data examined seasonally, and (b) was the sediment ORP measured to determine the relationship between metal concentration/availability and sediment location?


JICA