

**ASSESSMENT OF WATER QUALITY
PARAMETERS, BIOMAGNIFICATION STUDIES OF
SELECTED HEAVY METALS AND
CHARACTERIZATION OF SOLID WASTES IN
SUNGAI PENCALA**

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ABSTRACT

The study was conducted to assess the extent of pollution in Sungai Pencala. A total of 14 monitoring stations were established along the river. The selected sampling stations represented the various activities in the surroundings of Sungai Pencala. Samplings were conducted 12 times over a period of 16 months from March 2006 – June 2007. Water quality parameters such as temperature, pH, DO, BOD, COD, NH₃-N, conductivity, turbidity, TSS, TDS, TBC, and E Coli were monitored to determine the pollution status of the river. The results were then compared to the current recommended Interim National Water Quality Standards for Malaysia (INWQS) and DOE Water Quality Criteria for Malaysia. Apart from water, fish and plant samples were also analyzed for selected heavy metals such as, cadmium, chromium, lead and mercury to assess the bioaccumulation of those metals. Heavy metals were analyzed using Inductively Coupled Plasma –Mass Spectrometry (ICP MS) and Flow Injection Mercury Analyser (FIMS). Analysis of certified reference material (CRM) from National Research Council Canada (DOLT 2) showed good agreement with the certified values for all selected metals, obtaining more than 84% recovery. Solid waste characterization was also carried out at few selected locations. This study reveals that Sungai Pencala needs a better management and development in order to provide better ecosystem to support healthy aquatic life.

ABSTRAK

Kajian ini dijalankan bagi menilai tahap pencemaran Sungai Pencala. Sejumlah 14 stesyen pemantauan telah diwujudkan di sepanjang sungai tersebut. Stesyen yang dipilih itu mewakili pelbagai aktiviti yang terdapat di sekitar Sungai Pencala. Pensampelan dilakukan sebanyak 12 kali untuk tempoh selama 16 bulan dari Mac 2006 – Jun 2007. Parameter kualiti air yang diukur ialah pH, DO, BOD, COD, $\text{NH}_3\text{-N}$, kekonduksian, kekeruhan, TSS, TDS, TBC, dan E.Coli. Data-data yang diperolehi kemudiannya di bandingkan dengan Piawai Interim Kualiti Air Nasional bagi Malaysia (INWQS) dan Kriteria Kualiti Air JAS bagi Malaysia. Selain daripada air, kandungan logam berat iaitu, kadmium, kromium, plumbum dan merkuri dalam ikan dan tumbuhan juga ditentukan bagi menilai keupayaan bioakumulasi logam-logam tersebut. Logam berat dianalisis dengan menggunakan Inductively Coupled Plasma–Mass Spectrometer (ICP MS) dan Flow Injection Mercury Analyser (FIMS). Analisis bahan rujukan yang disahkan (CRM) dari National Research Council Canada (DOLT 2) mendapat keputusan yang bertepatan dengan nilai sah bagi kesemua logam dengan keperolehan semula lebih daripada 84%. Pencirian bahan buangan pepejal juga dilakukan di beberapa lokasi terpilih. Kajian ini menunjukkan bahawa Sungai Pencala memerlukan pengurusan dan pembangunan yang lebih baik bagi menghasilkan ekosistem yang lebih sesuai untuk hidupan akuatik.

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B	Water samples Results
C	Method verification Data
D	Summary Quality Control data for Fish and Plant sample analysis

LIST OF SYMBOLS & ABBREVIATIONS

°C	-	degree Celsius
DO	-	Dissolved Oxygen
BOD ₅	-	Biochemical Oxygen Demand (in five days)
COD	-	Chemical Oxygen Demand
As	-	Arsenic
Cd	-	Cadmium
Cr	-	Chromium
FIMS	-	Flow Injection Mercury analyzer
g	-	gram

mg	-	milligram
µg	-	microgram
g/L	-	gram per litre
ppb	-	Parts per billion
%	-	Percent
L	-	litre
mg/L	-	milligram per litre
mg/kg	-	miligram per kilogram
mL	-	mililitre
ppm	-	Parts per million
Hg	-	Mercury
HNO ₃	-	Nitric Acid
H ₂ SO ₄	-	Sulphuric Acid
H ₂ O ₂	-	Hydrogen Peroxide
HClO ₄	-	Perchloric Acid
ICP AES	-	Inductively Coupled Plasma Atomic Emission Spectrometer
ICP MS	-	Inductively Coupled Plasma Mass Spectrometer
FIMS	-	Flow Injection Mercury Analyzer
IDL	-	Instrument Detection Limit
MDL	-	Method Detection Limit
INWQS	-	Interim National Water Quality Standards
POPs	-	Persistent Organic Pollutants
Pb	-	Lead
Zn	-	Zinc
NH ₃ N	-	Ammoniacal Nitrogen

NH ₃	-	Ammonia
N ₂	-	Nitrogen
NO ₂ ⁻	-	Nitrite
NO ₃ ⁻	-	Nitrate
TS	-	Total Solid
TDS	-	Total Dissolved Solid
TSS	-	Total Suspended Solid
Temp	-	Temperature
HDPE	-	High Density Polyethylene
PVC	-	Polyvinyl Chloride
LDPE	-	Low Density Polyethylene
PP	-	Polypropylene
PS	-	Polystyrene
KLGCC	-	Kuala Lumpur Golf and Country Club
TTDI	-	Taman Tun Dr Ismail
NGO	-	Non-Government Organization
CETEC	-	Centre for Environmental Technologies
NMDMP	-	National Marine Debris Monitoring Program
MMC	-	Marine Mammal Commission
EPA	-	Environment Protection Agency
UNEP	-	United Nation Environment Program
MSW	-	Municipal Solid Waste

