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第二回アジア太平洋地域水文水質源国際会議
NILIM特別セッション
報告書

河川研究部

NILIM SPECIAL SESSION IN THE FIRST INTERNATIONAL CONFERENCE ON HYDROLOGY AND WATER RESOURCES IN ASIA PACIFIC REGION (APHW 2004)
Report

River Department

国土交通省　国土技術政策総合研究所

National Institute for Land and Infrastructure Management
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第二回アジア太平洋地域水文水資源国際会議 NILIM特別セッション

報告書

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NILIM SPECIAL SESSION IN THE SECOND INTERNATIONAL CONFERENCE ON HYDROLOGY AND WATER RESOURCES IN ASIA PACIFIC REGION (APHW 2004)

Report

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概要：

平成16年7月7日に第二回アジア太平洋地域水文水資源国際会議において開催されたNILIM特別セッションの内容を取りまとめたものである。

キーワード：水循環、治水政策、利水政策、水資源管理

Synopsis

Proceedings for NILIM Special Session in the second international conference on hydrology and water resources in Asia Pacific Region (APHW 2004)

Key Words : water cycle, flood control policy, water utilization policy, water resources management

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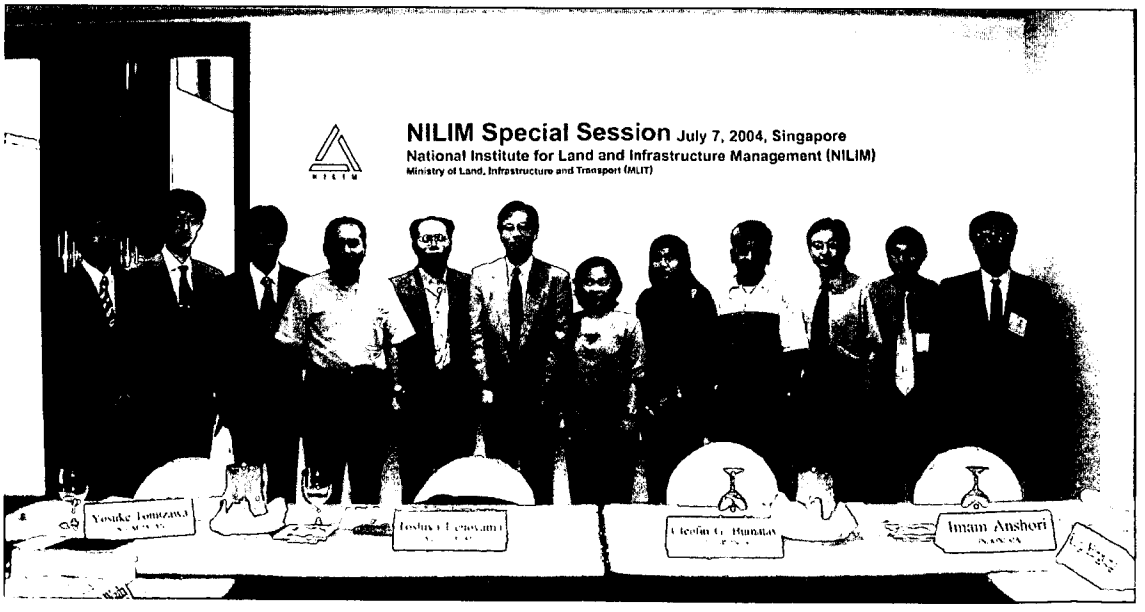
はじめに

平成１６年７月５日から８日までの４日間、シンガポール・サンテックインターナショナル・コンベンション&エキシビジョンセンターにおいて第２回アジア太平洋地域水文水資源国際会議（APHW2004）が開催された。 APHW2004 では８つの特別セッションが開催され、国土技術政策総合研究所河川研究部もそのうちの一つとして前回の APHW2003 に引き続き、NILIM セッションを主催した。本資料は NILIM セッションの概要について取りまとめたものである。

今回の NILIM セッションでは、アジアモンスーン地域諸国の水問題と、これに対する対策として進められている水制度の紹介を行い、アジアモンスーン地域諸国の共通の処方箋として活用できる情報の共有化のためのツールボックスとされることを想定し、アジア５ヶ国から７名の参加者を招聘し各国における水管理についての法制度について議論を行った。海外の都市に７名という数多くの外国の専門家を一度に招聘して開催するという、国土技術政策総合研究所にとっては、これまであまり経験したことのないやり方で行ったため苦労した点も多くあったが、その成果としてセッションでの議論を通じ、それぞれ地域ごとに異なった特徴的で重要な課題があるという認識を新たに共有することができた。なお、本セッションは文部科学省科学技術振興調整費（水災害の監視・予測・軽減への貢献：代表 京都大学防災研究所 寶 馨教授）によって開催されました。また、関係国の JICA 専門家には外国の専門家の招聘にあたり多大な協力をいただいた。ここに記して謝意を表します。



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—2003年堆河の洪水とその予測、予報について— (Mr. Liu Jinping)

中国のLiu氏からは2003年に発生した洪水の際に行われた、中流部の流下能力不足で氾濫しやすい小流域に注目した対応策について発表が行われた。これに対する質疑は以下のようなものであった。

Q: 5カ所の流域で水位が高くなった原因についてどのように説明するか。

A: 第一に、降水量が通年の2倍にあたる500 mmを記録したということがある。また、おそらく、氾濫水が9つの河川に流れ込んだために、この30年のうちでより高い水位につながった。

Q:水位について過去にさかのぼって見れば、降雨量が増加することはないように思われるが。

A:そのとおりである。

2. National Standards Technical Specification for River Works in Lao PDR
—ラオスにおける河川技術基準— (Mr. Bounphet Phommachanh)

ラオスのPhommachanh氏からは、ラオスでは河川技術基準の統一がなされておらず援助国の技術基準に則って施行されているという発表があった。これに対する質疑は以下のようなものであった。

Q: この種類の活動を基準化するにおいて、護岸の区分はあるか。

A: ラオスにおいて河岸侵食は喫緊の課題であり、河川工事は最重要事項である。設計は資金供与者に基づき、予算は使い切らなければならない。設計に関しては、当然のことながら、流量、方向、水路測量を収集し、場合により、土壌の掘削を行っている。

3. Urban Heat Islands-Effects on The Microclimate of Malaysian Cities
—マレーシアの都市の局所的な機構に及ぼすヒートアイランド現象の影響—
(Ms.Norlida Mohd Dom)

マレーシアのMohd Dom氏からは、ヒートアイランド現象によると思われる降雨量の差異およびこれに対して行われている対応策について発表があった。これに対する質疑は以下のようなものであった。

Q: 局所的な気候変動が明らかになったのはどのような根拠に基づくのか。

A: カナダやスイス、中国においても組織的影響に関する研究が行われているが、まだ根拠が明らかになっているわけではないが、降雨、洪水、災害が頻繁に起きており、徐々に事実となりつつあると言える。これはわたしが根拠を見つけようとして行った予備的研究にすぎない。局所的な気候変動を証明する具体的な解析が存在するか

もしれないし、農業との関連性はないかもしれないが、クアラルンプールでは近年、気温が上昇している。

Q: 35 年間というのは、実際何が起きているかを理解するには短すぎる。

A:そう思う。

Q:クアラルンプールとの比較地点は？

A:郊外の 45km あたりである。

Q:では、比較はその二つの地点だけで行われているということか。

A:そのとおりである。われわれは、クアラルンプールの唯一の研究機関であるため、一組のサイトの比較のみを行っている。

Q:田園地帯には、いくつも観測地点があるのでは。

A:他の観測地点も調査することにする。

4. The Challenges in the Water Resources Management in the Philippines
—フィリピン水資源管理における挑戦— (Ms. Pacita Fernandez Barba)

フィリピンの Barba 氏からは、フィリピンにおける水管理についてのいくつかの問題点や流域管理組織の必要性について発表があった。これに対する質疑は以下のようなものであった。

Q: フィリピンの都市部では水不足が起きているか。

A: マニラ首都圏は、水不足に悩まされている。供給源としてダムが一つしかない上、そのダムは灌漑にも使われている。水位が低下する干ばつ時には、「配水の原則」に沿って水が配分される。

Q: 水質はどうか。

A: マニラ首都圏にある河川の水質は、生物学的にすでに最悪な状態であるため、マニラからの水源は利用しておらず、近隣の県からの供給に頼っている。

Q: 河岸の浄水システムを管理しているのは誰か。また、流域レベルでの配水制度を担当するのはどのような機関か。

A: 河川水の配分は、国家水資源委員会（National Water Resources Board）によって行われているが、飲料水として利用するために河川水を浄化する役割は保健省になっている。

5. Recent Flood Control Issues in Japan and Legislation for Preventing Flood Damages in Urban Areas
—近年の日本における洪水管理問題と都市域における洪水被害軽減のための法整備—
(Mr. Atsushi Hattori)

日本の国土技術政策総合研究所 服部主任研究官から近年の大きな課題である都市河川の水害問題について、その特徴と課題の紹介及び、こうした課題の対策として策定された特定都市河川浸水被害対策法の紹介が行われた。これに対する質疑は以下のような

ものであった。

Q: 給水系統の状況がはっきりしている都市はいくつあるか。貯水設備の機能の低下はどの程度深刻か。

A: (服部主任研究官) このプロジェクトは始まったばかりであり、明確に決まっていない。また、遊水地の機能低下についてであるが、日本でどの程度深刻かは、あいにく専門家でないため答えられない。

A: (村瀬主任研究官) この法律は、制定は昨年、施行は今年なので、指定地域はまだ決まっていない。機能低下は起きているかもしれないが、結果は明らかになっていない。このたびの制定によってなんらかの経験が得られると考えている。

6. The Revision of Water Law of P.R.C. and the Efforts for Remedying the Dry-up Problems of Yellow River—中国における水法改正と黄河断流対策への取り組み—
(Mr. Xiong Xiangyang)

中国の Xiong 氏からは、水法の概要とその改正、および黄河断流の現状とその対策について発表があった。これに対する質疑は以下のようなものであった。

Q: 水利権の許認可制度に基づいて地下水から取水するのか。

A: この地域では近年、地下水レベルが急激に下がっており、有効な緊急措置を持たずにいたが、近年、長江から取水し、北部へ引水する事業に取り組んでおり、時がたてば、地下に流出する水源が増えると考えている。

Q: 中国では、水法と水資源法が別々に制定されているのか。

A: 水法だけで、水資源法はない。

7. Character and The Most Important Subjects of The Indonesian Law on Water Resources—インドネシア水資源法の特徴と最重要テーマ— (Mr. Imam Anshori)

インドネシアの Anshori 氏からは、インドネシアにおける 2004 年に制定された水資源法と水資源管理の現状について発表があった。これに対する質疑は以下のようなものであった。

Q: インドネシアには河川流域資産を管理する機関があるが、昨年、水の利用をめぐって争いが起きている。調停プロセス、伝統的な制度とはどのようなものか。

A: インドネシアには約 90 の河川流域があるが、主要河川の数は 5,000 以上にもなるため、流域の境界を新たに設定しようとしている。ある二つの地区の流域は統合され、一つの管理計画にまとめられる。そのためには、主要なスタッフが水資源管理計画を作成しなければならない。

Q: インドネシアでは、水の利用に関して農業の優先順位がいまだに高い。関係者の要求により、当局が配分を調整するのか。

A: そのとおりである。わが国における水の利用については、全体の 80%を農業が占め

ている。しかし最も優先順位が高いものは、生活用水である。農業はその次に優先される。優先順位の3番目、4番目は、その流域の状況により異なる。バタン島のように農業が盛んではない地域では、優先順位の3番目として挙げられるのは、産業であると思う。観光、その他は4番目、5番目である。

Q: インドネシアでは、法律に水資源管理に関する許認可はあるか。

A: ある。許認可は、 権限および責任の一部である。よって、わが国の法律は、水資源管理を行う権限および責任について明記する必要がある。法律は5つの条項から成る。中央政府が責任を担うが、別の条項は、中核管理の原則により、中央政府は地方自治体に任務を移譲できるとしている。ただし、地方をまたがる水資源管理については、依然として中央政府の管轄である。

8. Water Use in Metro Manila and Metro Cebu—メトロ・マニラ及びメトロ・セブにおける水利用— (Mr. Cleofin G. Bumatay)

フィリピンの Bumatay 氏からは、首都マニラおよびセブ島にあるメトロ・セブにおける水の需要と供給の現状およびその問題点について発表があった。これに対する質疑は以下のようなものであった。

Q: 給水システムに民間セクターを取り込んでいる貴国において、政府がマニラ市の水の価格は自由市場としているのか。

A: 将来的に自由市場とすることもできる。

Q: 貧困層に関しての水供給をどう考えているか。

A: 価格を検討する際には貧困層も考慮している。

Q: 給水システムに民間セクターが参入しているという説明があったが。

A: 先頃、マニラ首都圏の水道事業は、Manilad Water Services Corporation および Manila Water Company という専門企業により民営化された。

9. Systematic Review of Water Management during Drought in Japan
—日本における渇水時の水管理の体系的な概観— (Mr. Masahiko Murase)

日本の国土技術政策総合研究所 村瀬主任研究官から、日本の低水管理について概観的にとりまとめた発表があった。これに対する質疑は以下のようなものであった。

Q: 水配分のプロセスにおいて争いを避けるためのアドバイスはあるか。

A: 基本的に、わが国では、過去 10—20 年の間、新たな水資源の開発に投資を行い、問題解決を図ってきた。多くの水資源を用意することにより、新たな利用者と古くからの利用者の間の争いを避けてきた。しかしながら、環境への懸念が高まったために新たな水資源の開発が困難になり、新たな利用者と古くからの利用者との争いが避けられなくなった。このような経緯から、新たな利用者と古くからの利用者との間で情報や問題の共有が必要になったわけであるが、その取り組みは始まったば

かりである。

Q: 日本では水配分に関する論争を収める制度があったと思うが、どのような教訓があるか？

A: 以前と比べて現在の日本の社会は大きく異なっており、先の話はおそらく200年前のことであると思うが、当時と今とでは環境が大きく異なる。当時は地域社会があって、そこには住民の間には強い結びつきがあり、飲料水を配分するための確固たる制度が存在した。田園地帯においてそのような社会が失われて久しく、農業水の共有を目的として過去のそういった制度を適用するのは容易ではない。

Q: 新たな水利権はどのように施行されるか。

A: 法律に従い、政府が水利権を全面的に管理する。

Q: 水資源の利用を監視するのか。

A: 新たな水資源の所有者は、水利用に関するデータを河川管理者に提出しなければならない。この部分は全面的に監視されている。

Q: 日本では、慣習上の水利権は取引できないと聞いている。渇水が顕著な今、なぜこの権利を取引する制度を設けないのか。

A: 慣習上の水利権については、公式には移譲や取引を認めていないが、深刻な干ばつが発生した際には、一種の妥協により、飲料用や新規参入者向けに慣習上の水利権の融通が行われている。これは自発的なものであり、政府の規制を受けない。深刻な干ばつの際には、現実的には妥協的措置がとられ、これが制度と現実の間を埋めていると言える。

報告

Report of the NILIM Special Session

HUAI RIVER FLOOD IN 2003 AND ITS FORECASTING, PREDICTION AND DISPATCHING

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Abstract: Huai river basin, one of seven large river basins in China, hit by heavy rainfall in the flood season of 2003. With the result that Huai river occurred the second large basin-wide flood since 1949. In the period of Huai river flood, 3 kinds of flood forecasting and prediction were provided focused on the various needs from decision-making departments of flood control and water projects management to provide, and some new fundamental have been embodied in the flood control and water dispatching. This paper aims at introduction to this catastrophic flood, the experiences of operational flood forecasts and prediction and the new concepts actually appeared in the flood dispatching.
Key words: Huai river flood in 2003, forecasting and prediction, flood dispatching, new fundamental

1. BRIEF DESCRIPTION TO HUAI RIVER BASIN

1.1 Hydrogeography and Hydrologic Characteristics

Huai river basin, one of seven large river basins in China, lies in the middle of the country with a population about 100 millions. It includes Huai river system and Yishusi river system. Huai river system starts from the Tongbai Mountains. Its upper basin is in Henan Province, its middle basin in Anhui Province and its lower basin in Jiangsu Province. Its trunk is about 1000 kilometers long and its catchment area about 190,000 km^2.

The Huai river system has roughly the characteristic shape of leaf veins. There are many tributaries on the both sides of Huai river. Limiting the list to the upper and middle reaches the largest tributaries on the north side are: Ruhe, Honghe, Quanhe and Yinghe rivers. On the south side along the same reaches the largest tributaries are: Shihe, Zhuganhe, Zaihe, Huanghe, Bailuhe, Shiguanhe and Pihe rivers.

The tributaries on the south side have their source in mountains areas at a height of 1200~1600m. Precipitations in these areas are very heavy (1200~1600 mm yearly) and the above tributaries represent therefore the main source of the upper and middle reaches of Huai river. Most of the tributaries in the north side are plain channels.

Because of its characteristics the Huai river can be divided into 3 stretches, each with distinct hydrographic conditions (shown in table 1).

The Huai river basin is located within the transitional area between the climates of northern and southern China. Owing to the shear line and typhoons it has heavy rainfall.

The mean multi-annual rainfall over the basin is 900mm/yr, with means of 1400~1600mm/yr in the southwest and 600mm/yr in the north. The distribution of rainfall over the years is very irregular. The flood season, when 60% of annual rainfall occurs, lasts from June to September.

The river flows faithfully reflect the trend of the rainfall. The differences between the minimum, average and normal peak flows are very great, also during the rainy season.

Table 1 Huai River Hydrographic Characteristics

Item	Upper course	Middle course	Lower course	Total
Area of basin (km^2)	31,000	127,000	31,000	189,000
Length of river (km)	360	490	150	1,000
Main gradient	0.5‰	0.033‰	0.04‰	0.2‰

1.2 Hydraulic Works

In 1956 the basin program mainly for flood prevention, waterlog control and irrigation was completed. In 1971, another program was draw up and several major projects planned. Each program envisages flood storage and flood diversion by means of detention and diversion basins in the middle and upper reaches, and flood discharge in the lower reach, which will reduce the peak flood discharge and ensure the safety of the Huaibei embankments.

The total length of the main embankment on the left is 700km, protecting the great northern plain. And there are other smaller ones (along the tributaries on the right side), making a total of more than 1000km of embankments.

About 5200 reservoirs were built in the basin, 16 of which are large reservoirs with a storage capacity of more than $110x10^8m^3$. It should be stressed that the influence of these reservoirs on the formation of the flood wave is generally slight, since the basins dominated by the reservoirs are small and situated at the far end of the upstream basin.

At present, there are 9 detention basins with a total area of $2286km^2$ and 18 diversion areas in the middle reaches with total area of $1320km^2$. The embankments of detention basins run along the riverbed and can be flooded when the water level exceeds given values at the control station. The embankments of the detention basins are 4~5m high on the average ground level. The diversion areas located also beside the riverbed. But the embankments are usually lower and flooding and drainage are not regulated by gates but are carried out through the natural overflow of the embankments.

2. BRIEF INTRODUCTION TO HUAI RIVER FLOOD IN 2003

2.1 Climate and rainfall

In the summer of 2003, the subtropical anticyclone of the Northwest Pacific was much stronger than the normal and controlled most area of northern China incessantly. Meanwhile, the southwest warm and wet current was prevailing. The warm and cold current was interacting in the region between Yellow and Yangtze rivers. Suffering from the abnormal climate, Huai River basin occurred heavy rainfall.

From June 20 to July 21 in 2003, there were 6 precipitation processes(shown in figure 1). The accumulate value of the mean average precipitation amounts to 487mm(31 days) which is more than twice as much as that in the same period of normal years. The rainfall at storm center is 946mm. Analysis shows that the maximum 30-day precipitation is larger than that in 1991 and less than that in 1954(shown in table 2).

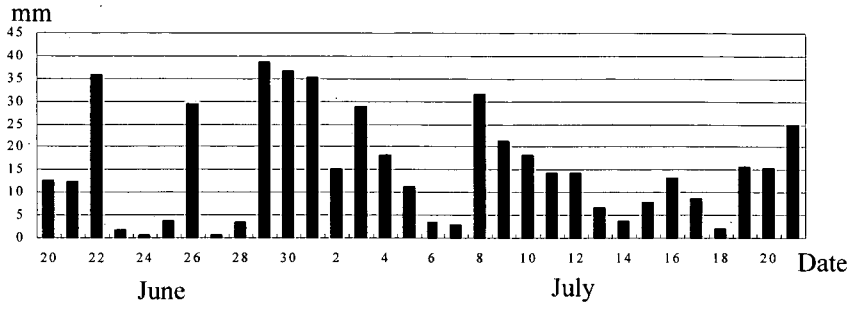

Fig. 1 The precipitation processes From June 20 to July 21 in 2003

Table 2 Precipitation in Huai river Basin in 1954, 1991 and 2003

Year / Item	In 2003 (a)	In 1991 (b)	In 1954 (c)	Comparison	
				(a) and (b)	(a) and (c)
Max. 30-day-prec. (mm)	465	389	516	+20%	-10%
Water Volume on the Basin(10^8m^3)	898	739	983		

Note: The period in 1954 is 31 days

2.2 Flood

As a result of heavy rain, all tributaries of Huai river basin occurred big flood many times and the main river of middle-stream befell 3 times freshet processes (shown in figure 2). The water level of all gauges along the main stream exceeded the warning stages, in which some reaches' water level over the warning stages 1.38~3.35 meters, with a period of 25~33days. The water level of some reaches in middle stream of main river exceeded the historical record by 0.25~0.51 meters.

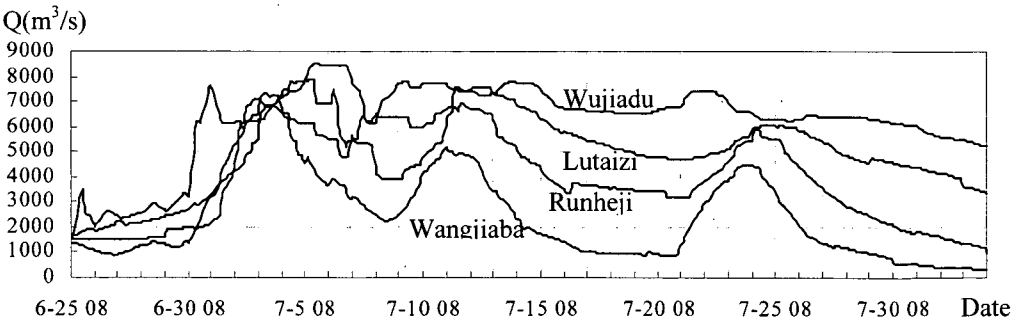

Figure 2 Hydrographs at main stations along Huai river

Table 3 Max. Water Level and Discharge in large flood years

Year	Wangjiaba		Zhengyangguan		Bengbu		Jiangba
	H (m)	Q(m^3/s)	Hl(m)	Q(m^3/s)	H (m)	Q(m^3/s)	H(m)
2003	29.42	6420	26.80	7980	22.05	8580	14.37
1991	29.56	6280	26.52	7480	21.98	7840	14.08
1954	29.59	9600	26.55	12700	22.18	11600	15.23

Synthetic analysis indicates that the return period of flood at Wangjiaba station that is outlet of upstream reaches 10 years, 20 years at middle reach and over 30 years at Zhongdu station that is outlet of Hongze Lake. In 1991, the return period of flood at middle reach was less than 20years. And in 1954, the return period of flood at Wangjiaba station was about 20 years and 50 years at middle reach. Therefore, we can say that this Huai river flood occurred in 2003 is the second large basin-wide flood just next to the catastrophic flood occurred in 1954 since 1949.

2.3 Flood Disaster

During this big flood, 9 detention areas and some diversion waterways were put into use. Affected population amounted to 37 millions, inundated farmland reached 3.8 million hectares, the died people was 29 and the total direct losses of people's property and gross national product summed to 28.5 billions RMB Yuan, or about 3.5 billions US dollars. The flood in 2003 is larger than that in 1991 while the losses is lower(shown in table 4).

Table 4. Comparison of Flood Disaster in the Year of 1991 and 2003

Year	Innudated farmland (million hm^2)	Affected people(million)	Died people	Ruin house (million)	Total losses (billion Yuan)
2003	3.85	37.30	29	0.77	28.6
1991	5.52	54.23	572	2	33.9

3. FLOOD FORECASTS AND PREDICTION

During the period of Huai river flood, the Chinese hydrologists focused on the various needs from decision-making departments of flood control and water projects management to provide all kinds of flood forecasting and prediction by the whole bag of tricks. Some results of forecasts and predictions are shown in table 5. Hydrologists issued various flood forecasting and prediction once or twice even three times every day in order to meet the needs of decision-makers as soon as possible. Decision-makers took full advantage of those results to made decisions for flood disaster prevention, preparedness, reduction, mitigation and rehabilitation and got a great achievement.

3.1 Forecasting continually to the whole river system combining with QPF to increase lead-time as soon as possible

In order to increase lead-time to buy long time for early warning and flood control, 2 aspects of shebang had been emphasized during the period of flood: the first one, make the best of Quantitive Precipitation Prediction (QPF) from department of meteorology to

Table 5 The list of some results of Forecasts and Predictions

Flood No.	Station	I. T.	Forecasted			Action on water projects	Observed	
		m d h	P. T.	P. L.	L.T.		P. T.	P. L.
1	WangJB	7 02 14	7 03 12	29.55	1d	Operarte Mengwa Detention area	7 03 04	29.41
	Runheji	7 04 08	7 04 12	27.30	4h	Operarte Cihuaixinhe Waterway and TangDH detention area	7 06 02	27.32
	ZhengYG	7 06 08	7 07 08	26.70	1d		7 06 15	26.55
	Wujiadu	7 04 15	7 07	22.30	3d	Operarte Huaihongxin Waterway	7 06 22	22.05
	Hongzehu	7 09 08	7 14 08	14.40	5d	Operarte Ruhai Waterway	7 14 15	14.37
2	Wangjiaba	7 10 15	7 11	28.80	1d	Operate Mengwa, ChengDH, Qiujiahu detention areas and XiangHD Reserviors	7 11 2	28.87
	Runheji	7 11 08	7 12	27.80	1d		7 11 17	28.65
	ZhengYG	7 11 08	7 13	26.90	2d		7 12 19	26.80
		7 12 08	7 13	26.78	1d			
	Runheji	7 13 19	7 14 20	<27.1#	1d	Close Mengwa, Chengdonghu detention areas	7 14 14	27.08
	ZhengYG	7 13 19	7 14 08	<26.5#	1d		7 14 12	26.49
	Wujiadu	7 10 15	7 15	22.10	5d	Operarte Huaihongxinhe waterway	7 14 01	21.85
	Hongzehu	7 10 20	7 14	14.40	4d	Operate Ruhai waterway	7 14 16	14.37
3	Wangjiaba	7 21 20	7 23 23	28.60	2d		7 24 05	28.64

Note: I.T.—Issue Time; P. T.—Peak Time; P. L.—Peak Level; L.T.—Lead Time.

produce daily stream flood prediction up to 10 days in advance for decision making of flood disaster preparedness including dweller evacuation from flood prone area and material redeploying for flood defense; the second one, based upon real-time information of rainfall, river stream flow and water projects produced continual flood forecasting to the whole river system from upstream to downstream up to 6 days in advance for flood disaster prevention including flood water dispatching, water projects operation and flood fighting. For an example, during first flood event, hydrology department issued on June 30 that the water stage at Wangjiaba station, which is outlet control station of upstream and representative station of Mengwa detention area, would exceed the guarantee level (29.00m) which is operation standard of Mengwa detention area on July 3. This forecasts got 3 days lead-time. Decision makers in the Office of State Flood Control Headquarters issued early warning to flooding area immediately after they received the forecast and decided to evacuate all dwellers and properties from Mengwa detention area and to prepare everything ready for flood water detention.

For another example, during the period of second flood, hydrologists forecasted by any means on July 9 that the water stage at Jiangba guage of Hongze lake would be over 14.40 meters on July 14. According to this forecast, decision makers decided to operate some new-constructed diversion waterways to divert flood water in order to decrease inundated area. In fact, the water stage at Jiangba guage was controlled at 14.37 meters. The lead-time of this forecasts attained 6 days and the error of forecasting was only 3 cm.

3.2 Forecasting aiming at the needs of early warning, flood control and water projects operation

During the period of Huai river flood in 2003, hydrologists aimed at the needs of decision-makers from departments of flood control and water projects management to do forecasting and prediction. Someday, hydrologists provided forecasts and prediction for

several decade stations or key sites along the main river. Depended on those forecasts and prediction, decision-makers issued early warning for dwellers in flooding area and orders for flood water dispatching, water projects operation and flood fighting in advance. Hence the importance of flood forecasts and prediction in flood disaster prevention, induction and mitigation had been appeared fully.

In the period of the second flood, the situation of flood control was very serious and rigorously, decision-makers had to decide whether many flood detention ponds and flood diversion waterways were put into operation or not. In this critical time, hydrology sections provided timely forecasts with 3~6 days lead time for all important sites of flood detention ponds and flood diversion waterways and for all reservoirs according to real-time rainfall and predicted rainfall. Based on those forecasts, decision makers made a series of decision to decrease water lever of middle reach, such as using of Mengwa detention area for the second time, operation of Chengdonghu detention area for the first time, decreasing the outflow from reservoirs in upstream, increasing the outflow from Huaihongxin waterway located in middle stream and Ruhai waterway of Hongze Lake located in downstream. With the results, the flood losses were minimized.

3.3 Forecasting for flood disaster rehabilitation

In order to meet the demands of promoting what is beneficial and abolishing what is harmful, hydrologists provided the recession prediction up to 30 days in advance in the later period of Huai river flood. Decision makers made the public policies for flood disaster rehabilitation including drainage from inundated area, flood-water utilization, reconstruction of water projects and dwellers allocation and etc.

For an example, just after the peak of second flood, hydrologists forecasted the date with 12~32 days lead time when the water stages at all stations and all detention areas in middle stream would fall to under the warning stage. Based on those results, decision makers arranged and organized properly the manpower of flood defenses and made the plans timely for drainage from inundated areas.

For another example, in the later period of third flood, hydrologists issued on July 25 the forecasts that the water level of Hongze Lake would fall to lower than warning stage around August 10 and to normal stage around August 20, and forecasted the water volume remained in rivers. According to those forecasts, decision-makers issued the orders to decrease outflow of gates and kept proper water stage in Hongze Lake and saved water about 2 billion cubic meters in the Lake, as well as arranged the plans for flood disaster rehabilitation and for dwellers to return to their homelands.

4. FLOOD DISPATCHING

The new idea, namely from man passively conquer nature to that man positively steer nature has been put into full operation in whole period of flood in 2003. Because the main reservoirs, detention basins and diversion waterways were operated on man's own initiative, the maximum flood control benefit brought into play.

4.1 Reservoirs

During 2003 Huai river flood, 5 main reservoirs, i.e. Lianyushan, Meishan, Xianghongdian, Suyahu and Foziling played remarkable role in storing floodwater and reducing flood peak. Totally 2 billion m^3 floodwater was stored (shown in table 6).

Table 6 The operation situation of main reservoirs during Huai river flood in 2003

Name	Max. water level (m)	Max. Storage volume (10^8m^3)	Time (m.d.h)	Max. in flow		Max. out flow		Reducing ratio (%)
				Q (m^3/s)	Time (m.d.h)	Q (m^3/s)	Time (m.d.h)	
Xuyahu	54.20	4.46	7.05.07	2090	7.02.02	844	7.08.06	59.6
LianYSH	109.31	6.21	7.11.22	1810	7.10.11	667	7.10.17	63.1
Meishan	131.31	15.8	7.11.16	7400	7.10.12	975	7.11.16	86.8
XiangHD	129.11	14.8	7.12.13	5810	7.10.10	884	7.10.22	84.8
Fuziling	119.01	2.7	7.10.19	2890	7.10.15	1840	7.10.19	37.1

4.2 Detention Basins

During the 2003 Huai river flood, totally there were 9 detention basins to be put into use for flood detention. The total retarded water volume was about $28x10^8m^3$ (shown in table 7). According to the analysis, Due to the operation of those detention basins timely, the peak water level of middle reach of main river were reduced effectively. The maximum reduced water level reached 1.26m.

Table 7 The operation situation of detention basins during Huai river flood in 2003

Name	Control station name	Flood No. 1		Flood No. 2		Flood No. 3		Total volume
		Oprtn Time	Water Volume	Oprtn Time	Water Volume	Oprtn Time	Water Volume	
		m d h	10^8m^3	m d h	10^8m^3	m d h	10^8m^3	10^8m^3
Mengwa	WangJB		2.03					5.61
					3.58			
Chengdonghu	DongHZH				3.00			3.00
Qiujiahu	Wangji			7.11.17	2.77	7.24.20	0.39	3.16
Tangduohu	ZhengYG	7.06.15	4.80	7.12.22	0.84	7.25.10	0.62	6.26
Up Liufangti Down	Fengtai	7.06.16	1.78	7.13.02	0.00	7.25.16	0.15	1.93
Shiyaoduan	Huainan	7.06.21	1.23	7.13.22	0.24	7.23.00	0.07	1.54
Luohewa			1.80		0.14		0.1	2.04
Jishanhu					4.09		0.16	4.25
Sum			11.64		14.66		1.49	27.79

4.3 Diversion Waterways

During the 2003 Huai river flood, some important new constructed waterways were put into use for floodwater diversion and played a key role for flood control. One is Cihuai new river that links Ying river and the down reach of middle stream of Huai river. It was operated 4 times and diverted $4.58x10^8m^3$ of floodwater. The water level of breach

from Zhengyangguan to Huannan was lowed about 0.15m. The second one is Cihuai new river that links the down reach of middle stream of Huai river and Hongze Lake. It was operated 3 times and diverted $16.7x10^8m^3$ of floodwater. The water level was played down about 0.5m and thousands people were safed. The third one is Ruhai waterway that conducts water from Hongze Lake to Yellow Sea. It discharged $44x10^8m^3$ of water from Hongze Lake and lowered water level 0.4m.

5. CONCLUSION

By Huai river big flood in 2003, it is recognized that real-time flood forecasts and prediction must be closely integrated with the actual demands of flood disaster prevention, reduction and mitigation so that the real-time flood forecasting and prediction can play more key effect in the supporting of flood control decision-making.

A new conception of has been put forward in 2003, i.e. from man conquer nature to that man should harmoniously co-exist with nature, from the practice of preventing water from harming man to that of paying special attention to effectively manage water.

Scientific regulation of flood added with effective administration of government is the key to successful control of flood in 2003.

NATIONAL STANDARDS TECHNICAL SPECIFICATION FOR RIVER WORKS IN LAO PDR

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ABSTRACT

The development of river work in Laos has started since long and independently carried. All activities no one has National Standards Technical Specification (NSTS), so those projects were implemented base on imported technology and standard. Until now, management of river works existing with various systems, project use national budget it managed through the Ministry of Communication Transport Post and Construction (MCTPC), project funded by donors or international organizations were managed by the MCTPC or other line agencies, but standards technical specification totally imported.

Recently, JICA study team and Infrastructure Development Institute-Japan conduct the Study on the Mekong River bank protection around Vientiane municipality. Based on the result of that Study, the first Master Plan for the bank protection in the Mekong River in the Vientiane Municipality is under studying and will be the first step for the NSTS.

The bank protection work along the Mekong River and its tributaries, the construction of river port and ferry crossing, the construction of the flood protection dikes, the improvement of the navigational channel, the excavation of the sand and gravel in the Mekong River was applied with several of design, several of owners and with difference levels and methods.

Due to project used difference of standards technical specification makes it difficult to control or supervise the project even this standard was good and suitable for Lao condition. Many standard which imported can not be sure that it is good enough due to we do not have we own to check it and causing many of river project were collapsed after or during construction period. For funded project, mostly, the river works activities were carried out according to the donors' standards, which started from project formulation, investigation, design, tendering, procurement, implementation and transfer. For project invested by government the standard was based on the books, experienced of local or international consultant firm stationed in Laos.

NSTS is tool for government staff to manage and monitor the river works in term of planning and supervision. In the last decade several study were carried out by international experts and consultants, but no one study was come up to the NSTS level.

This paper presenting a general view of the river works activities and how important of the NSTS in term of management and development. The detail explanation of this discussion will be provided more in separate part of this report.

1 INTRODUCTION

1.1 Physical setting

Lao People's Democratic Republic (Lao PDR) is a land locked country with an area 236,800 square kilometers stretching more than 1,700 kilometers in north-south direction and between 100 and 400 kilometers from east to west. The country is bordered by Vietnam in the east (1,957 km), Cambodia (492 km) in the south, Thailand to the west, Myanmar (230 km) and china (416 km) to the north.

Geographically, the Lao PDR is dominated by two features: the mountain of the north and east, and the Mekong river and its east-bank tributaries. Extensive mountain ranges with an average height of 1,200 meters cover an area of 70% of the territory, and fertile flood plains embrace 30% of the territory, stretching along the left bank of the Mekong river. More than 40% of land is covered by forests. It is estimated that the total cultivated area for agricultural purposes is 710,000 ha.

The country experiences a tropical monsoon climate with alternating, wet and dry seasons. Typically, the wet season extends from April to October and is dominated by a southwest monsoon with high rainfall, temperature and humidity. The distribution within this season is nevertheless uneven, varying respectively to location, topography and other factors. The annual rainfall ranges from less than 1,300 mm/y in the northern valleys to over 3,700 mm/y in the south. The heaviest annual rainfall is in August. The dry season extends

from November to march, a period that typically includes both coolest moth (January) and warmest month (March). Average maximum and minimum temperatures vary in between 15 to 40 degree Celsius.

1.2 Water resource potential

Around 80% of the country's area lies within the Mekong river Basin. The remaining 20% drains through Viet Nam directly to the South China Sea. The major tributaries of the Mekong all have significant watersheds. Besides the major tributaries of the Mekong, there are hundreds of small streams, which mostly have a torrential during the rainy season and have a very low or no flow during the dry season.

The total annual flow of water flow in Lao PDR is estimated at 270,000 million cubic meters, equivalent to 35% of the average annual flow of the whole Mekong Basin. The Lao PDR is blessed with plenty of water resources. Its exploitable water resources exceed any foreseeable effective demand. More than 1,000 mm annual run-offs can be expected in most parts of the country.

The Mekong River and its tributaries drain all of Lao PDR, which, consequently, consists of abundant surface and ground water sources from which water can be utilized as well as from deep tube wells, for irrigation, hydroelectric power, urban and rural drinking water supply and for other industrial uses. They provide a means of communication by carrying the boats that transport freight and passengers and yields fish stocks natural, which have great economic and dietary importance. Furthermore, like the river in the north, those in the south hold considerable irrigation and hydroelectric potential. In central of Laos, the rice plains are more extensive for which water supply can be provided through irrigation systems. The hydropower potential on the tributaries of the Lao PDR estimated at 13,000MW is accounted for more than one third of the potential of the Mekong basin. Some possible run-off-river hydropower project sites identified on the mainstream are located within the territory of Lao PDR (Pak Beng, Pak Lay, Luang Prabang,Sayaburi, Khone Falls).

2. OVERVIEW OF RIVER WORK DEVELOPMENT IN LAO PDR

WATER LAW

The Water and Water Resources Law of 1996, sets out a legal framework for development in the Water Sector. Many issues in the Law, particularly the roles and responsibilities of various agencies for specific activities such as water allocation and the process for licensing water users, need to be developed. There is an urgent need for the development of further legislation or degree for sub-sectoral activities, as well as the necessary legal documents to accompany the Law and make it effective. Support to the Lao government in this area should be undertaken in a counterpart relationship with the Department of Legislation within the Ministry of Justice as this agency has the final responsibility in issuing degrees. External assistance is also required in water sub-sector agencies to draft regulations. A pre-requisite for success in this field is the capacity building throughout the Water Sector because this is new activity for the water sector, which traditionally focused on development rather than management and regulation.

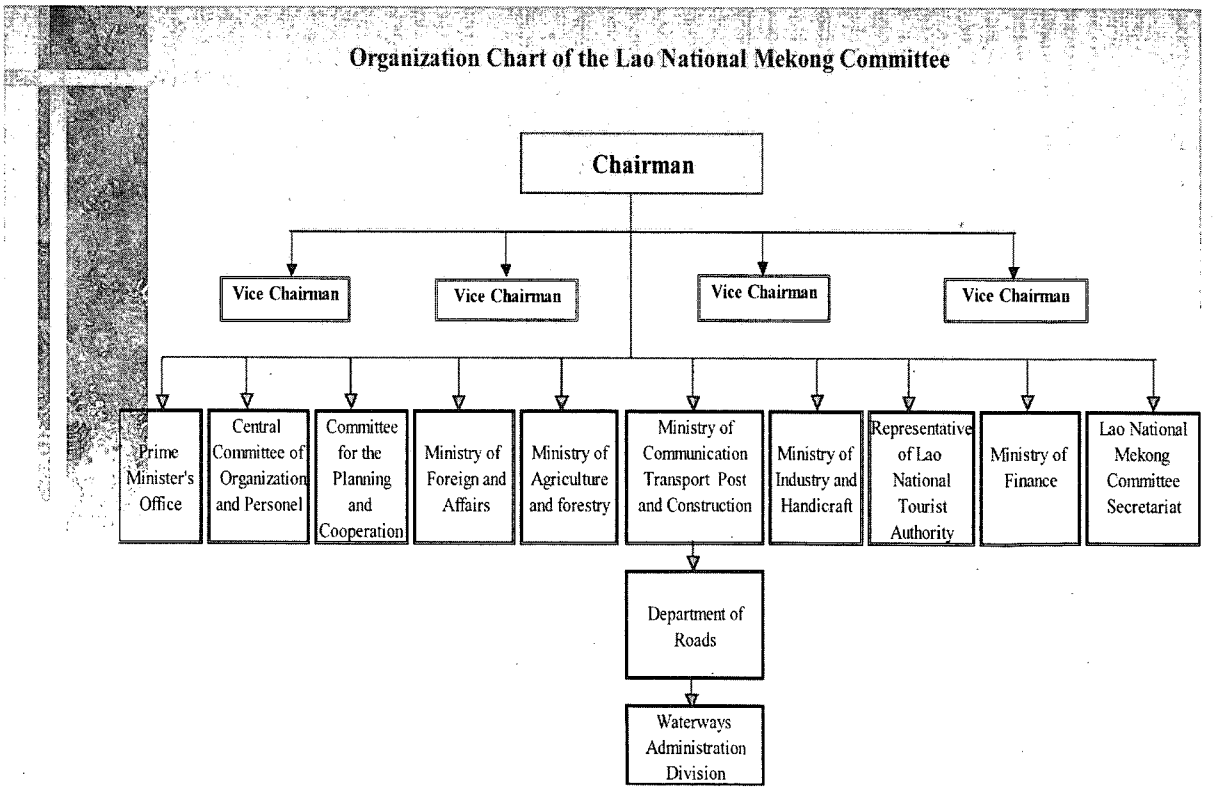
The 2001 Decree to Implement of the Law on Water and Water Resources, issued by the Prime Minister, defines the structure of water resources planning and management at the national and river basin levels.

MANAGEMENT SYSTEM

System about water management in Lao PDR consisting of two organizations and concerning line agencies, one is Water Resources Coordinating Committee (WRCC) and the other is Mekong River Commission (MRC), both of them are working under Prime Minister Office, the detail function of management as be lows:

Items	WRCC	MRC
Vision	To attain the modern status of a state coordination agency to provide advisory services to the Government in decision making, based on a more balanced treatment of sectoral water perspectives, and to mobilize the public in their participation in the development, management and protection of the water and water resources to achieve improved quality of life in the Lao PDR	A world class, financially secure, international river basin organization serving the Mekong countries to achieve the basin Vision.

Mission	Protect, manage and develop the water and water resources to achieve improved quality of life in Lao PDR.	To promote and coordinate sustainable management and development of water and related resources for the countries' mutual benefit and the people's well being by implementing strategic programmes and activities and providing scientific information and policy advice.
Strategic plan	*Mission Goal*: 1). Manage, develop and protect water and related resources to meet the needs of current and future generations; 2). Operate, maintain and rehabilitate facilities safely, reliably and efficiently to protect the public investment; and 3). Enhance organizational effectiveness.	*Strategic Goals:* 1). To establish and implement 'rules" for water utilization and inter-basin diversions; 2). To establish a dynamic basin development planning process as a framework for natural resources management and sustainable development; and to plan and execute corresponding priority sector programmes and projects; 3). To establish and promote MRC environmental and socio-economic management systems, recommendations, and policy guidelines; 4). To establish an effective organization, capable to promote, in partnership with other institutions, basin wide development and coordination;
Line agency	• Ministry of Agriculture and Forestry • Ministry of Industry and handicrafts • Ministry of communication transport Post and construction. • Ministry of public health • Lao national Mekong Committee. • Science Technology Environmental Agency	• Ministry of Agriculture and Forestry • Ministry of Industry and handicrafts • Ministry of communication transport Post and construction. • Ministry of Public Health • Ministry of Justice • Science Technology Environmental Agency • Water Resources Coordinating Committee



RIVER WORKS

The history of the development of river works in Lao PDR has reached its eight decades since the introduction of Western techniques with more indigenous techniques. During this time, numerous river work projects have been completed or are still in progress in all corners of Lao PDR.

- Transit port at Khong Fall island (1924),
- Navigation aid (beacon, buoys.,) along the Mekong river,
- Bank protection in the main towns at the Mekong river bank,
- Water tower and intake for water supply,
- Flood protection dikes and water gates,
- Shipyard and ship building,

2.1 Bank protection works

Since 1966, technical assistance has been provided to Laos on bank protection design and construction at critically affected areas. Financial assistance has been provided from Australia for such construction at Tha Deua (1992), Wattay (1995), Watmuangwa (1997). The construction of bank protection at Wat Sop (1996) part funded by South Korea, the construction of bank protection at Ban Hatdokkeo (1990) funded by European Community, the construction of bank protection at ban Sibounhuang (2001, 2003), Ban Chomcheng (2003), Ban Dongphosy (2003) funded by Japan and some parts of critical areas has been protected by local budget and private sectors contribution.

2.2 Port development

Many port has been constructed along the Mekong river in Laos since 1924, such as transit ports at the down steam and up stream end liked by railway at Khong Fall island to serve the navigation from the Mekong river mouth in Viet Nam Delta come up to Vientiane (Laos). With financial assistance from the Netherlands the Kengkabao port was constructed on the Mekong riverbank at the Savannakhet province southern of Laos, the purpose of this port was used to transit the cargo between Da Nang (sea port, Viet Nam) via national road No. 9 and Laksi port one of modern port in Vientiane.

From year 1988 to 1992 with financial assistance from Australia several ports has been constructed along the Mekong river section from Vientiane to the north of Laos namely Tha Deua, Pak Khone, Luang Prabang, Pak Beng and Houy Sai ports. In the year 2003 the Flanders Government has provided technical assistance to Laos on river port survey, design and soil investigation at Luang Prabang province. Beside these assistances the Lao government also invested some of the river ports with small scale and private sectors has built up port for their own used.

2.3 Navigation channel improvement

Since 1924, some parts of the navigation channel of the Mekong River in Laos has been improved, the work included rock removing in the front of the Kengkabao port, dredging and installation of navigation marks. Follow up the Navigation for Commerce Agreement in the Upper Mekong stretch from Golden triangle to Chinese border among China, Laos, Myanmar and Thailand, the step one of the first phase of the navigational channel improvement project has been completed in April 2003, the work included the channel regulation of 11 rapids, 9 scattered reefs and installation of 6 winching stations. Now project under implementing of step two is navigation aids installation, the project funded by Chinese Government and technical staff from four countries.

2.4 Survey and design work

- Hydrographic survey:

The second of hydrographic survey for the Mekong Hydrographic Atlas with scale 1:20,000 from Golden Triangle to the Sea has been completed in 1994; the project was funded by Finnish Government. In some areas the hydrographic survey also has been done with different scale according to each purposes.

- Survey and design:

State river survey and design companies, local private companies and international consultant companies have carried out survey and design for several river projects. Last year, Flanders government provided assistance for survey design of Ban Bo O bank erosion protection and Luang Prabang port.

2.5 Flood control

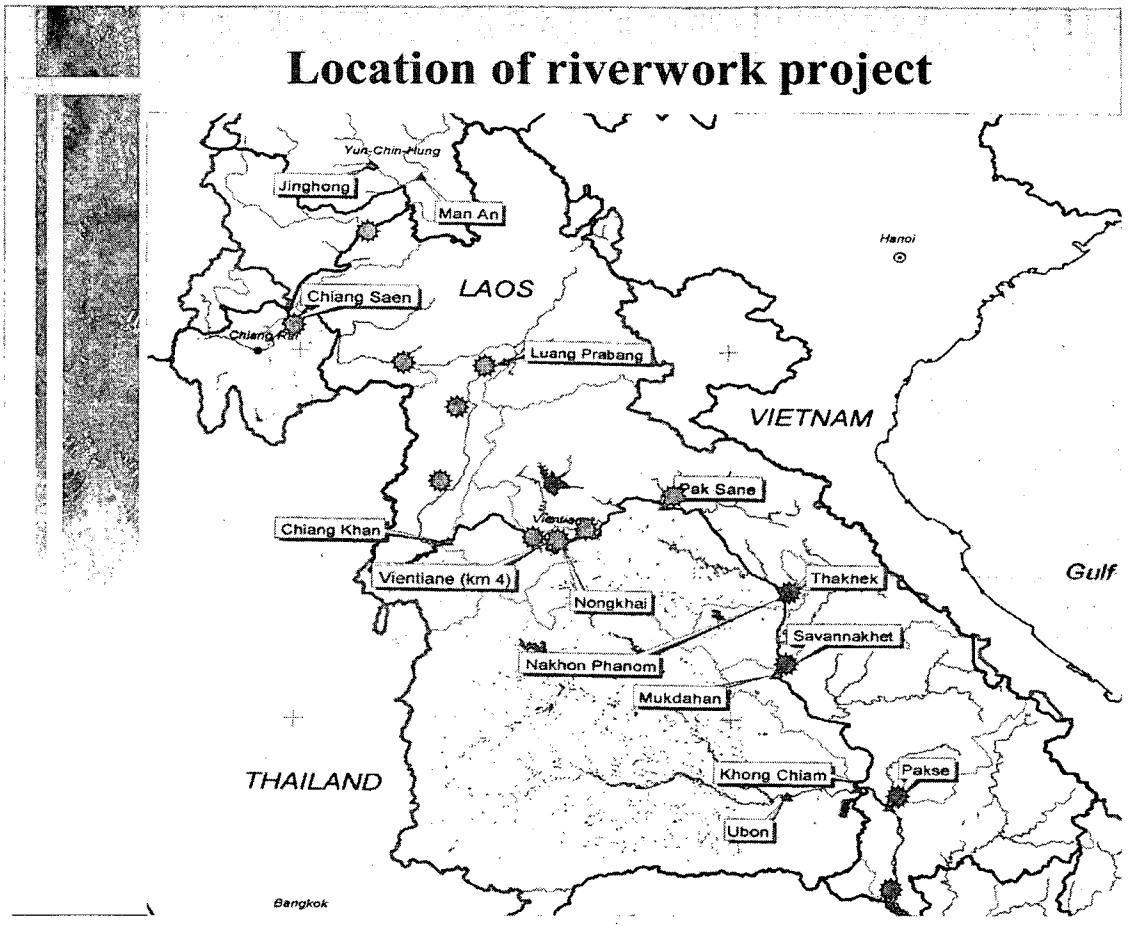
Flood control dike and flood defense gates are constructed along the Mekong River and main tributaries to protect the cities and the low-lying agricultural areas of the Vientiane Municipality, Paksane, Thakhek, Sannakhet and Pak Se. In the Vientiane City, under European Community Flood Protection Programme about 74 km long of the first flood control dike and flood defense gates have been constructed along the Mekong River in 1994. In 2002, the Secondary Towns Urban Development under ADB Project, 5 km of the flood control dike and some of the water gates have been constructed along the Mekong River at Pakse City.

3 WHY WE NEED NSTS FOR RIVER WORK PROJECT

To meet the long-term goals of river work planning and river work management, the establishment of national standards technical specification is critical needed to avoid the country with out standard or with too many-imported standard.

Since 1924, the development of river work in Laos has been started and has implemented base on imported standards technical specification and technology. The foreign standard of river work come to Laos the way of project-by-project, generation-by-generation depended on the size and source of fund and give example as be lows:

Items	Name of project	Original standard technical specification	Imported Year
1	The construction of transit port and railway at Khong Fall island.	France	1924
2	The construction of concrete beacon for aid of navigation for the Mekong section from Vientiane to Lao-Cambodia border.	France	1924
3	The construction of transit port at Keng Kabao, Savannakhet province.	The Netherlands	1974
4	The construction of river port and ferry ramp along the Mekong river in Laos.	Australia	1988
5	Mekong riverbank protection project, Vientiane City.	Australia	1995
6	Wat Sop Mekong riverbank protection project, Vientiane City.	Korea	1996
7	Mekong riverbank protection project at Ban Hatdokkeo,Vientiane City.	European Community	1992
8	Mekong riverbank protection project at Ban Sibounhuang, Chomcheng, Dongphosy, Vientiane City.	Japan	2000
9	Updating of Hydrographic Atlas of the Mekong river in Laos and Thailand.	Finland	1988
10	Survey and design of bank protect at Ban Bo O and Luang Prabang port.	Flanders	2003
11	Navigation channel improvement of the Upper Mekong river from Lao-China border to ban Houy Sai.	China	2003
12	Water quality and sedimentation	Mekong River Commission Secretariat	1990



The standards technical specification as mentioned above we have applied for a long time ago and it just a few example only. The standards technical specification comes along with project and we could not refuse or reject it due to we lack of we own standards technical specification.

The imported of technique and technology was so importance for the least developed country as Laos. However, we could not keep working condition without national standards technical specification. The lack of standards technical specification causes difficulty for government staff to manage the river work in term of technical checking, construction supervision, quality control, project evaluation and etc., Recently, Ministry of Communication Transport Post and Construction and concerning agency responsible for all activities of the river works while various systems and standard still existed.

With the difficulties as mentioned above the Ministry of Communication Transport Post and Construction in cooperation with JICA study team and Infrastructure Development Institute (IDI)-Japan conduct a Study on the Mekong River bank protection around Vientiane City since 2001, the result of this Study will support to the first Master Plan for the bank protection in the Mekong River in the Vientiane City and it will be the first step for starting of the national standards technical specification for river in Lao PDR.

We need national standards technical specification as an administrative tool for government staff to manage and monitor the river works in term of planning and supervision. Many studies and activities have been carried out during the past two decades by international consultant, international organization, but no one study was come up to the NSTS level.

3 CHALLENGE OF NATIONAL STANDARD TECHNICAL SPECIFICATION

In the past, a lot of river work projects and related activities of river works in Laos were implemented according to donor's standards technical specification and very few of standard of the recipient country were used for those project, so that it cause some difficulties and problem as follows:

- Difficult to work on the macro level with planning and budgeting,
- Low efficiency on project management,

- Lack of unity of standards while national standards are very important,
- National staff not interest to set up their own standards.
- Donor money is powerful, and we might say yes to things we would not have chosen otherwise.
- Donor countries represent different standards; each country naturally favors its own standards.
- The situation where all details have to be approved one by one on top level, we need to give more attention to overall problems (global problems) affecting our nation. National standards may help in guiding us.
- Some standard has imported can be too high level and not appropriate for Lao condition causing many of river project were useless after hand over of project.

4 EXPECTATION

In the near future we are expect to see the Lao standard technical specification for river work projects which will contents of many parts and each part has kind of numbers of river works. The more important and practical things are as follows:

- International technical expert on river work station and assist the Waterways Administration Division, Department of Roads, MCTPC to work with Lao technical staff to prepare the CODE for standard technical specification for river works,
- One country need one standard technical specification for river works,
- Technical cooperation should base on national standard technical specification,
- Strengthening of the national capacity building for planning and management, '

5 CONCLUTION

Development of sound standard, technical and specification is one of primary means by which the Waterways Administration Division can play its management role within the water sector and within river work project.
In this report, it has been explained that the national standards technical specification has been positioned as an objective since the issued of the water law. In addition, the availability of national standards technical specification will support to planning, budgeting and decision making for the river work and it can be used as an administrative tool and guideline for engineer who is working with river work and easy to implement. It is hoped this may useful for the promotion of the opinions of local engineers during the creation process of river improvement plans.

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URBAN HEAT ISLANDS -EFFECTS ON THE MICROCLIMATE OF MALAYSIAN CITIES

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Abstract

Rapid economic expansion the last few decades has resulted in intense build-up of buildings and paved surfaces in all our urban areas. With this has come a host of environmental problems, which has been making the headlines year after year, like flash floods, air pollution and river water pollution. Urban Heat, up until now, has not captured much attention. Yet, this is a growing phenomenon, which is getting worse with time. This paper explains the problem, it's causes and what we can and should be doing to counter its effects in our urban areas. The drain on power consumption with large-scale proliferation of air conditioners is only one aspect of the problem. It is also causing microclimatic changes to the weather in urban areas with increased frequencies of extreme event rainfalls and increased total annual rainfalls. The result is an increasing trend in flash floods especially in the Federal Capital of Kuala Lumpur.

Introduction

Malaysia is experiencing rapid economic growth especially in the last 2 or 3 decades. Extensive land development in urban areas has completely altered the surface profile of our cities. Tall office buildings are complemented by high-rise condominiums, flats and an increasing number of elevated highways and rapid transit railways winding through them.

Large scale human interference in the natural environment has always been shown to bring with it unwanted consequences – like large dams triggering tremors and earthquakes, large irrigation schemes resulting in salt flats in arid areas, large scale land development increasing flash floods, and so on. It is only expected therefore, that the

high density built landscape of urban areas that has replaced the natural greenery will bring with it a host of reactions from nature.

Sometime in year 2000, the then Prime Minister of Malaysia, Dato' Seri Dr Mahathir made the observation that Kuala Lumpur city is too hot in the daytime hours. He suggested that KL City Hall try out sprinklers from the tops of tall buildings, which spray out fine jets of water mists to try to cool the streets below. It did not turn out to be practicable due to the amount of sprinklers needed for just one city street, let alone the whole city. There is also the problem of getting the amount of water, and the cost involved, including the power consumption. Besides, the city is humid enough (mostly above 80% humidity) even without the additional vapor. It was a clear observation that the heat in Kuala Lumpur is not normal, at least when compared with lesser-developed areas of the country.

In 2001, an Asian Development Bank (ADB) study commissioned by the Department of Irrigation and Drainage (DID) on Sg.Klang found that what were previously 50-year return period discharges are now occurring with alarming frequency almost every year. Much of this can be attributed to urbanization: increasing impermeable areas due to pavements and buildings, and the old drainage approach of 'rapid disposal' whereby drainage systems were designed to dispose rainwater to the nearest waterway as quickly as possible. But it was also quite apparent that something is happening to the Kuala Lumpur weather. Thunderstorms seem to be more intense and occur with increasing frequency. Is it due to the much talked about 'Global climate change' or is it more localized?

The DID started analyzing rainfall data for Kuala Lumpur and comparisons were made with Johor Bahru (a fairly heavy urbanization) and an undeveloped area close to Kuala Lumpur i.e. a green area. The results were conclusive: Urbanization alters the microclimate of the urban area resulting in increased intensities and frequencies of rainstorms. Checks with the Internet revealed considerable information on the phenomena of 'Urban Heat Islands' (UHI), which seem to be capturing attention, especially in developed countries. Findings by NASA (USA) show that UHIs increase the net amount of rainfall for large urban areas.

All the international attention being focused on UHIs however is not towards rainfall. Their primary concern is the effect of UHIs on *energy consumption* in the summer months. Countries like Canada, Australia, USA and Japan are already issuing comprehensive guidelines to all their big cities to counter the effects of UHIs, even though it is only a problem in summer.

Urban Heat Islands

Trees and natural vegetation use the sun's energy for photosynthesis to produce food; hence, they do not heat up with more sunlight. They also absorb water from their roots to transpire through their leaves, an evaporation process which absorbs heat from the surrounding air. Tropical forests are always cool even at the hottest time of day.

As cities grow, buildings and paved surfaces replace the natural landscape. Hard, inert surfaces absorb the sun's heat, causing their temperatures to steadily rise with increasing exposure. Dark coloured surfaces like roofs, roads and parking lots absorb the most heat. In our Tropical climate, road and car park surface temperatures can exceed 60°C in the mid-afternoon when air temperature is somewhere in the 30s. Large masses of tarmac, concrete and steel buildings absorb and store large amounts of heat, which in turn radiate into the surrounding air. As a result, temperatures in city areas can be 10°C or more above suburban green areas. This bubble of heat is known as an Urban Heat Island (UHI). A large urban conglomerate like Kuala Lumpur will have numerous such concentrated build-ups of heat in-between areas of cool greenery, which show up in the thermal maps of satellite imageries as dark areas in contrast to the yellow and white heat of the hot areas.

Satellite images taken by NASA show that UHIs over American cities generate thunderstorms in the summer, as the heat bubble causes a warm air tunnel to rapidly rise into the lower atmosphere, rapidly condensing into a rainstorm. Which such conditions do not occur every day, given the complexity of meteorological processes, it occurs frequently enough to offset the natural cycles of the microclimate over the urban area concerned. Allowing UHIs to increase in an urban area will result in increasing frequencies of such occurrences.

Effect of UHIs on Kuala Lumpur

The Malaysian Centre for Remote Sensing (MACRES) has known about the existence of UHIs in Kuala Lumpur for some time. Processed satellite imageries clearly show the range of temperature gradations across the city.

The phenomenon is also well known by the Malaysian Meteorological Service, who is aware that it is responsible for warm nights in city areas. This is due to the large amount of heat accumulated during the daytime slowly being released at night, raising the ambient air temperature.

In developed countries where concerted action is being taken on UHIs, the main concern is on the large increase in power consumption in urban areas to cool down buildings, with additional air-conditioners or a heavier usage of existing air-conditioners. Higher air temperatures (albeit in the summer months) also mean that the air quality deteriorates as a result of increased ozone and pollution.

The series of analysis carried out by the DID on rainfall characteristics in Kuala Lumpur compared with rainfall in an outlying suburb which is still undeveloped (i.e. green) gave fairly conclusive results. Comparisons were also made with another urban area – Johor Bahru. Fig 1 to 3 are samples of only a few of the analyses made. Fig. 1 shows the number of times the long-term mean value for 3-hour rainstorms is exceeded from 1971 to 2002. The frequencies show a rising trend for the urban station. Fig 2 shows the increasing gap in annual rainfall between urban and rural (green) areas –

consistent for both KL and its suburb and also Johor Bahru and its suburb. While Fig 3 shows the occurrences of 15 and 30 min. rainstorms as compared to time of day.

	URBAN Station no. 3117070	GREEN Station no. 2818110
	Year 1971-2002	Year 1971-2002
Mean (mm)	8.3	1.9
% Difference	9.0%	2.9%

Fig. 1 The number of times the long term mean value for 3 hour rainstorms is exceeded from 1971 to 2002.

These would represent the typical convectional storms, which would be associated with UHIs. All these bear out those UHIs not only increase the intensity and frequency of convectional storms but also increase the annual rainfall amounts in urban areas. Of course, these data must be tempered by the difference between convectional storms and large-area frontal storms like the one, which caused the 1971 flood in KL. These latter storms cover hundreds or thousands of square kilometers and can last for days. They are more associated with global weather movement than the localized convectional storms.

What can we do about UHIs?

There is very little local research in UHIs to validate much of what is already accepted as established fact all over the world. A quick search over the Internet will show that international initiatives are well underway with clear guidelines on how to counter the effects of UHIs (see Http://www.hotcities.org/documents.htm). These guidelines are mostly targeted for the local governments of large cities. What we in Malaysia can do in the short term is to adopt these guidelines, as they are clearly applicable regardless of region or climate. Among the more notable are:

i) Urban car parks should comply to a minimum of 50% shade requirement. This is so common sense, which seems strange that it has not been thought of by our local authorities. Any local motorist coming back to his/her car parked in a hot, open-air, city car park will testify to the furnace awaiting him/her on opening the car doors. And everyone would have experienced the joy of finding the rare tree-shade in an open-air car park.

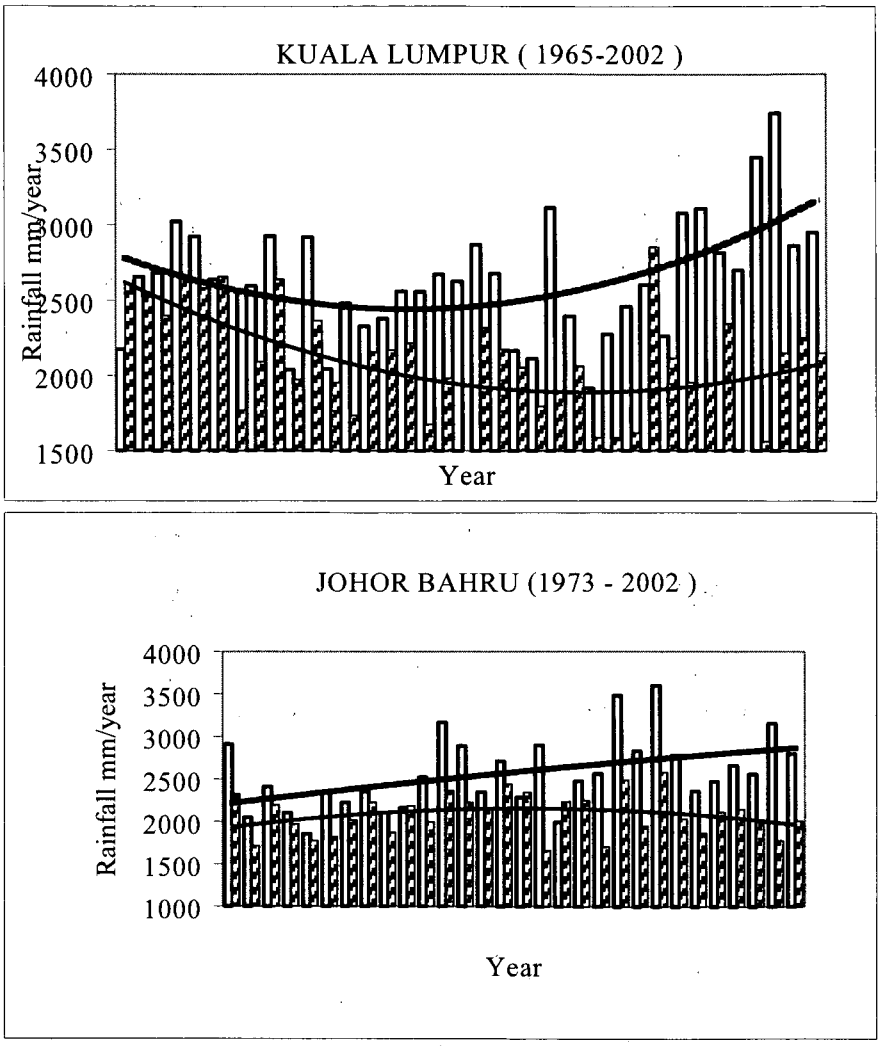

Fig 2. Increasing gap in annual rainfall between urban and rural (green) areas – consistent for both KL and its suburb and also Johor Bahru and its suburb.

ii) Roof tiles should be manufactured to comply to high albedo (reflectivity) values. Basically, this means that the tiles reflect most of the sunlight instead of absorbing it, and are *light* in color – dark tiles having the characteristic of absorbing more heat. Malaysian tile manufacturers do not yet design their tiles with this requirement in mind, colour being an aesthetic consideration.

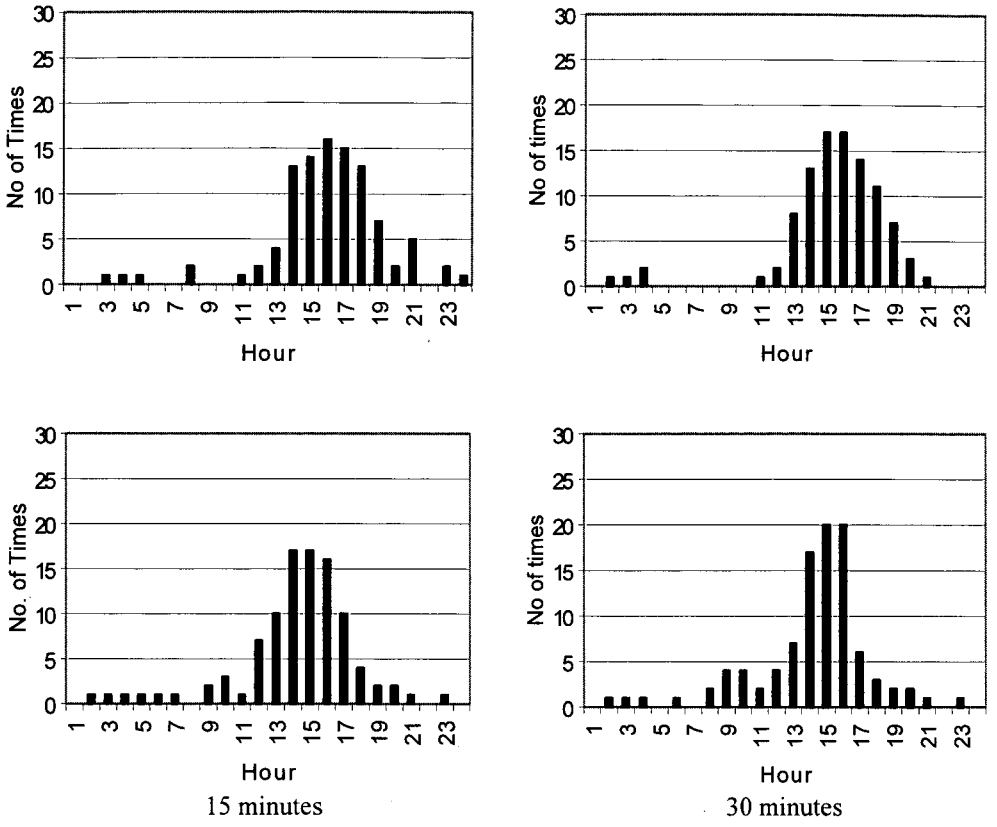

Fig 3 . Occurrences of 15 and 30 min. rainstorms compared to time of day

iii) Urban buildings should not be painted in dark colours. Tall buildings should take into consideration that the sides of the buildings are subject to long hours of exposure to sunlight, absorbing a lot of heat. It would also be advisable to use high albedo tiles for the sides of the buildings, should they be covered with tiles.

iii) Commercial buildings, almost all having flat roofs in Malaysia (to accommodate air-conditioning equipment and water tanks) should go 'green'. This means cultivating greenery on the flat roof surfaces to absorb the sun's heat. Not only will this help the city to counter UHIs but building owners will benefit in terms of savings in air-conditioning power consumption.

iv) Large public buildings like the Federal Territory Mosque should not be designed to expose large areas of marble or other hard tiles, which absorb

heat throughout the day. In Putrajaya, large 'public squares' i.e. open areas, are covered with blocks of marble, granite or tiles. Although these are better off than black tarmac, these surfaces absorb a lot of heat in direct sunlight. As a result, already searing air temperature is amplified by heat from these hot surfaces in the late afternoons and evenings. Again the answer will have to be the proper use of greenery, or where necessary the use of high albedo tiles.

v) Trees should be planted to shade the hot tarmac of inner city roads like Jalan Tuanku Abdul Rahman; or low-level bushes planted along the covered drains. This is also in retrospect, another common sense feature, the greens bringing much needed softening of the hard landscape.

vi) Roads and highways, which take up an ever-increasing proportion of the urban area, should also be creatively designed to include green shade, at the very least along the medians. The large masses of concrete in new flyovers continuously being built all over the city, which can capture and store large quantities of solar heat should also take into consideration plant cover, like overhanging creepers which can shield or block absorption of the heat.

vii) Tree planting programs should be *reintroduced* for all housing estates. Incentives like 'Landscape Competitions' and subsidies should be part of the long term planning.

viii) The ubiquitous motorcar will have to be restricted in the city area. Again, this is nothing new, although previous considerations mostly had to do with pollution and traffic congestion in central city areas. In the case of UHIs however, clearly, motorized traffic when numbered in the hundreds of thousands (or more than 2 million in the case of KL) contributes an enormous amount of heat to the surrounding air: one car engine just reviving at 2000 rpm is turning out about 2000x4 i.e. 8000 high temperature explosions a minute. Multiply that by about 1 hour (average time spent on the road per vehicle, say) and 500,000 vehicles a day, we get about 4 billion explosions a day in KL city! All of which goes to creating more heat in the city.

Air conditioners, whether from buildings or from motorcars, make urban heat build-up worse as they continuously emit hot air out into the atmosphere. The more the number, the more heat they generate. There should be a concerted effort to encourage owners of large buildings especially hotels, to recycle this heat. A few hotels have installed heat exchangers, which recycle the heat back to the hot water supply. This is exactly what is needed in large numbers to cut back on the heat being emitted. Unfortunately however, there is no regulation or incentive for them to spend money on such installations, other than pure economics i.e. savings in the cost of heating water – which may not be enough.

UHIs will continue to increase power consumption in urban areas in ever increasing spirals. As urban heat builds up, people will resort to more air conditioners, in turn building up more heat, and so on. Already nighttime temperatures are too warm to sleep without air conditioners. Clearly, something needs to be done to counteract this trend, the sooner the better.

Conclusion

i) In view of the fact that there is very little awareness on Urban Heat Islands now, it is necessary that authorities start on an awareness campaign to educate the public. Professionals like architects will also need to be put into the picture to specifically design with this in mind. Highway designers will also have to be informed to find ways to put in the greenery.

ii) Laws and regulations will need to put in place to counteract this trend.

iii) There will need to be sufficient incentives in addition to laws which penalize, for present building owners to start converting for e.g. to high albedo tiles.

iv) Subsidies can be studied for commercial owners although it may not be much of an incentive given the unsubsidized portion still to be paid for.

v) In view of the intensity of new construction work everywhere, it is vital that regulations be put in place for new buildings to comply as much as possible with measures to counter UHIs. Forbidding dark paints for buildings is the simplest start.

vi) The tile manufacturing industry will have to be pressured to manufacture tiles with high albedo values and lighter colors.

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THE CHALLENGES IN WATER RESOURCES MANAGEMENT IN THE PHILIPPINES

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ABSTRACT

The Philippine government have gone through a wide range of problems to effectively managing the water resources in the country such as extreme weather events, increasing demand conflicts and environmental degradation. Most of all, there is insufficient planning and data base with which to develop adequate planning framework to guide water resources development, hence the apparent lack of coordination among sectors/agencies and weak institutional capacities to regulate and coordinate the activities across sub-sectors. To address the issues on water resources management, the National Water Forum was conducted and called for the immediate adoption and subsequent implementation of integrated water resources management (IWRM) based on river basin as the direction for future water resources planning and investment.

I. INTRODUCTION

The Philippines, due to its geographical location, has abundant water resources. It has an average annual rainfall of about 2,500 millimeters. The dependable supply is estimated about 126,000 million cubic meters per year (MCM/year) based on recent assessment. On the other hand, groundwater safe yield of aquifers covering some 50,000 square kilometers found extensively in the plains of the three major islands is estimated at 20,200 MCM/year.

However, despite of the abundance, it is becoming one of the critical resources in the Philippines. The assessment in 1995 reveals that only 69% of the total population has access to safe water drinking. The rest still depend largely on water from sources of doubtful quality and quantity. Success in improving access to adequate sanitation has been even more elusive, sanitation coverage is 74.2% in 2000, below its baseline of 74.9% in 1991. Agriculture as a whole is the greatest consumer of water however only 44 percent of the potential irrigable area of 3.16 million hectares are being irrigated. Because of insufficient water for irrigation, the country was not able to meet the rapid increasing food demand. Thus, the people especially the poor are often forced to exploit the environment because of their need for food and water that resulted to environmental deterioration.

II. CHALLENGES TO WATER RESOURCES MANAGEMENT

The challenges in effectively managing the water resources of the country are the failure to adopt an integrated, holistic approach in addressing the inherently interrelated issues of development and management planning, implementation, and operation, demand management, pollution control, and watershed and groundwater protection. Moreover, the water pricing policy undervalues the water as a scarce resource.

The major constraints and challenges in promoting effective water resources management are discussed below:

2.1 Weak Institutional Framework

Fragmented management. One of the most critical issues confronting the Philippine water sector is the lack of an appropriate institutional framework to address issues of development and management of water and related resources. At present, there are over 30 government agencies and departments separately dealing with water supply, irrigation, hydropower, flood control, pollution, watershed management, etc. It is this fragmented approach to water management bringing about an overlap of work and conflicts among agencies that result in fractional water management plan that does not adequately meet the requirements for sustainability. Many projects are being implemented in many cases without considering the interactions between hydrological and economic system, thus, resulting in inefficient resource use, economic and social losses, and environmental degradation.

Despite the promulgation of the Water Code and the creation of the National Water Resources Board (NWRB) in 1974 to coordinate the activities of water resources agencies, the goal of integrated water resources management is still far from being a reality.

Lack of water allocation formula. Most of the problems encountered in the water sector today arise from an issue of conflicts of use and water allocation. With the increase of population coupled with worsening pollution of water, lack of infrastructure and facilities and dry spell causing water shortages regularly in many areas resulting in allocation issues and conflicting rights over the limited water supply. The principle in the Water Code of "first in time priority in right" may no longer be an equitable approach in resolving such conflicts. Current allocation procedure is insufficient to cover all aspect of water allocation such as economic aspect.

In view of the growing scarcity of the country's water resources and the felt need for effective measures to resolve water shortages and improve water use, consideration of an alternative approach using a system of tradable water rights has been advocated. The institution of a tradable water rights regime requires the establishment of a secure property right to water. Under such regime, the water rights should be sold freely at negotiated prices to any one for any purpose. However, the Water Code imposes restrictions, which essentially weakens the property right associated with the water right.

While the lease or transfer of water rights is explicitly allowed by the Code, such lease or transfer is restricted for the same beneficial purpose for which the water rights is granted as required under Article 12 of the Code. Although the potential advantages of promoting water markets have been recognized, the necessary cultural, legal and institutional elements are not yet in place.

NWRB is the sole authority that allocates water rights for various uses. However, the basic structure of NWRB is the major setback to the effective discharge of its functions.

Weak water use regulation and enforcement. The investigation and processing of water permit applications constitute the type functions for which NWRB is not properly equipped in terms of either manpower of resources. Besides, deputation of such functions to other

government agencies has not proven satisfactory. Moreover, the capability of NWRB to monitor compliance with the terms and conditions of the permit, which it grant is very limited owing to lack of manpower and budgetary constraints for travel-to-site expenses.

Enforcement of the provisions of the Water Code is lacking owing to resource constraints. Investigation of cases involving violations of the conditions of the permit is often left to the discretion of the deputized agents. In many cases, directives of NWRB are ignored since it does not have "enforcement powers" to exact compliance with those directives.

Outdated framework plans and research. For the past years, the national government has steadfastly pursued its dedication to developing a regime of efficient water resources management system. There had also several studies of paramount impact to the sector such as the framework plans that are expected to provide the implementing agencies with a better appreciation of the problems outside their individual sector. The plans would also serve as a mechanism for developing joint projects by concerned agencies. They could also serve as a basis for well-coordinated agencies, even if they are undertaken as separate projects by the different agencies. However, these plans require updating from time to time but very little effort is directed to the commissioning of similar studies and research.

Economic Pricing. The existing water pricing system in the country does not reflect the realities of scarcity or abundance of water with minimal attention on economic value of water. Consequently, it does not serve the function of allocating the scarce resource to the most productive users and does not provide economic incentive for efficient use and conservation of water.

It is well accepted that the proper pricing of raw water is one way of resolving a number of problems in the sector. The proper pricing of raw water will 1) result to more efficient allocation of water; 2) encourage conservation of water; and 3) greater efforts in the part of suppliers to reduce non-revenue water. Pricing water, if implemented and enforced fairly and equitably, would generate revenues that could be used for sector improvement. Policy changes of this nature will be difficult to implement mainly because of political opposition based on fear that prices to poorer families and irrigation farmers will increase. Adverse public reaction is expected and the perception of political weakness of the government will ensue on account of public resistance.

The basic dilemma facing government is that a change is needed from viewing water as a free or public good to an economic good where it has a price. Such concepts are difficult for elected executives, in particular, to accept specially in circumstances where constituents enjoy free water. Specifically, policy changes have not been enacted due to the following reasons:

- lack of will to change;
- difficulties in selling the concept to consumers and businesses;
- lack of technical capabilities to design and implement such policy reforms; and
- political difficulties under the current institutional and regulatory environment

2.2 Disparities between water supply and demand

Limited water resources and their spatial and temporal distribution. Although the Philippines is endowed with abundant water resources, the distribution of these resources varies widely in time and place as result of the different geographic and climate conditions prevailing in different pats of the country. Several factors and processes affect local and regional water resources. Human activities, in particular, influence the hydrologic cycle through change of water and land use. In recent years, the issue of climate change due to human activities posed a major concern to water managers, planners and policy makers. The climate change has occurred because the present water management practices are mainly based on semi-stationary geophysical processes with inadequate consideration being given to increasing demands owing to population and land use changes.

Inefficient water use. A major concern at present is not only water scarcity but also inefficient management of existing projects. Most of the existing water supply projects are inadequately managed, as characterized by low service efficiency resulting in supply deficiencies to meet the water demand. In addition, tremendous waste of water in distribution lines, irrigation canals and at homes. Inefficiency in water usage was exacerbated by the absence of regulations, economic incentives and institutional arrangements needed to promote water conservation and rational use of water.

Lack of data. The established observation stations for meteorological, hydrological, geologic and water quality monitoring are not sufficient in quantity and location. In the Philippines, the water resources data are being collected and processed by various concerned agencies and kept in their independent database. The absence of reliable water resources information system diminishes the capacity of concerned authorities to make difficult and controversial water allocation decisions. Beside, it would be difficult for the private sector to invest in the water sector when reliable water resources-related data are scarce and the means of obtaining them unavailable. Therefore, the improvement of data collection and establishment of an integrated nation-wide database on water resources is needed.

2.3 Environmental Degradation/Water-Related Disasters

Most of the watersheds in the Philippines are in critical condition as manifested from recent and recurring calamities such as flashfloods in Southern Leyte and Northern Mindanao and greater frequency of El Nino in Luzon that reduces the water levels in dams. The chronic shortage of water supply in Metro Manila and the countryside has placed in the forefront the increased recognition of the adverse effects of man's activities in the watersheds which has caused erosion and siltation problems in the country's rivers, lakes and reservoirs. One particular concern is deforestation leading to siltation of dams and waters stored in inland lakes such as the Laguna Lake near Metro Manila and the Ambuklao Reservoir in the north.

To address problems on watershed degradation, many environmental laws were enacted such as Forestry Reform Code, Water Codes, Provincial Water Utilities Act, NIPAS Act and Water Crisis Act. These laws, however, constitute only a partial, implicit framework, which fail to address key areas of watershed management.

Water quality in the country has been impaired severely owing to population growth and misuse of water and land. Domestic sewage contributes approximately 52 percent of the population load, while industry contributes the remaining 48 per cent. The steadily increasing water pollution could seriously compromise the country's capability to provide adequate supplies of good quality water for domestic, agriculture and industrial use.

Furthermore, indiscriminate groundwater abstraction resulting salt-intrusion were noticeable in Metro Manila and Cavite (Region IV), Iloilo (Region VI) and Cebu (Region VII). The indiscriminate use of groundwater wells for residential and industrial areas due to the failure of major utility providers to service these areas is the major cause for the depletion of the groundwater resources in the country.

The review of the current situation in the Philippines makes it clear that the lack of water pollution control facilities is severe and calls for efficient water services, adequate sanitary facilities to improve the environment and the public health, economy and the quality of life of the populace.

2.4 Partial access of water

The management of water as a critical resource shall be done in a sustainable manner taking into account the needs of the present and future generations. In this respect, sustainable management of water resources shall take into consideration the principles that water resources management shall be decentralized, participatory and community-based and conducted at the lowest appropriate level. It is also recognized that women play a central part in the provision, management and safeguarding of water resources and shall be represented in decision-making process with regard to water resources management.

The participation of women is no longer considered a strategic level issue in the country. This may be attributed to the fact that among the countries in Asia, the Philippines is considered as the nation with highest level of gender awareness and the only one that has established policy on gender as reflected in RA 7192.

As regard the issue on participatory planning and management, assistance in policy dialogue and awareness maybe required. Advice on approaches may also be needed in the areas of private sector participation, community based organizations and analysis of development options. Capacity building will also be needed to strengthen the community-based organizations.

2.5 Creation of River Basin Organization

It is typical for IWRM to be undertaken in a river basins context because river basin or, in cases groundwater basins, form the natural unit to manage water resources. There have been earlier efforts in the Philippines at regional and basin planning for which the corresponding institutions were established. Some ceased their operation, because the agencies were abolished due to the following reasons:

- insufficient funding support;
- lack of adequate trained staff
- lack of political will to exercise their broad powers and authority effectively

- insufficient authority to exercise the general mandate of basin authority; and
- being undertaken by events that gave premium to sub-sector agencies to implement the programs and project within the area of jurisdiction of their basin authorities.

Noting increasing human population growth, urbanization, industrialization and food production as we move into the 21st century, the need for a comprehensive river basin or groundwater aquifer-scale integrated management programme is more critical than ever. Because of this, the government is now again bent in pursuing the river basin management approach and would therefore need advice on approaches and capacity building to strengthen the existing river basin organizations.

III. TOWARDS EFFECTIVE WATER RESOURCES MANAGEMENT

The water resources sector continues to address policy and operational gaps in water resources management to ensure adequate water supply. The National Water Forum held on March 22, 2004 called for the immediate adoption and subsequent implementation of the integrated water resources management framework, seeking to change the existing water based development-planning paradigm into a more rational, integrative, and total approach. The government pushed for the strengthening of a working commitment toward a more wide-ranging course of action to effectively deal with the country's water-related issues. The imperatives needed to dovetail all water resources management initiatives include the river basin approach, supply optimization, demand management, equitable access of water, improved policy regulatory and institutional frameworks, and inter-sectoral approach.

Moreover, the Government enacted the Philippine Clean Water Act on March 22, 2004, the law that provides for a comprehensive water management program to protect the country's water bodies from land based sources of pollution such as industries, mining, agricultural operations, as well as community household activities. The Clean Water Act is a very important piece of legislation that would pursue all issues that affect the state of the country's water quality.

Efforts to strengthen the NWRB have been initiated by the government through the enactment of Executive Order No. 123 dated September 12, 2002. This is the transfer of NWRB to the Office of the President and then to the Department of Environment and Natural Resources. The strengthening involves the changes in the membership of the Board, strengthening the planning, enforcement and monitoring capability of the agency and modification of the Water Code and its implementing rules and regulation.

RECENT FLOOD CONTROL ISSUES IN JAPAN AND LEGISLATION FOR PREVENTING FLOOD DAMAGES IN URBAN AREAS

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Introduction

In recent years, flood damages in the river basins of Japan's urban areas are increasing due to the delay in river channel improvement and flood control dam development as compared with the progress of urbanization and due to the frequent heavy intensive rainfalls as a main effect of the heat island phenomenon. Under these circumstances, a new law concerning countermeasures against flood damages in urban areas , which is called Designated Urban River Inundation Prevention Act, was enacted in June 2003.

This report reviews the flood control measures in post-war Japan, makes clear the characteristics of recent flood damages and relevant issues, and describes this new law, which stipulates flood control measures for urban river basins.

1.Change of Flood Control Measures in Last Sixty Years in Japan

Two decades since 1945

During the two decades since 1945, a number of large-scale typhoons such as Catherine Typhoon successively attacked the devastated land of post-war Japan and caused substantial damages. The attack of Typhoon Ise Bay in 1959 gave rise to the legislation of two laws in 1960: Erosion and Flood Control Emergency Measures Law and Flood Control Special Account Law, which for the first time stipulated the formulation of long-term plans for flood control projects.

To meet the dramatic increase in demand for industrial and municipal water supply in line with the rapid economic growth, water resources development was promoted through construction of multipurpose dams, which are designed for both water control and water utilization, and their construction and management were centralized and integrated in river administrators.

In accordance with the development of economy and society and the changes of administrative structures since around 1955, the River Law was fully revised in 1964

with the background of increasing needs to respond to urbanization of areas along rivers and to the increase of various types of water demands, arising from socio-economic development.

Formulation of a "Basic Plan for the Implementation of Constriction Works" became compulsory for river administration. Accordingly, the river management drastically changed from the conventional river-section management to the coherent river-basin management that covers a whole river system from the up most to the lowest reaches.

Two decades since 1965

Urbanization in line with substantial economic growth has degraded the water retention and retarding functions of river basins, which has resulted in the increase of runoff and even flood peak discharge, and has raised the frequency of flood occurrence. In addition, the concentration of population and assets due to urbanization has increased damages caused by floods. In fact, floods occurred frequently throughout the country during these decades. The 1974 flood of Tama River caused serious damages and some victims filed a lawsuit against the government.

With this background, the River Council issued the "Interim Report for Promoting Policies for Comprehensive Flood Control Measures" in June 1977, and presented the "Proposal for Policies to Implement Comprehensive Flood Control Measures" in March 1988 in order to diversify the conventional river improvement method which had placed a focus on the excavation and widening of river channels. Namely, the policy has shifted to undertake comprehensive flood control measures that include multipurpose retarding basins with compatibility between flood prevention and urban development, regulation and encouragement of land use, public announcement of flood prone areas, improvement of forecasting and warning systems, etc.

In addition, zero-based budgeting was adopted as part of the financial reconstruction plan in fiscal 1981, but minus-based budgeting was adopted in the following year. River administration was carried on under such a tight budget for the subsequent seven years.

From 1985 to the present

Expectations for rivers has been increasing not only as facilities that simply have functions of flood control and water utilization but also as living environment that relaxes people with their diverse natural environments and waterfront spaces. In order to respond to such increasing needs of people for water quality, maintenance of the ecological system, landscape of water and greenery, and amenity of river space, the river administration added in 1997 the "improvement and conservation of river environment" to the objectives of the River Law, which had been only "flood control" and "water utilization."

In line with this policy, "nature-oriented river works" have been conducted. These works are to address improvement of rivers and streams by incorporating characteristics of the nature of individual rivers and streams, and is different from the conventional

standardized improvements but secure areas for various creatures and plants to live and grow, maintaining the safety against floods.

As examples of comprehensive flood control measures for extraordinary floods, there are super-levees with high durability against overtopping and infiltration, Metropolitan outer loop flood diversion channels as urban flood control measures, and disaster prevention stations for supporting prompt flood fighting activities and emergent recovery.

In addition, optical fiber networks are being established with an aim to improve the efficiency of river management during flooding by quickly identifying, through digitalization, the status of operation of river management facilities and the current flooding conditions.

2.Characteristics of Recent Flood Damages in Japan and Relevant Issues

Frequency of urban type flooding

In September 2000, the Tokai Region was hit by heavy rains, which recorded the precipitation of 93 mm per hour at maximum around Nagoya City. The Shin River and Tempaku River in Nagoya City flooded, and landside inundation was also observed. About 18,000 houses were flooded in Nagoya City and adjacent Nishi-Biwajima and Shinkawa Towns. The railroad networks including the New Tokaido Line fell into chaos, and subway stations also suffered from flood damage. Urban functions were completely paralyzed due to successive power breakdowns and telephone line failures. The total amount of damages in Aichi Prefecture resulting from this deluge reached about 865 billion yen, equivalent to about 8 billion US dollar. This is the second largest damage in post-war Japan, next to that of Typhoon Ise Bay in 1959, but is the largest as urban flood damage.

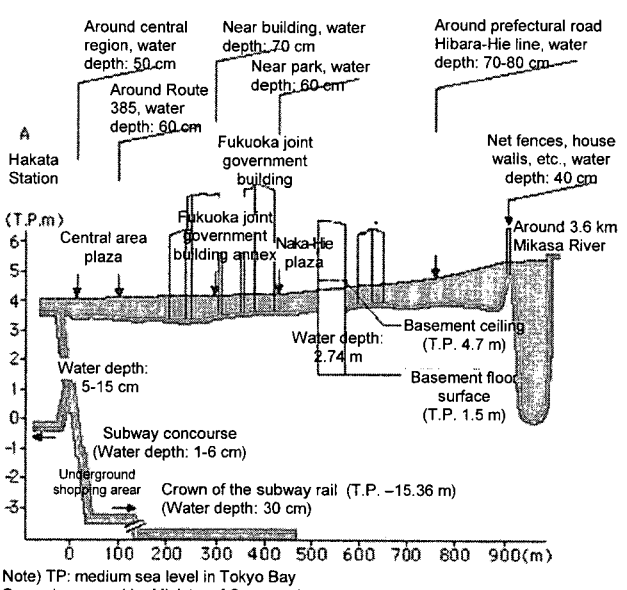
As aforementioned, urban type flood damages are usually caused by the localized inundation in urban areas where assets are concentrated, and they may occur more frequently than those caused by riverside water flooding due to breach of river levees.

Underground Inundation

On June 29, 1999, rains caused by the Baiu-front (seasonal front) began to fall at the daybreak and recorded the precipitation of 77 mm per hour in Fukuoka city. The Mikasa River flooded, and underground facilities such as building basements, subways, and underground shopping areas were inundated as illustrated in Figure 1. Urban functions were suspended, and one person left alone in the underground area was killed. On July 21 of the same year, concentrated heavy rains in Tokyo killed one person who was in an inundated residence basement.

In recent years, underground space is effectively utilized in Japan as valuable space at urban centers, particularly in large cities, for various purposes such as subways, shopping areas, and building equipment. In such circumstances, inundation of

underground space may cause a failure in urban functions due to power failure in electrical equipments which are often installed underground. In addition, damage that affect human life may occur if people in underground space fail to escape because of no information of the aboveground inundation, or if they are locked in an underground room because they cannot open doors due to water pressure. To prevent damages from such underground inundations, required are "soft" countermeasures such as improvement of disaster information transmission system and escape guiding system in full consideration of underground inundations, in addition to "hard" countermeasures such as development and improvement of flood control and sewerage facilities.



Note) TP: medium sea level in Tokyo Bay
Source) prepared by Ministry of Construction

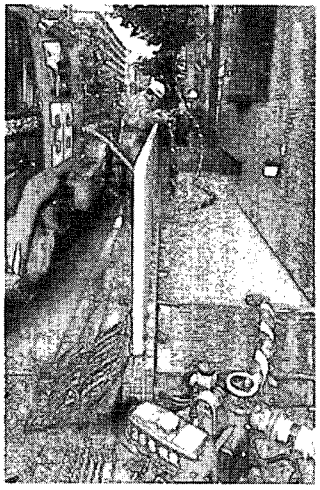
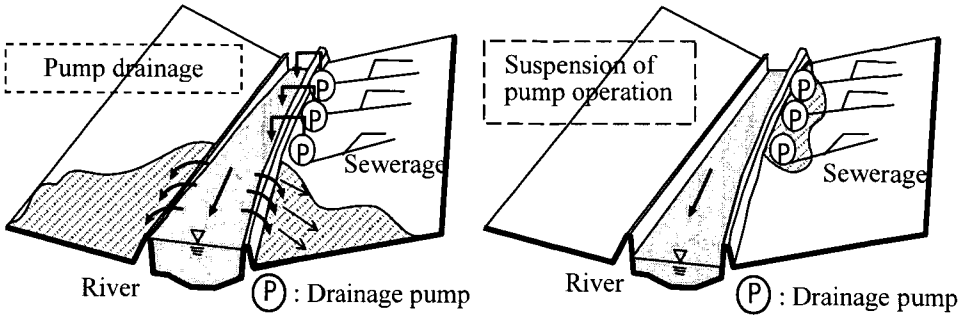

1st floor of this building was submerged under water due to the Mikasa River Flood (Source: The Asahi Shimbun)

Figure 1 Cross-Sectional View of Inundation in Fukuoka Flood

Inadequate coordination with sewerage

During a flood, rainwater is discharged through drainage pumps of sewerage system in low-lying areas. The operation of drainage pumps mitigates landside water damage but increases river discharge and may therefore cause more sever river flooding.

Conversely, control of drainage pump operation may increase landside water damage around drainage pumping stations. Floods caused by levee breach generally have a high possibility to result in extensive damage, but stopping the operation of pumping stations is critical for neighboring residents. It is therefore needed to formulate rules to minimize damage while taking "hard" measures such as construction of storage facilities around pumping stations. (Figure 2)



Drainage pumps are to mitigate the landside water damage but may cause river water flooding at a bottleneck in the downstream.

Suspension of pump operation may cause landside inundation damage around the drainage pumping station.

Figure 2 Image of Inundation Caused by Drainage Pumps

Frequency of extraordinary heavy rains

In recent years, extremely heavy rains exceeding the precipitation of 100 mm per one hour have been frequently observed in Japan. For example, heavy rains that hit Kochi in September 1998 recorded an hourly rainfall of 109 mm and a 24-hour rainfall of 979 mm, and localized heavy rains hit the area centering on the Kokubu river basin. As another example, heavy rains attacked a comparatively wide area from the northern part of Kanto Region to the southern part of Tohoku Region at the end of August 1998. In some places of the area, an hourly precipitation of 90 mm was observed, and the total precipitation of 1,200 mm was recorded during six days from August 26 to 31.

As one of the causes for such heavy rains, there is a view that temperature rise due to global warming has intensified local heavy rains.

As countermeasures, effective and intensive arrangement of facilities are needed to prevent recurrence of disasters, and, in order to minimize damage, effective flood control measures are required for the whole river basin, including coordination with land utilization plans, establishment of information networks, formulation of voluntary disaster prevention systems, etc.

3.Legislation against Flood Damages in Urban Rivers

In light of such flood damages and issues in the basins of urban rivers, Designated Urban River Inundation Prevention Act was enacted in June 2003 as a new law that provides a new framework for flood control measures.

Purpose

The purpose of the new law is to implement the following three items for urban river basins where serious flood damage has occurred or is likely to occur and where rapid urbanization makes it difficult to prevent such flood damage by means of improvement of river channels. (Figure 3)

- To designate the relevant rivers and regions as specified urban rivers and specified urban river basins, respectively.
- To formulate plans for basin flood control measures to promote comprehensive flood control measures
- To specify the measures to be taken by river administrators including improvement of rainwater storage and infiltration facilities.

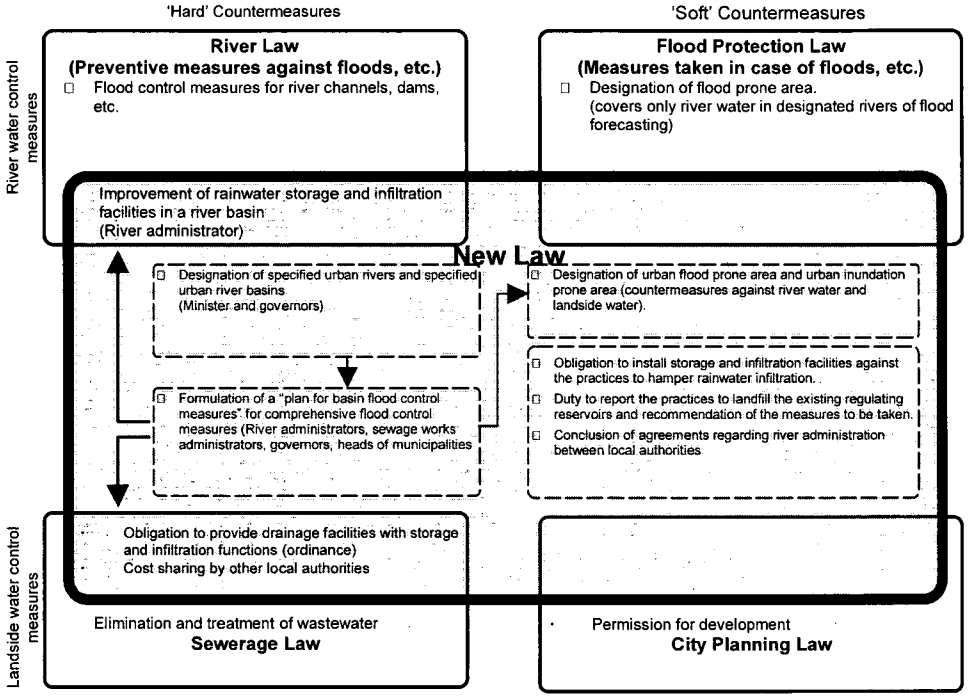


Figure 3 Relations between the New and Existing Laws on Flood Control Measures for Urban River Basins

Designation of specified urban rivers and specified urban river basins

There three requirements for the designation of specified urban rivers and river basins: (i) the river are those that flow in urban areas; (ii) the river basins have experienced serious floods and are subject to flooding; and (iii) the rivers and river basins have difficulties in mitigating flood damage only by the conventional river improvement methods such as channel improvement and construction of dams or retarding basins.

In designating the specified urban river basins, also designated is the sewerage drainage areas where sewerage water flows into the specified urban rivers located outside the river basin.

Formulation of plans for basin flood control measures

When a river is designated as a specified urban river, river administrators, sewerage administrator, governors and heads of municipalities must jointly formulate a plan for basin flood control measures to prevent flood damage. The plan is assumed a midterm control measure plan to improve a river basin in about 20 to 30 years, and should include the following:

- Basic policy for flood control measures in the specified urban river basin;
- Standard rainfall that gives criteria to prevent flooding or inundation in the specified urban river basin;
- Issues on the improvement of specified urban rivers, development of rainwater storage and infiltration facilities, and construction of sewerage systems, which are provided in the river basin by river administrators;
- Issues on the storage and infiltration works to be implemented by local authorities;
- Issues on the measures for preventing the spread of damage when inundation occurs; and
- Issues on the operation coordination of sewage pumping facilities.

The Law stipulates that the authorities that have formulated the plan shall make efforts for the best practices, requesting the residents and employers in and around the basin for cooperation.

Measures based on the plan for basin flood control measures

The Law also stipulates the institutionalization of the following matters with an aim to promote the plan for basin flood control measures:

[1] Improvement of rainwater storage and infiltration facilities by river administrators

River administrators are authorized to improve rainwater storage and infiltration facilities as river management facilities located in specified urban river basins pursuant to the plan for basin flood control measures.

[2] Burdens of other local authorities for construction of sewerage systems

Local authorities that implement sewage works projects and others as stipulated in the plan for basin flood control measure are empowered to charge other beneficiary local authorities the relevant costs.

[3] Exceptions to the technical standards for drainage facilities connected to sewerage systems

It is possible to oblige each household to add storage and infiltration functions to its drainage facility by ordinance.

Regulations for controlling runoff in the specified urban river basins

[1] Permission for the practices to hamper rainwater infiltration

In the specified urban rivers, permission from a governor is required for the practices to hamper rainwater infiltration to an excessive extent, which are conducted in

agricultural lands and forest areas, other than building lots. And such permission requires countermeasures such as regulation reservoirs for flood prevention and infiltration trenches. Also, permission shall be obtained again in case of implementation of any construction works that may hamper the due function of the existing rainwater storage and infiltration facilities. In some cases, these permissions are required even for the practices to be conducted by public authorities.

[2] Notification of practices associated with conservation and regulation reservoirs
Notification to a governor is required for the practices such as filling work that may hamper the functions of the conservation and regulation reservoirs when the governor has designated a regulating reservoir, over a certain scale, for disaster prevention as the conservation and regulation reservoir. In addition, the governor may give advice or recommendation to encourage the construction in such a method as may not impair the function of the conservation and regulation reservoir.

[3] Management agreement concerning the conservation and regulating reservoir
Local authorities may conclude an agreement with the owner of conservation and regulation reservoir so that local authorities be able to manage it. In such cases, this management agreement is also applicable to the assignee of the conservation and regulation reservoir.

Designation of urban flood prone area and urban inundation prone area

The delineation and depth of possible inundation under the existing facilities are announced to the public, and these areas are designated as an urban flood prone area if it is due to river water flooding and as an urban inundation prone area if it is due to the lack of drainage capacity of sewerage systems.

Municipal disaster prevention councils set forth in a municipal disaster prevention plan the communication methods of inundation information, locations of evacuation centers, information delivery methods to underground shopping centers, and fully familiarize them to local residents. Further, the management of underground shopping areas is obliged to make efforts to prepare and officially announce a plan for evacuation when flooded.

Conclusion

This report summarized flood control measures in postwar Japan, and with a review on their changes, introduced the characteristics and challenges concerning the issue of flood damage in urban rivers, which is causing great concern in recent years. It also introduced a new law, which was formulated as a countermeasure against these issues.

The new law will be enforced in April 2004 and several years would be required for the effectiveness of the law is demonstrated in case of flood. It would be a great pleasure for us if this new law could contribute to the solution of urban river flood risks in the Asian monsoon countries.

The Revision of Water Law of P.R.C. and the Efforts for Remedying the Dry-up Problems of Yellow River

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The first Water Law of China was the foundation of implementing water resources management. It could not meet the needs of management and must be revised because since 90's the situations of society and economy and water resources have got great changes. Many systems that were proved effective in water resources management have been adopted in the revised water law. For remedying the dry-up problems of Yellow River, some drastic measures have been taken. These effective measures have also been taken in the new water law. Some new regulations for dealing with water issues in Yellow River based on the new water law are drafting.

1. THE FIRST WATER LAW

1.1 The history of water legislation

China has long history on making water law to manage water affairs. In Chinese ancient time, every dynasty issued some regulations on water management. In Han Dynasty (206 B.C—25 A.D.) and Tang Dynasty (618 A.D.—907 A.D.), the government issued some famous water decrees to regulate water use.

In 1954, the People's Republic of China had the first Constitution in which there were some provisions about water.

In the early 80s of twenty century, the State Council issued some regulations on water project management.

In 1984, China issued the Law on Prevention and Control of Water Pollution。

On January 21. 1988, the first Water Law of the People's Republic of China was adopted by the Standing Committee of the Sixth National People's Congress.

Since that time, China has issued more laws and regulations on water management such as Flooding Control Law and Regulation of River Management.

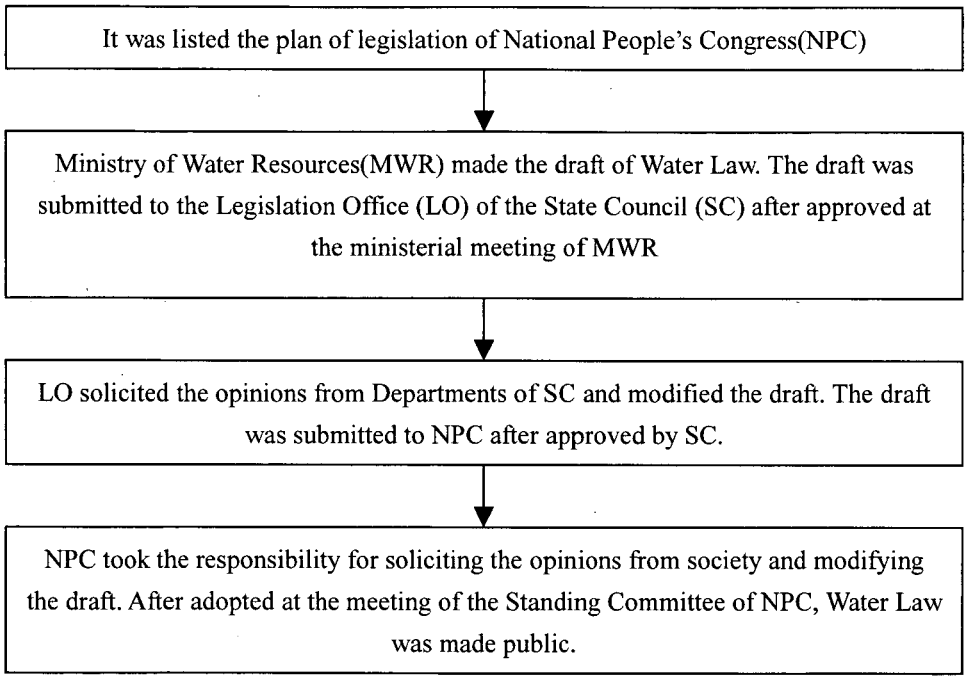
In 2002, Water Law was revised and issued.

To 2003, China has issued 4 laws, 19 administrative regulations, 90 ministerial Rules, hundred provincial regulations and about 800 provincial rules on water management.

1.2 Formulation of the First Water law

The first Water Law set some administrative systems which mainly came from practical experience in water management and other natural resources management in China and some effective experience in other countries.

In China, the procedure of formulating and revising Water Law is following:



1.3 Main Contents of the First Water Law

1.3.1. The first Water Law was formulated in accordance with some important principles.

★ Utilizing water and preventing harmful aspects of water should be combined.

★ The demands of domestic water for urban and rural inhabitants occupy the priority.

★ The development of water energy follows the policy of multiple-purpose of water resources.

★ Saving water and protecting ecological environment must be taken into consideration.

★ The management of surface water and ground water must be integrated.

1.3.2. The main systems set by Water Law are following:

□ ★ System of unified administration on water resources in association with

administration at various levels and by various departments.

□ ★ System of comprehensive scientific investigation, survey and assessment of water resources

□ ★ System of water plan

□ ★ System of water allocation

□ ★ System of licensing for water-drawing

□ ★ System of compensation for water use

□ ★ System of approval for construction in river

□ ★ System of protecting groundwater

★ System of consulting water dispute

★ System that administrative heads assume overall responsibilities for flood control

1.4 The achievements of implementing Water Law

★ The people have gradually realized the importance of regulating water affairs.

★ A system of regulation has been set. The affairs concerning water development and management can be regulated by these regulations and laws.

★ The system of unified management and supervision has been setting up step by step. Policies concerning water have been partly unified.

★ The order of development and utilization of water resources is getting better.

★ A technical system for supporting the water resources management has been setting up.

2. REVISION OF WATER LAW

Since 90's, the situations of society and economy and water resources have got great changes. Revising old Water Law became an urgent task. In 1994, the revision of Water Law was placed on the plan of legislation of 8th National People's Congress. In 2002, the new Water Law was adopted and made public and effective. In new Water Law, some new administrative systems have been added and some principles of old Water Law have been replaced by more scientific principles. The revision of Water Law was highly appraised.

2.1 The reasons of revising water law

In 90's, the issues of water shortage, flood disaster and water environment degradation had been not eased. Water shortage has become one of the major constraints on stable development of national economy, especially the sustainable development of agriculture. Nearly half of the river courses suffered from various degrees of pollution. In some areas, the pollution problem became more and more serious. Flood disaster was still the troublemaker of the Chinese nation. Meanwhile, China was facing the greater and greater challenges caused by population growth, social and economic development. The old Water Law must be revised to meet the needs of strengthening water management.

In the old Water Law, some contents needed to be changed.

★ Comparing the development and utilization of water resources, the systems concerning the protection and saving of water resources were weak.

★ Some policies on water resources management had been thrown into confusion by carrying out the system of unified administration on water resources in association

with administration at various levels and by various departments.

2.2 The main ways to revise Water Law

★ Summing up the effective experience and lessons of water resources management of China

★ Drawing the new experience and principles of water resources management such as sustainable development and river basin management from other countries.□

★ Paying an attention to coordination of Water Law and other laws concerning natural resources management.

★ Making the administrative systems more concrete.

2.3 The main parts revised

Comparing the old Water Law, the main parts revised are following:

★ Emphasizing the unified management of water resources.

The system of unified administration on water resources in association with administration at various levels and by various departments has been replaced by that the administrative departments for water resources of governments are responsible for unified management and supervision over the water resources.

★ Stressing the proper allocation of water resources.

The water resources in every river basin should be allocated according to the principle of amount control. Every region will get an amount of using water, and the remains of water resources should maintain a proper flow of rivers and keep the lakes, reservoirs and groundwater at a proper water lever. The local governments must control the needs to water resources and distribute the water to all the users under the amount allocated.

★ Strengthening the measures of macro-management.

The planning, allocating, dispatching and supervising of water resources should be undertaken with the river basin as basic unit.

The State shall formulate national water resources strategic plan.

The system of river basin management combining with management of administrative region should be applied. The river basin authorities will play more important roles in water resources management especially in allocation of water resources, supervision of drawing and using water resources, management of plan, dispatch of surface water and groundwater.

★ Emphasizing the harmony of water resources and population, development of economy and ecological environment.

The system of dividing and managing water function zone, the system of establishing conservation districts for drinking water source, the system of controlling total discharge of various pollutants, the system of managing sewage discharge outlet, the system of defining the prohibited area and restricted area of groundwater exploitation and the system of prohibiting the reclamation of river shall be strictly applied nationwide.

★ Enhancing the water-saving.

The State applies the system for the use of water under which control over the total volume is combined with control over the quotas.

The water-saving facilities shall be designed, constructed and put into operation simultaneously with the principal part of project.

The State gradually eliminates the techniques, equipment and products that are outdated and are of high water-consumption.

Some policies will be made to encourage the use of recycled water.

Two-step water pricing mechanism will be taken. Under the quotas, the price will cover the cost and profit. Above the quotas, the price will increase with the amount. □

★ Strengthening the management of river and water project.

The State applies the licensing system for sand quarrying in river courses.

The scope of management and protection of the waterworks shall be defined.

2.4 Implementation of New Water Law

After the new Water Law was issued, MWR speeded up formulating the regulations and rules in order to implement the new Water Law. The provincial People's Congresses also began to revise the local Water Regulations. Some regions have already issued the new water regulations.

3. THE EFFORTS TO REMEDY THE DRY-UP PROBLEMS OF Yellow River

3.1 The basic facts of Yellow River basin

The Yellow River is the second longest river in China. It originates in northwestern Qinghai Province and runs through 9 provinces and autonomous regions. The main course of the Yellow River is 5465 km in length and its basin area is about 795,000km^2. Its average runoff is about 500 mm and the total amount of runoff is 66.1 billions m^3 per year. Its population is 99.22 millions.

3.2 The briefing of the dry-up problems of Yellow River

The dry-up of Yellow River began in 1972. Since that time, the sustained drought combined with the increasing water consumption has led to a sharp decrease in water flow in upper reaches, causing some sections of the river to go dry in the lower reaches. The situation was more and more serious in 1990's. The worst situation occurred in 1997 that the dry-up period was as long as 226 days and the parched riverbed was about 700 kilometers which is 83% of length of its lower reach. In this year, the dry-up even happened in flood season.

3.3 The negative impacts of the dry-up problems of Yellow River

The dry-up caused some serious negative impacts on many aspects.

★ The losses of agriculture and industry were more than one billion Yuan annually in 70's and 80's, and three billions in 90's.

★ The people bore a inconvenient life.

★ The river was filled up more and more seriously, and its capacity of releasing floodwater sharply decreased.

★ The water quality and the ecological environment of river degraded obviously.

★ The wetlands decreased sharply to half, fish to 60% and birds to 70%.

★ The intrusion of seawater and salinization of soil were serious.

3.4 The reasons of the dry-up problems of Yellow River

The main reasons are following:

★ The shortage of water resources and uneven timing and spatial distribution of water resources in Yellow River.

★ The sustained drought□

★ The sharp rise of demands for water resources

★ A low price of water

★ Too many reservoirs along the river which store too much water and are dispatched according to different targets

★ A weak authority of river basin management which did not have the enough power to adjust and control the regions' total amount of drawing water

3.5 The measures to remedy the dry-up problems

3.5.1 Some measures which were proved effective were taken.

★ Formulating the plan of water allocation of river basin. This plan defined region's total amount of drawing water from Yellow River and the proper flow of river. In 1997, the plan was approved by the State Council.

★ Formulating the Administrative Regulation of Water Dispatch in Yellow River. The Regulation that endows the authority of Yellow River Management with power to adjust and control the regions' amount of drawing water and sets up the procedure of the water amount management was issued in 1998.

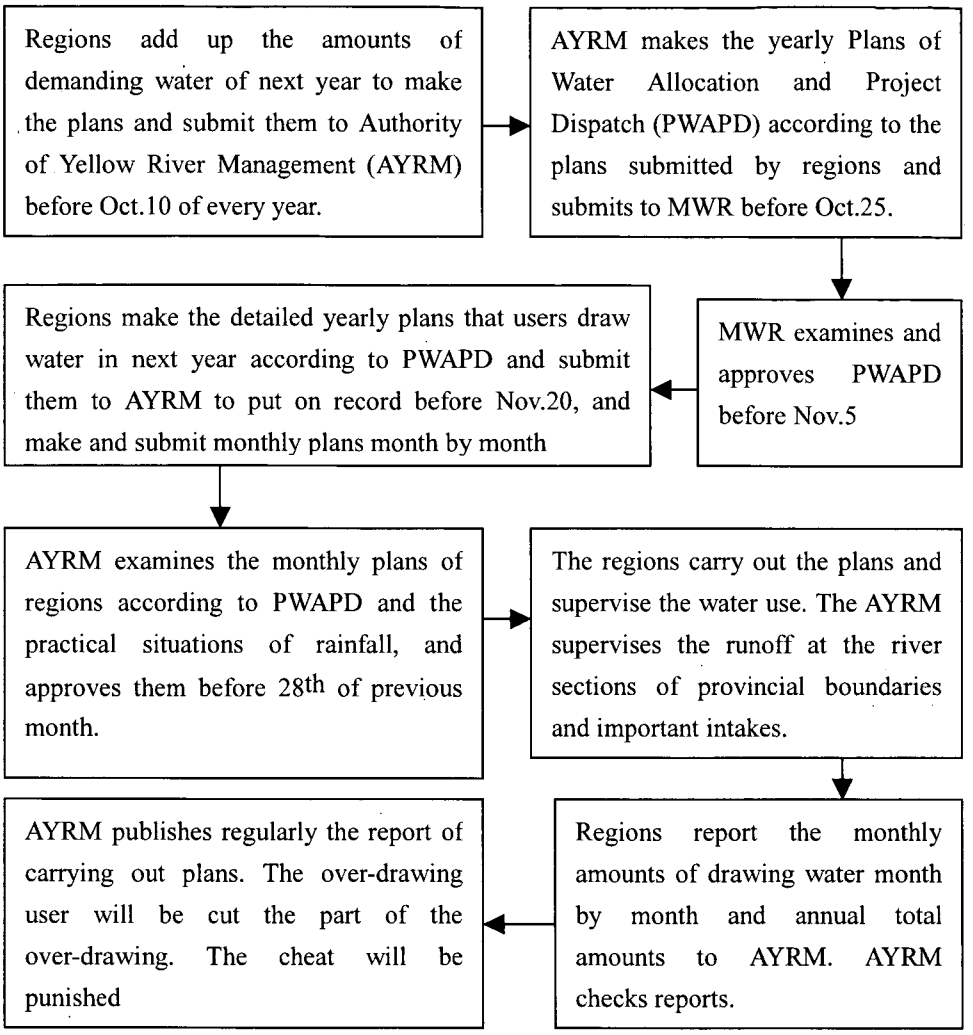
★ Setting up the special institute taking charge of adjusting and controlling the regions' amount of drawing water.

★ Building the water project aiming at adjusting water amount and controlling floods.

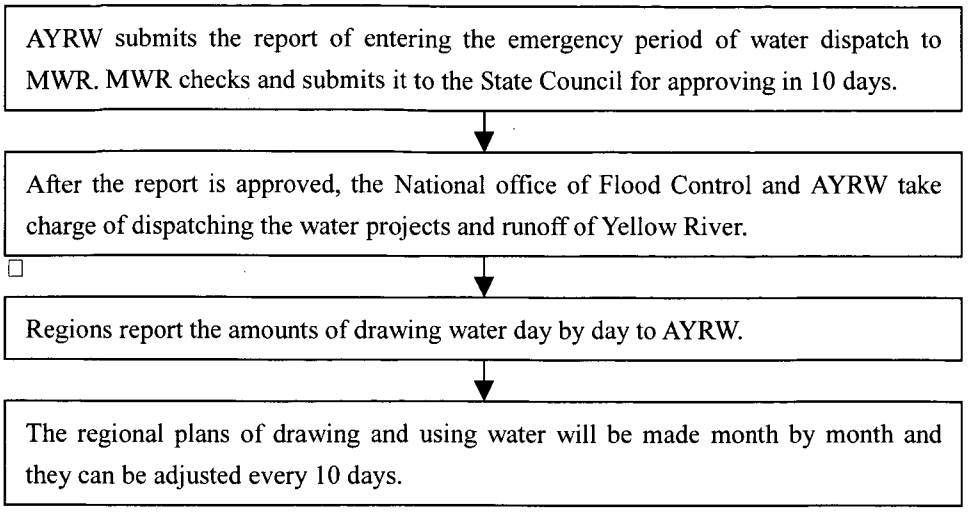
★ Rising the water price. The price for irrigation at the lower reach of Yellow River rose to twice of the original, and for industry to 11 times of the original.

★ Publicizing the policies of water saving.

3.5.2 The procedure of water amount management (In ordinary year)



3.5.3 The procedure of water amount management (In serious dry season)



3.6 The effect of taking the measures to remedy the dry-up problems

Since the Administrative Regulation of Water Dispatch was implemented in 1999, the situation of Yellow River has been getting better. In 1999, the dry period of the lower reach was shortened by 8 days. From 2000 to 2003, Yellow River did not go dry. In 2000 and 2002, Yellow River even supplied water to ease the problem of water shortage in Tianjin City which is out of Yellow River Basin. In addition, some positive changes appeared.

★ The ecological environment of Yellow River has been gradually recovering.

★ The essential demands for water in whole basin has been ensured.

★ The effect of water-saving is obvious. In Ninxia Autonomous Regions and Inner Mongolia Autonomous Region, the total amount of using water in 2000 decreased 1.27 billions m^3.

Some effective administrative systems for remedying the dry-up problems such as the system of controlling total amount of using water, the system of water allocation, the system of supervision of using water and the system of ensuring the proper flow of river have been adopted in revising Water Law.

3.7 The further measures to improve the management of Yellow River Basin

★ Formulating the Yellow River Law. The research of the law is on the way.

★ Strengthening the management of water quality. The regulation of water resources protection in Yellow River has been formulating.

★ Improving the administrative systems according to the new Water Law.

★ Setting up the system of water rights of Yellow River step by step. Some regions are launching the trade of water rights as the pioneers.

★ Setting up gradually the new system of river basin management in which the regions and users will play more important roles in making policies and the river basin authorities will strengthen allocation of water resources, supervision of drawing water, management of plan, dispatch of surface water and groundwater.

CHARACTER AND THE MOST IMPORTANT SUBJECTS OF THE INDONESIAN LAW ON WATER RESOURCES

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Abstract:
After decades of strongly centralized administration and governance structure, the new government of Indonesia embarked on major democratic reforms based on the new paradigm of regional autonomy to realize administrative and fiscal decentralization. The water sector was no exception. High priority of the water sector reform was given to the preparation of the new Law on Water Resources. The Law on Water Resources comprises 100 articles. The larger volume of the law is the result of the fact that in the new law more subjects have been provided for and also discussed in more detail than the existing law. This paper presenting a general sketch of the character and important subjects of the new law. The most important subjects provided for by law are subsequently discussed in further detail in separate paragraphs.

1. Background.

The year 1998 was a major turning point for Indonesia, a country of over 210 million people with diverse ethnic background living in 13.000 islands. After decades of strongly centralized administration and governance structure, the new government embarked on major democratic reforms based on the new paradigm of regional autonomy to realize administrative and fiscal decentralization. The new administrative framework establishes empowered local governments at the levels of districts and provinces, besides central government. The water sector was no exception. High priority of the water sector reform was given to the preparation of the new Law on Water Resources.

Along with the change in the paradigm and to anticipate complexity in the development of issues on water resources; to put water in harmoniously social, environmental and economic dimensions; to attain integrity in **water resources management (WRM)**; to accommodate the demand for decentralization and regional autonomy; to give better attention to the basic human rights to water; to put the mechanism and process of formulating policies and a more democratic plans of WRM in place, it is necessary to enact a new law in place of Law Number 11 of 1974 on Water Resources.

2. Character of the new Water Resources Law.

Since the commencement of the Water Resources Sector Reform Program in May 1998, high priority was given to the preparation of the draft Law on Water Resources. Mid 2001 a draft executive proposal had been completed. After various amendments, the President formally submitted the final bill to the parliament in October 2002. Since its submission, a number of discussions with the parliament and the community concern have been made, 100 articles have finally been approved by the Commission IV of the National Parliament

on the February 11, 2004 and have been approved by the General Assembly of the National Parliament to be enacted by February 19, 2004.

The following are some salient characteristics of the new law:

a. The law has now become a true management law. It is no longer primarily focused on the construction (development) of water resources infrastructures, but on the provision of conditions for sensible, sustainable WRM.
b. This law is containing comprehensive arrangements, not only covering the **domains** of WRM, but also the **process** of WRM.
c. The law's scope is aimed at integrating WRM in all its aspects i.e., surface water and groundwater, with regard to quantity and quality. Consequently, a coherent integral approach is adopted.
d. Openness and encourage participation of stakeholders. All social organizations involved in the water management and citizens (community) are given possibility of participating in all steps of water resources development and management. In this respect, principles of good governance such as effective, efficient, transparency are adopted.
e. The law is integrating social function and economic values. Along with water's social function, their economic value is now emphasized. This reflects the fact that water is a scarce commodity, with need investments that in principle should be paid for.
f. Although the law has grown considerably in size in comparison to the old law, i.e. from 17 articles to 100 articles, the subjects included in the act are mostly provided in outlines. Substantive elaboration of almost all subject is took place in the following government regulations. This makes the law typical framework law and therefore it is accordance with the modern principles of legislation approach in complex policy areas.

The important features and issues of the bill on WRM aspects are described in the following paragraph.

3. Philosophic and Basic Principles of WRM.

Base on philosophic consideration, the law declares that water resources are a blessing of the One and Only God that give benefits for the welfare of the whole people of Indonesia. Water resources shall have social, economic and environmental functions and shall be implemented and realized in a balanced manner.

Base on the legal aspects has been stated in Article 33 paragraph (3) of 1945 Constitution, this law stipulates that water resources are controlled by The State and are use for the maximum benefits of the people in a fair manner. The State's control of the water resources is undertaken by The National Government and/or the regional governments while recognizing and respecting the traditional communities such as the *ulayat (traditional)* right of the local, traditional community and any other similar rights as long as such rights are still acknowledged in line with the community's development and the principles of the Unitary State of the Republic of Indonesia.

Base on technically consideration, the new law states that water is actually dynamic resource by nature, flowing to lower places without distinguishing the administrative regions. The nature of water follows the hydrological cycle that is closely associated with the climatic conditions of an area, causing inequality in the availability of water by period of time and by region. To ensure the implementation of WARM, which will give

the outmost benefits for the welfare of the people in all aspects of life, WARM scheme shall be established. The WARM scheme shall be prepared **based on river basin**. WARM scheme shall be based on the principles of balance between conservation efforts and effective utilization of water resources.

4. Water Use Right.

Water Use Right (WAR) is an organized means of managing a planned sharing of water for the benefit of a community. WAR in Indonesia is the rights are **only limited to use and to utilize the amount of water** for various purposes that user is allowed to take at any particular time from common water resources such as river, lake, canal or aquifer.

The new law states that WAR does not mean the right to own water, but the right to obtain and use or utilize water an amount (quota) of water following the allocation determined by the Government for the water users, comprising users required to have permits and those who are not so required. The volume of allocation determined in this respect is not conclusive and must be in compliance with the volume stated in the permit, but this may be reviewed if the requirements and conditions used as the basis for determining the permit and the condition of water availability in the related source has changed significantly compared with the water availability condition at the time the allocation was decided.

The community's growing need of water effect the increasing economic value of water compared with its social functions. Such a condition will potentially create conflicts of interests between sectors, regions, and between various parties engaged in water resources. Meanwhile WARM that rests more on the economic value tends to favor the capital owner and may ignore the social functions of water resources. Based on these considerations, this law gives more protection to the interests of weak economic groups of the society, by applying the principles of WRM that will ensure the balance of social, environmental and economic functions.

WUR to fulfill the basic daily needs of individuals and the people's agriculture activities located within an irrigation system will be protected by the Government or the regional governments. Basic daily needs means water required to keep a healthy, clean and productive living, such as water for praying, drinking, cooking, bath, and toilet. People's agriculture means agriculture activities of growing food crops, fishery, livestock, developing and common people plantation and forestry, undertaken by the people on land of particular area with water requirement of not more than 2 liters per second per family.

5. Institutional Aspects.

The new law is promoting the policy to meet in between the spirits of decentralization or regional autonomy, and the basic principle of integrated WRM. Institutional aspects concern the distribution of responsibility and authority, the way in which policy coordination between the various authorities involved in water tasks has been arranged (coordination), and the way in which the participation of society in the policy-making processes in the area of water management has been regulated.

5.1. Distribution of Responsibility and Authority.

The regulation concerning Responsibility and Authority in the new law is clear. It is stipulates the task and responsibilities of the National Government, the province, and the districts/municipalities. The authority and responsibilities in the WRM by the

Government, the provincial governments, and the district/municipal governments are arranged in accordance with the situation of the river basins, namely:

a. river basins across provinces, across countries and nationally strategic river basins will be taken care by the national government.
b. river basins cross districts/towns will be taken care by the provincial government;
c. river basins located totally in a district/town areas will be taken care by the district/municipal governments.

These authorities and responsibilities in WRM include the activities of regulating, determining and providing permits for the usage, provision, utilization and exploitation of water resources in river basins while observing the importance of conservation and control of the water destructive power.

The president shall determine the river basins and groundwater basins upon learning the recommendation of the National Water Resources Council. The determination of river basins shall cover the river basins in a single district/city, across districts/cities, across provinces, across states, and in nationally strategic river basins.

The national strategic river basin is decided on the following parameters/aspects:

a. the size and potentials of the water resources in the river;
b. the number of sectors and population in the river basin;
c. the extent of the social, environmental and economic impacts on the national development; and
d. the extent of the negative impacts caused by the water destructive power on the economic growth.

The regional governments in accordance with the laws and regulations may carry out a part of the national government's authorities in WRM. The new law also provides for arrangement that takes the provinces the option of transferring part of their task to national government in particular circumstances. It also provide for arrangement in case tasks are neglected. In case the regional government is still unable to carry out a part of its authorities, the concerned regional government may transfer such authorities to the government of a higher level, in accordance with the laws and regulations. The implementation of a part of the authorities in WRM by the regional government shall be undertaken by the government of the higher level in the case:

a. the regional government is not carrying out a part of its authorities in WRM that the situation will be detrimental to the public needs; and/or
b. there is an inter-provincial or inter-district/city dispute.

5.2. Coordination.

WRM covers a cross-sectoral and cross-regional interest that requires integrated actions in order to maintain the sustainability of the function and benefits or water and water sources. The WRM shall be done through coordination by integrating the interests of various sectors, regions, and stakeholders in water resources. This requires sound horizontal and vertical policy coordination, not only at the level of strategic policy determination, but also at the level of operational policy-making (priority of usages, drought and flood management, water service fee, etc).

The importance of this is acknowledged in the chapter XII of the new law. It provides for establishment of coordination bodies (councils or committees). The

current legislation already provided for the establishment of coordination committees at different administrative levels. These were official committees.

In the new set-up, these committees are transformed into more administrative consultative bodies. In addition, the composition of these consultative bodies will be considerably broadened. The coordination body shall be composed of representatives of the government and non-government elements in a balanced number based on the principles of representation. Social interest organizations will also represented in the councils.

The coordination body will be set up at the national and provincial levels, and at the district/city level, and the basins level as required. The inter-coordination body working relations at the national, provincial, district/city, and river basin levels shall be consultative and coordinative. This way, the openness principle laid down in the law is given substance, aimed at the involvement of society in policy-making processes in the area of WRM.

5.3. Public Consultation and Involvement.

Development of the WRM schemes should embrace the best participation of the communities and the business world includes cooperatives, state-owned enterprises, regional enterprises, and private sector enterprises. In line with the principles of democracy, the community will not only be given the role in the preparation of WRM policy, but also the role in the process of planning, construction, operation and maintenance, monitoring and supervision of the WRM. Involving society more in WRM was stated in the following articles, such as:

a. The preparation of a WRM plan on each river basin shall be done in coordination with the related agencies in their respective tasks and responsibilities, by getting the involvement of the stakeholders in water resources. The related agencies shall in their tasks and responsibilities openly publish the draft of WRM plan to the community. The community shall have the right to complain about the published WRM plans, in a particular period as applicable to the local conditions.
b. The construction activities of water resources infrastructures and facilities on land of another party shall only be done after proper settlement of compensation to the party with the right to the land, in accordance with the laws and regulations.
c. To ensure the attainment of WRM objectives, supervision activities shall be undertaken of all the processes and results of the implementation of the WRM in each river basin. The Government and the regional governments shall in their respective authorities and responsibilities conduct supervision by involving the role of the community. The role of the community in the supervision shall be done by informs and/or complaints to the authorities.

6. Water resources utilization.

The regulation regarding water resources utilization is the most extensive section of the new law. This is due to the fact that utilization comprises a broad range of activities, i.e.: supply, usage, development and exploitation of water resources.

The provision of water resources in each river basin shall be done in accordance with the usage arrangements of the water resources determined in the bid to serve the basic needs, environmental, sanitation, agriculture, energy, industry, mining,

transportation, forestry and biological diversity, sports, recreation and tourism, ecosystem, aesthetics, and other needs as provided in the laws and regulations. The provision of water resources shall be planned and decided as a part of the WRM plan in each river basin by the Government or the regional governments in accordance with their authorities.

Along with its social function, the economic function of water now also takes an important place in law. The utilization of water resources shall be done by giving priority to the social function by considering the principles of water users to pay for management service fees. The principle of the user pay for management service fees is that the beneficiary will jointly support the WRM, directly or indirectly. This provision does not imply to the water user for basic daily needs and people's agriculture.

The new act also reconfirms the importance of water's social function. The use of water (from the natural resources) by individual citizens for their daily necessities of life is free. No license is therefore required. All other forms of water use are subject to license, except of water use for people's irrigation within the existing irrigation system.

Water supply to serve the human basic needs shall be the top priority in the provision of water resources over all other needs. The second priority given to the people's irrigation within existing irrigation system. The order of priorities in the provision of water resources for the other uses of water shall be determined in each river basin by the Government or the respective regional governments in accordance with their authorities. If the determinations of the order of priorities in the provision of water resources produce adverse effects on the existing users of the water, the Government or the regional governments shall arrange for the compensation to the users.

Under an emergency condition, the Government and/or the regional government may regulate and determine the use of water resources for conservation, and fulfillment of the priorities in the use of water resources. Emergency here means a situation requiring emergency immediate actions, such as the use of water resources for conservation purposes include, for instance, flushing of water source in urban areas where pollution rate is high (contamination has occurred).

The exploitation of surface water resources covering entire a river basin (from the upstream through the downstream) **may only be done** by a state-owned enterprise or a regional enterprise engaged in water resources management. Individuals, or private enterprises may do the exploitation of water resources in a particular location as determined in the permit.

Water exploitation for other countries is not allowed, except for the supply of water for various needs in related river basin and observing the needs of the adjacent regions has been fulfilled. A water exploitation plan for other countries shall be prepared through a public consultation by the government within its authority. Water exploitation for other countries shall require a permit from The National Government based on a recommendation of the regional government in accordance with the laws and regulations.

7. Water resources conservation.

In the new law, water resources conservation is designed to maintain the sustainability of the supporting capacity, holding capacity and functions of the water resources. Water resources conservation shall be conducted through the activities of **protection of water resources, water preservation,** and **water quality management**

& water pollution control base on the WRM scheme determined for each river basin. Ruling on water resources conservation shall be a reference in spatial planning.

Water source protection and preservation are meant to protect and conserve water sources and their environment from any destruction or disturbances by natural forces, including draught and man-made activities. The protection and preservation of water sources shall be done in a vegetative and/or in civil-engineering treatments through social, economic and cultural approaches.

Water preservation is meant to maintain the existence and availability of water and water quality, in its functions and benefits. The water quality management shall be done by improving the quality of the water in the water resources. The water pollution control shall be done by preventing the entry of water pollutant into the water body. Every person or enterprise shall not do any activities that will cause the destruction of the water body, impediments in the water preservation activities and/or water pollution.

Article 33 and 34 are instructs the authorities responsible for water management to take suitable measures to prevent possible threats from water resources and their surroundings. Citizens are also obliged to participate in these efforts.

8. Planning.

In the new act, a distinction is made between two forms of planning: **water resources policy planning** base on the administrative boundary (the National, Provincial, and District), and **water resources development and management** planning base on the river basin boundary. The first one is more general and aimed at policy, and the second has more operative and technically.

It has been determined that provincial water resources policy should be based on national water resources policy. National water resources policy document is consequently a starting point for the regional policy. Applicable to all authorities is that they must determine a WRM plan for the river basins under their responsibility. This plan must be based on water resources policy at provincial and subsequently at national level. WRM planning shall be done to produce a plan that serves as a guide and direction in the activities of water conservation, water resources utilization, and control of water destructive power.

9. Management of irrigation systems.

Related to management of irrigation system, the new law states the following principles:

a. the authority and responsibility for the development and O&M of primary and secondary irrigation systems across provinces shall be within The National Government;
b. the authority and responsibility for the development and O&M of primary and secondary irrigation systems across districts/cities shall be within the provincial government;
c. the authority and responsibility for the development and O&M of primary and secondary irrigation systems in a single district/city shall be within the concerned district/city government;
d. the right and responsibility for the development and O&M of tertiary irrigation systems shall be with the water user associations;

e. the development and O&M of primary and secondary irrigation systems shall be arranged with participation of the community; and
f. the water user associations or other parties in accordance with their needs and abilities may do the development and O&M of primary and secondary irrigation systems.

10. Water resources information systems.

Water resources information systems have an appropriate place in this new law. One chapter is dedicated to regulate water resources information systems by giving obligation to the governments (national, provincial, and district/municipal) to foster them as a part of their responsibility in managing water resources at their jurisdiction. The information systems consist of the hydrological, hydro-meteorological, hydro-geological conditions, water resources policies, infrastructures, technologies, environment, and the socio-economic activities related to the water resources. The National Government and the regional governments may set up their technical implementation units to operate water resources information system.

The National Government and the regional governments as well as the WRM shall in their respective authorities provide water resources information for all parties interested in water resources.

11. Financing.

The financing of WRM shall be determined in accordance with the actual needs of WRM. The funding sources for each type of financing may come from:

a. the state budget;
b. private sector budget; and/or
c. revenues of WRM services.

The water resources users for basic daily needs and for people's agriculture shall not be charged WRM fee. The users of water resources other than for the purposes shall be charged the WRM fee. The amount of WRM fee for each type of water resources used shall be based on the considerations of the economic abilities of the users' groups and the volume of water resources use.

12. Concluding remarks.

Reforming WRM policies and strategies as stated in the new water resources law is an important way in achieving sustainable development of water resources in Indonesia. Sustainable development of water resources in Indonesia can only be fully realized through implementation new policies, strategies and systematic programs. It is necessary that the government and the community be understand on substantive of law and given a role in WRM in a consistent manner. Ruling on the implementation of WRM scheme shall be further determined in a government regulation. The program of disseminations of the new law are presenting to all stakeholder in the national and regional level, and substantive elaboration on following the government regulations should be enacted as soon as possible.

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WATER USE IN METRO MANILA AND METRO CEBU

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ABSTRACT

The Metro Manila is the main city and national capital region of the Philippines and the Metro Cebu lies at the center of the island province of Cebu in Region VII. The water systems of Metropolitan Waterworks and Sewerage System (MWSS) and Metro Cebu Water District (MWCD) provide the water supply of Metro Manila and Metro Cebu, respectively. These water systems have failed to provide an economically efficient, socially equitable, and environmentally sustainable development, distribution and use of water resources.

A. WATER SUPPLY SITUATION

1. Institutional and Legal Framework

The Metropolitan Waterworks and Sewerage System (MWSS), attached to the Department of Public Works and Highways, is responsible for providing domestic, municipal and industrial water supply in Metro Manila. MWSS has jurisdiction, supervision, and control over all waterworks and sewerage systems within Metro Manila and some cities/towns in nearby provinces of Rizal and Cavite. In August 1997, by virtue of Water Crisis Act of 1995, the operations of MWSS were privatized through two concession contracts; thus, its service area was divided into east and west zones. The two private concessionaires are the Manila Water Co., Inc (MWCI) for east zone and the Maynilad Water Services, Inc. (MWSI) for the west zone. MWSS now assumes the role of regulator.

Water supply to Metro Cebu area is the responsibility of Metro Cebu Water District (MCWD), established in 1974. The jurisdiction of MCWD covers the cities/towns of Cebu, Mandaue, Consolacion, Liloan, Compostela, Talisay and Cordova. MCWD was created and governed by P.D. 198, also known as the Provincial Water Utilities Act, provided for the creation of independent and locally controlled water districts that could own and operate water supply and distribution systems for domestic/municipal and industrial uses.

2. Service Coverage

In the greater Metro Manila area with about 12 million people in year 2000, the MWSS piped water connections reach about 8 million people or about 67 per cent of its population coverage. The MCWD, which provides piped water connection to the second

most populous urban area in the Philippines serves 450, 000 people or less than 40 per cent of the population of 1.2 million in its service area.

The remaining per cent of water consumers not served by MWSS and MCWD water systems were assumed to obtain water from privately owned sources.

3. Demand and Supply

The estimated water demand of Metro Manila area in year 2000 was 3,800 million liters per day (MLD) and projected to increase to 8,000 MLD by 2025. At present, the water supply capacity of MWSS water system is 4,000 MLD. The MWSS get its water from Angat Dam, which is a multi-purpose facility for water supply, power generation and irrigation. Angat Dam provides 97 per cent of Metro Manila's water supply. The construction of Umiray-Angat Transbasin Project augmented the water supply availability from the Dam. In order to cope up with the water demand of Metro Manila, MWSS formulated the "Development Plan for Future Water Supply sources for Metro Manila" that comprises interim and long-term water development projects. The interim water supply projects will increase the supply capacity by 800 MLD in 2007 and the long-term water supply projects will have additional water supply capacity of 4,900 MLD by 2024.

On the other hand, the estimated water demand of Metro Cebu area in year 2000 was 254 MLD and expected to reach 520 MLD by 2025. The existing water system of MCWD with water supply capacity of 130 MLD is not sufficient to meet the water demand of Metro Cebu area. Most of the sources of MCWD are dependent on groundwater. It has 92 production wells. In order to address the deficit in water supply, various water sources both groundwater and surface water have been studied. The proposed water supply development projects will increase the supply capacity of MCWD to 418 MLD by 2025.

Performance Assessment

The current supply by MWSS to Metro Manila's population is available on average for only 16 hours per day. An average of nearly 60 percent of the water produced by MWSS is non-revenue water, or water that is not billed or unaccounted-for due to illegal connections, leakage, and other reasons. Efforts of Manila Water Company to reduce non-revenue water in east zone of Metro Manila have shown improvement. However, despite various projects and programmes on reduction of NRW by Maynilad Water Services have largely failed and the level has remained high in the west zone of Metro Manila.

The Metro Cebu Water District supplies water at an average of 18 hours a day. Its rate of non-revenue water is also relatively high at 38 per cent of the water produced.

Industries generally obtain only a small proportion of their water demand from water systems of MWSS and MCWD and depend significantly on privately owned systems, for which the main sources are groundwater. As a consequence of the inadequate piped water

supply and weak regulation of groundwater abstraction, groundwater depletion has become a major problem, causing saline intrusion and land subsidence along coastal and certain inland areas. In Metro Manila , a 1990 estimate of groundwater abstraction of 970,000 cubic meters a day far exceeded the natural recharge rate of 533,000 cubic meters a day. In Metro Cebu, groundwater abstraction is estimated to be about 234,000 cubic meters a day, about 60 per cent more than the natural rate of recharge.

B. ACTIVITIES UNDERTAKEN FOR SUSTAINABLE WATER SUPPLY

1. Watershed Protection

   To protect the water sources as to quantity and quality, MWSS and MCWD are the forefront in the ecological and environmental issues. Other concerned organizations are coordinated in protecting water sources from contaminating, restricting the development of the watershed areas, and in reforestations. Information campaign was also launched to get the public involvement in the ecological and environmental concerns.

2. Water Conservation

   The MWSS and MCWD subdivided the service area into smaller, manageable hydraulic territories or blocks. Thus, it becomes easier to focus on the water supply and demand, to monitor and control system losses and easily disseminates water conservation awareness programmes. The activities on water conservation include: i) improving the systems' efficiency; ii) improving the metering efficiency and monitoring the unauthorized use of water; iii) encouraging the use of saving devices, application of clean technologies and recycling; and iv) conducting intensive public education programmes on water conservation.

C. ISSUES IN THE WATER SUPPLY SECTOR

The problem of widespread water shortages in Metro Manila and Metro Cebu areas, has become a central policy issue.

The problem is not one of the shortage of water per se but is due to supply-demand mismatches caused by inadequate infrastructure to capture and store abundant run-off in the rainy season for consumption in the dry season. The problem is compounded by weaknesses in water supply management and inefficient of water use. The major issues are:

1. Insufficient system capacity due to delay in developing new water sources. Various plans over the last several years to develop new sources have not been implemented due to lack of funds.

2. Competing demands from other water users that require increasing quantities of water during critical periods. The use of water available in the Angat Dam for water supply

during critical period is becoming a major issue due to the water rights of MWSS, which is lower than the other users of the Dam. Because MCWD is dependent on groundwater for most of its sources, there is competing use with the private extraction of groundwater.

3. Declining water resources due to degradation of watersheds, river pollution by untreated industrial waste and increasing salinity of groundwater.

4. Outdated and inefficient water distribution systems with high losses and low pressures.

5. Rapid population growth. The expansion of water systems of MWSS and MCWD has not kept pace with its population growth.

6. Institutional constraints caused by fragmented and weak development planning and regulatory functions. Aside from the inherent problems of government-operated utilities, the lack of a clear legal framework for effecting inter Local government Unit (LGU) water transfer has also caused the failure to operate the Compostela wells for Metro Cebu water supply.

7. Water pricing does not reflect its full economic cost. The urban water pricing policy has not recognized water as a scarce resource nor accounted for the pervasive externalities involved in the production and consumption of water.

D. RECOMMENDATIONS

Some of the above issues must be resolved through larger public investment in developing new water infrastructure, improved efficiency of service delivery and water use, high recovery of project costs and economic pricing of water. Institutional strengthening of water utilities and regulatory agencies, greater participation by beneficiaries in project planning and implementation, and increased private sector involvement in water supply services would encourage more efficient use of water.

The government has taken several initiatives in this regard, including the enactment of Executive Order no. 123 and 274, reorganizing NWRB and LWUA, respectively. On March 22, 2004, the National Water forum was conducted to address issues on managing the water resources effectively. While the Clean Water Act was enacted also.

In parallel with the above actions, water conservation policy should be pursued to sustain present and future water supply requirements. Water conservation should become a habit practice by everyone through the initiative of the Government and the private sector.

SYSTEMATIC REVIEW OF WATER MANAGEMENT DURING DROUGHT IN JAPAN

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The development of water resources by constructing dams and other facilities supports economic development in Japan. The principle focus of water resources development is on stabilizing river flow and meeting new water demands. To address the problems of drought, the Drought Conciliation system was implemented for the orderly allocation of water on a regional basis. This paper presents a review and comparison of the water conciliation procedures used in several regions during the 1994 drought to identify the strategy most suitable for local conditions or historical backgrounds of water policy. The practice during droughts in Japan is to institute conciliation procedures in accordance with the particular features of each river basin. The review provides a basis for comprehensive water management in Asia.

INTRODUCTION

Water use in Japan is characterized as agricultural use in paddy fields, quite similar to the styles of most Asian countries. A systematic review of water resource management is thus essential for the development of a comprehensive approach to water resource management with a view to its application in the Asian region. The population and property in Japan are concentrated in the alluvial plains, mostly below flood level, posing

a risk of potentially serious flood damage. However, many years of flood control efforts have reduced the total inundated area and made the alluvial plains available for residential and industrial use in addition to agricultural use. This paper presents a review of water resource development in Japan, mainly focusing on its history and the drought experienced in 1994. The review provides a basis for comprehensive water management in Asia.

HISTORY OF WATER RESOURCE DEVELOPMENT IN JAPAN

Efforts towards utilizing and taming the river have always been a matter of trial and error. Here, the history of water resource development in Japan is reviewed based on descriptions by the MOC [1]. Since long ago, the economy of Japan has been based on agriculture, producing rice as the staple food for the Japanese. The River Law was revised in 1997 to improve management.

Water resource development in Japan began with the construction of ponds or reservoirs to store water for agriculture as a precaution against droughts. There is a record of constructing reservoirs to store irrigation water on a large scale in all parts of Japan around the third century A.D. In the 1600s, Tokugawa Shogun constructed a 20-km canal, the first major public works for domestic water. At the end of the Second World War, in 1945, Japan embarked on efforts to restore its national land, but these endeavors were thwarted by a series of major natural disasters, such as large typhoons and earthquakes. Japan also experienced extreme hardship affecting the basic needs of clothing, food, and housing, and a serious shortage of electricity made it difficult to restore production activities. Encouraged by the impressive results of TVA in the U.S., the Japanese government started Comprehensive River Development Projects in 1950.

Japan made solid progress in the development of modern industry from 1955. This industrialization process led to a rapid increase in the demand for water. The Specified Multi-Purpose Dam Law in 1957 governed the execution of construction work on multi-purpose dams under the jurisdiction of the central government in the hands of the Minister of Construction who was also responsible for the maintenance and management of the structures. Since the 1960s, increased land use has required enormous development of water resources especially for households and industry. To meet these increased demands, the Water Resources Development Promotion Law and the Water Resources Development Public Corporation Law were enacted in 1961, paving the way to major comprehensive river development projects. The former law designated seven water systems as Water Resource Development Zones, which form the backbone of water resource development in the major regions of Japan. These water systems are the Tonegawa, Arakawa, Kisogawa, Toyokawa, Yodogawa, Yoshinogawa and Chikugogawa River basins. The Water Resources Development Public Corporation (Japan Water Agency as of October 2003) was established to construct new water resource development facilities and modify or improve existing facilities funded by government grants and subsidies as well as short- and long-term loans. Due to the demand for urban

water, including domestic and industrial water, the revision of the River Law in 1964 established integrated management, considering the balance between flood control and water use. The initial River Law in 1896 mainly focused on flood controls, without sophisticated or highly diversified water use. The 1964 revision newly applied the permit system authorizing the use of water and thereby exempting customary rights of the past.

The development of water resources by constructing dams and other facilities supported economic development in Japan. The principle focus of water resource development has been on stabilizing river flow and meeting new water demands. However, the high concentration of people and industry made successful achievement vulnerable and raised many risks. Achieving stable water supply accelerated the pace of concentration and created additional demand. Furthermore, the needs for water resources became more diversified, making it difficult to develop further water resources. The revision of the River Law in 1997 added 'maintenance and preservation of river environment' to the existing purposes of flood control and water use. In order to reflect people's opinions in river improvement plans, river administrators involved the public in the planning process by providing comprehensible information and adopting their opinions. Attempts have also been made to address the problems of drought on a regional basis through implementation of the Drought Conciliation system for the orderly allocation of water during droughts (MLIT [2]).

WATER RIGHTS AND DROUGHT CONCILIATION

The River Law of 1964 established a significant body of experience in the management of water resources under a water rights system with deep historical roots. The River Law, first established in 1896, introduced a unified and consistent system of water management for all forms of water use under official river administrators. This law authorizes water rights on the basis of assessment as to whether public interest is served and whether or not business activities related to the water use are relevant. The 1964 revision of the River Law established a rule of conciliation during droughts as one of the methods for management of water use in an emergency. The river administrators would be able to arbitrate in disputes when the water users were unable to reach an agreement in water conciliation (Table 1). The present water rights system is a combination of traditional and comprehensive management. In order to cope with limited resources, the water of Japan's rivers has been dominated by a large number of users with vested water rights. The agricultural interests with their customary right of water use accounted for almost the entire amount of water (Murase [3]).

The underlying principle of drought conciliation is that the water users should first seek conciliation in the spirit of fair give-and-take among themselves and refer to the river administrator for intervention only when their attempts at mutual conciliation fail. Section 2 of this article clearly describes this principle, which was adopted for two main reasons: (1) The practice of conciliation among water users is anchored in tradition as water users historically resorted to mutual conciliation in the various river basins; (2)

Drought differs from flood disasters in that it gives the water users sufficient time to reach a conciliation on water use (River Bureau, MOC [4]). With respect to the principle above, there is a pressing need for measures to ensure smoother coordination of water use during droughts. The revision of the River Law in 1997 established a mechanism for facilitating conciliation procedures among water users during extreme droughts.

Table 1. The River Law, Article 53 (Water Use Conciliation During Droughts)

For a case in which an *unusual drought* makes it difficult to adequately use the river water for the permitted utilization purposes or when such a situation is expected, the persons who have obtained permission to use the water (hereinafter, permitted water uses) shall make efforts to consult with one another. In this case, *river administrators* shall exert themselves to provide necessary information for water use conciliation to achieve smooth consultations.
2 In conducting consultations according to the preceding paragraph, permitted water users shall respect the uses of the others.
3 For a case in which no agreement is reached through consultations according to Paragraph 1, the *river administrator* may, when it is requested by the permitted water users or when he deems it would seriously harm the public benefit unless urgent coordination of water uses is effected, conduct the necessary intermediation for coordination of water uses.

Note: The "river administrators" refers to the Minister of Land, Infrastructure and Transport, or local governors. Under the River Law, official river administrators own all rivers for comprehensive river management. The national government (Ministry of Land, Infrastructure and Transport, MLIT) manages the major parts of the 109 river systems. Local governments manage the rest.

DROUGHT EXPERIENCE IN 1994

Despite the law's basic spirit of fair give-and-take among water users, there are regional characteristics in the style of drought conciliation, presumably due to the different historical backgrounds of each river. Because the summer of 1994 had little rain, causing drought conditions on a nationwide scale (Figure 1), it is possible to utilize that experience to analyze the relationships between water management and regional backgrounds. The drought conciliation procedures differed according to the particular features of local conditions or historical backgrounds. Here, the characteristics of three regions are discussed: Tonegawa, Kisogawa and Yoshinogawa based on River Bureau, MOC [4]. The locations of these regions are shown in Figure 1.

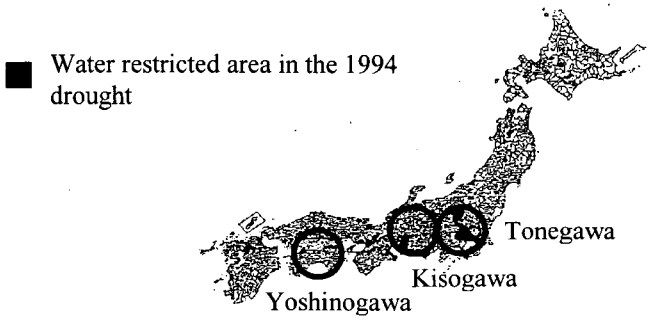

Figure 1. Restricted water-intake areas and water supply in the 1994 drought.

Tonegawa River system

The Drought Conciliation Council for Tonegawa opened its session to commence conciliation negotiations when the total water volume stored in the upper reaches of the Tonegawa had fallen to 54% of the normal volume during an irrigation period. The particular feature is that the rate of restricted water intake is equal for domestic water, industrial water and agricultural water, and that water use includes provisional water rights, which essentially do not entitle the holder to draw off water from the river during droughts (Table 2(1)). Although the domestic water supply was particularly curtailed, it was fortunately possible to avoid serious impact on water users.

Kisogawa River system

Domestic water was given priority over agricultural and industrial water, and intake restriction was at a rate of roughly half of these water uses (Table 2(2)). For instance, the maximum rate of restricted water intake was 35% for domestic water supply and 65% for industrial and for agricultural water. However, some locations were forced to remain cut off from domestic water supply for 19 hours a day, which had a serious impact. The industrial water restrictions reduced production output and forced companies to invest in other water resources through their own efforts. The farmers who obtained new water rights experienced the increased burden of meeting additional costs for rotating irrigation. The restriction on agriculture also had a serious effect on crops. After all, the decision was reached to impose a 60% rate of water intake restriction on the farmers who possessed vested water rights, effective for 10 days, at a time when the maximum water intake restriction rate was in force.

Yoshinogawa River system

During the drought of 1994, the river administrator for Yoshinogawa convened conciliation sessions. On June 20, the Council decided to start water intake restriction when the stored water volume of the main dam decreased to around 50% of its total capacity. The rate of restricted water intake for the first stage called for a uniform 30% restriction on domestic water, industrial and agricultural water of which water rights were newly associated with the upper dam, while no restriction was forced on users with vested water rights. The third restriction stage increased this rate to 75% for the same water rights and the allocation of water among the domestic water supply, industrial and agricultural water users was left to the discretion of the prefectures concerned. At the ultimate fourth restriction stage, water volume stored for water supply at the upper dam was used up, and it was agreed to use the water stored exclusively for power generation to replenish only domestic water. On the occasion of this arrangement, the Governor of Kagawa Prefecture had to make a formal request to the Governor of Tokushima Prefecture, who had the priority water rights. With regard to the priority water rights for Tokushima, restriction of water intake was not imposed until the third restriction stage. At the fourth restriction stage, however, the intake of water for the priority water rights was limited to the natural flow without replenishment from the dam (Table 2(3)).

Table 2(1). Drought conciliation in the Tonegawa River in the 1994 Drought

	Restriction rate		
	Agricultural	Industrial	Domestic
July 13, 1994 2nd session	0%	0%	0%
July 19, 1994 3rd session	10%	10%	10%
July 28, 1994 4th session	20%	20%	20%
August 15, 1994 5th session	30%	30%	30%
August 29, 1994 6th session	20%	20%	20%
September 19, 1994 (end)	-	-	-

Table 2(2). Drought conciliation in the Kisogawa River in the 1994 Drought

Agr: agricultural water use Ind: industrial water use Do: domestic water use	Restriction rate (%)							
	Makio Dam			Akigawa Dam		Iwaya Dam		
	Agr	Ind	Do	Ind	Do	Agr	Ind	Do
June 1, 1994	5	10	5	-	-	-	-	-
June 7, 1994	15	20	10	-	-	-	-	-
June 9, 1994						15	15	10
June 11, 1994	25	25	15	-	-			
June 13, 1994						20	20	15
June 14, 1994	35	35	20	-	-			
June 15, 1994						25	25	17
June 17,1994	40	40	22	-	-	30	30	20
June 25, 1994	25	25	15	-	-			
July 5, 1994	35	35	20	-	-			
July 7, 1994						35	35	21
July 9, 1994						50	50	25
July 11, 1994	45	40	22	20	11			
July 14, 1994	55	55	30	55	30	55	55	30
August 22, 1994	65	65	35	65	35	65	65	35
September 1, 1994	65	65	33	65	33	65	65	33
October 1, 1994	40	40	20	40	20	40	40	20
October 17, 1994	20	20	10	20	10	20	20	20
November 14, 1994 (end)	-	-	-	-	-	-	-	-

Table 2(3). Drought conciliation in the Yoshinogawa River in the 1994 Drought

	Restriction rate		
	Kagawa	Tokushima	
		New rights	Priority rights
June 20, 1994	30%	30%	0%
July 4, 1994	60%	60%	0%
July 12, 1994	75%	75%	0%
July 24, 1994	0%	0%	0%
July 27, 1994	60%	60%	0%
August 10, 1994	0%	0%	0%
	** continued after August 31, 1994**		
November 14, 1994 (end)	-	-	-

Note: The table describes the maximum rate of water intake restriction (River Bureau, MOC [4]).

DEMARCATION OF THE TYPES OF DROUGHT CONCILIATION

Without detriment to the spirit of reciprocity adopted in the River law, there are certain differences in the specific methods of conciliation applied, as described below.

a) Tonegawa: River basins in which reservoirs are operated on an integrated basis and the water rights of each holder are treated nearly equally even in droughts.
b) Kisogawa: River basins in which preferential treatment is given to priority water rights, such as agricultural water rights, which have been firmly established in the region from long ago.
c) Yoshinogawa: River basins in which preferential treatment is given to the original river basin (here, Tokushima Prefecture) on the basis of a basic inter-regional consensus reached at the time of development of water resources diverting water to areas outside the river basin (here, Kagawa Prefecture).

The differences have arisen from the balance between demand increase and water supply development in addition to historical and geographical relationships. Because of rapid concentration of the Tokyo metropolis area, water resource development has not been able to catch up with the increase in water demand. One fourth of domestic water relies on provisional water rights in Tonegawa and Arakawa (MLIT [5]). The target of water resource development has been set to 1/5 (drought statistically occurs once in five years), lower than the nationwide average of 1/10. In addition, the system of water use has become quite complicated because many water users take in their water at various locations. As a result, water resource has developed on a total-storage basis while most other areas have developed in addition to the baseline achieved or supplied by existing dams (Figure 2). This style of development looks simple and the drought risk is allocated equally to water users, but lacks fairness in accountability in terms of investment for water because water users with provisional water rights are treated the same as those who invested in water facilities in advance. This means that the impact of droughts is the same, regardless of whether investment in water is made or not. This may result in opposition to investment in dams, even in places where most of the water supply is covered by provisional water rights.

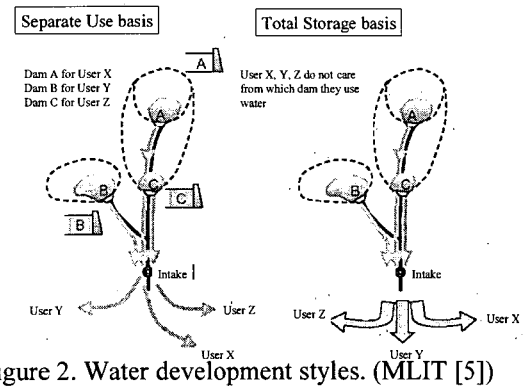

Figure 2. Water development styles. (MLIT [5])

CONCLUSION

Since the 1960s, increased land use has called for enormous development of water resources especially for domestic use and industry. The considerable increase in water use required a systematic framework for flood control and water use. The River Law of 1964 established a significant body of experience in the management of water resources under a water rights system deeply rooted in history. Water resources development has focused on stabilizing river flow and meeting new water demands; however, the success in achieving stable water supply accelerated the pace of concentration and created new demand. Attempts have also been made to address the regional drought problems through the implementation of the Drought Conciliation system for the orderly allocation of water during droughts. A review of the water conciliation procedures in several regions during the 1994 drought shows that drought arbitration procedures have strong regional characteristics, as observed in Tonegawa, Kisogawa and Yoshinogawa. Without detriment to the spirit of reciprocity adopted in the River Law, there are certain differences in the conciliation process arising from the balance between demand increase and water supply development as well as historical and geographical relationships. While laws and regulations provide some principles and directions for water policies, they cannot be applied successfully without considering local conditions or historical backgrounds. The Tonegawa example shows that the delay in water resource development urged equal water allocation despite the vested water rights system. Therefore, the best strategy can only be established on a basis suitable to the region with consideration of principles and directions described in laws and regulations.

REMARKS

This review does not reflect the official views or policies of the MLIT, Japan. This study was supported partly by Core Research for Evolution Science and Technology (CREST) of the Japan Science and Technology Agency (JST).

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[1] MOC (Ministry of Construction), "*Nihon no Kasen* (Rivers in Japan)", Construction Publication Association, Tokyo, Japan, (1995), pp 238-256. (in Japanese)
[2] MLIT (Ministry of Land, Infrastructure and Transport), "Rivers in Japan", Infrastructure Development Institute and Japan River Association, (2001), 65pp.
[3] Murase, M., "A Review of Water Rights in Japan", APHW, (2003), pp 1127-1132
[4] River Bureau, MOC, "*Drought Conciliation and Water Rights*", Infrastructure Development Institute-Japan, (1997), pp 121-156.
[5] MLIT, Paper for Water Management Committee #2, http://www.mlit.go.jp/river/shinngikai/management/, (2003). (in Japanese)

付録
ANNEX

Huai River Flood in 2003 and Its Forecasting, Prediction and Dispatching

Liu Jinping (China)

Second Asia Pacific Hydrology and Water Resources Conference
5-8 July 2004, Singapore

Huai River Flood in 2003 and Its Forecasting, Prediction and Dispatching

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Bureau of Hydrology
Ministry of Water Resources, China
E-mail: JPLiu@MWR.GOV.CN

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Second Asia Pacific Hydrology and Water Resources Conference
5-8 July 2004, Singapore

Contents

Description to Huai River Basin
Huai River Flood in 2003
Flood Forecasts and Prediction
Flood Dispatching
Conclusions

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1. Description to Huai River Basin

Huai River Basin is one of the 7 main rivers in China.

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3

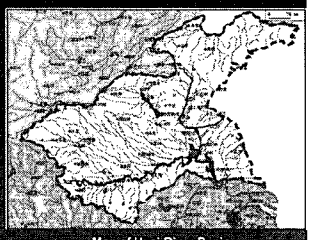
1. Description to Huai River Basin

270,000 km²

1000 km

100 millions

910 mm



Map of Huai River Basin

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1. Description to Huai River Basin

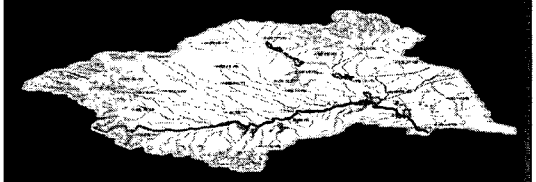

Table 1 Huai River Hydrographic Characteristics

Item	Upper course	Middle course	Lower course	Total
Area of basin (km^2)	31,000	127,000	31,000	189,000
Length of river (km)	360	490	150	1,000
Main gradient	0.5‰	0.133‰	0.04‰	0.2‰

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1. Description to Huai River Basin

Reservoirs :
Storage capacity :

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1. Description to Huai River Basin

Large reservoirs:
Storage capacity:
Flood control storage:

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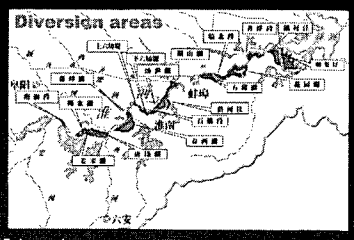
1. Description to Huai River Basin



Diversion areas:
Flow division:

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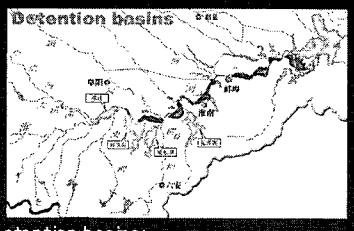
1. Description to Huai River Basin

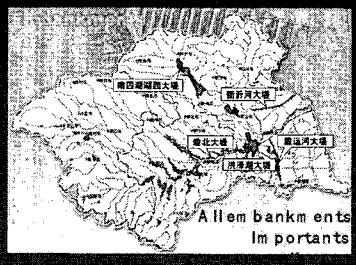


Detention basins:

4 larges:

9

1. Description to Huai River Basin



Allem bankments
Importants

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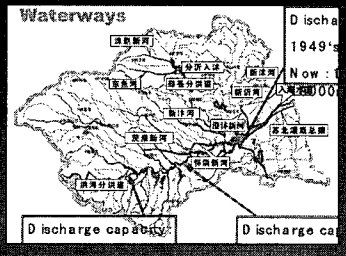
1. Description to Huai River Basin



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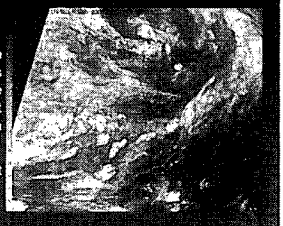
2. Huai River Flood in 2003

In the summer of 2003:

the subtropical anticyclone of the Northwest Pacific was much stronger than the normal and controlled most area of northern China incessantly.

the southwest warm and wet current was prevailing.



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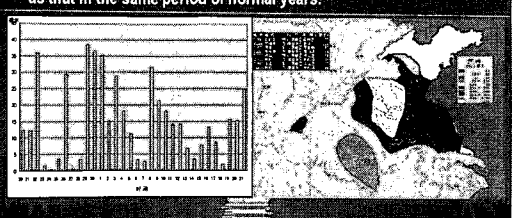
2. Huai River Flood in 2003

Suffering from the abnormal climate, Huai River basin occurred heavy rainfall from June 20 to July 21 in 2003.

The MAP amounts to 487mm which is more than twice as much as that in the same period of normal years.



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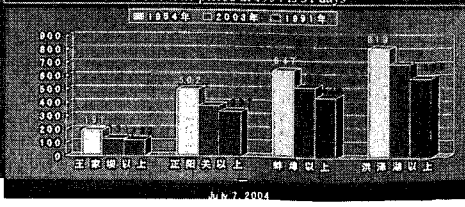
2. Huai River Flood in 2003

Table 2 Precipitation in Huai River Basin in 1954, 1991 and 2003

Year / Item	In 2003 (a)	In 1991 (b)	In 1954 (c)	Comparison (a) and (b)	Comparison (a) and (c)
Max. 30-day-prec. (mm)	465	389	516	+20%	-10%
Water Volume on the Basin(10^8m^3)	898	739	983		

Note: The period in 1954 is 31 days



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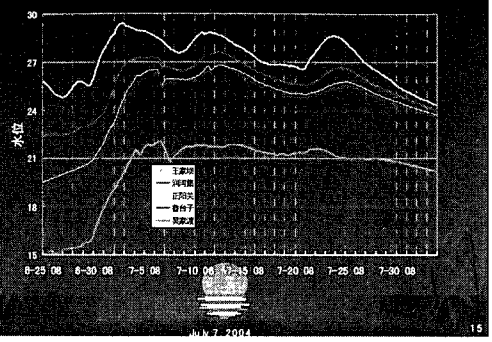
2. Huai River Flood in 2003



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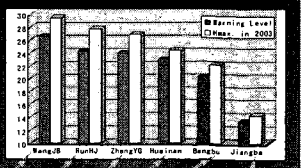
2. Huai River Flood in 2003

The water level of middle stream exceeded the by 1.37~3.36m.



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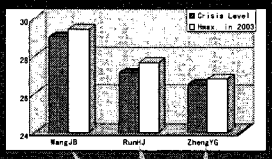
2. Huai River Flood in 2003



The water level of some reaches in middle stream exceeded the by 0.30~0.56m.

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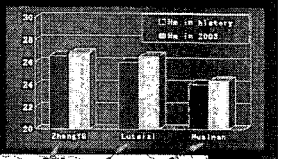
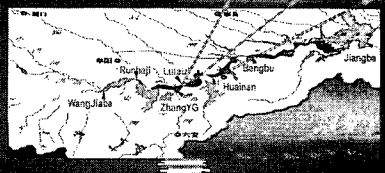
2. Huai River Flood in 2003

The water level of some reaches in middle stream of main river exceeded the by 0.25~0.51 meters.





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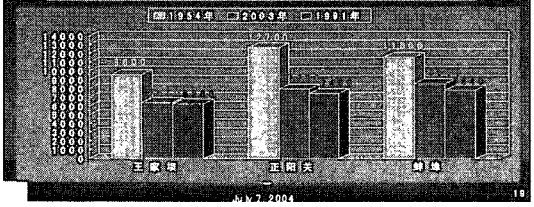
2. Huai River Flood in 2003

Table 3 Max. Water Level and Discharge in large flood years

Year	Wangjiaba		Zhengvangguan		Bengbu		Jiangba
	H (m)	Q(m³/s)	Hl(m)	Q(m³/s)	H (m)	Q(m³/s)	H(m)
	29.42	6420	26.80	7980	22.05	8580	14.37
1991	29.56	6280	26.52	7480	21.98	7840	14.08
1954	29.59	9600	26.55	12700	22.18	11600	15.23



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2. Huai River Flood in 2003

Table The return period of flood in 1954, 1991 and 2003

Station / Period / Year	Wangjiaba (outlet of upstream)	Zhengvangguan (Middle reach)	Zhongdu (outlet of Hongze)
1954	20	50	50
1991	<10	15	20
2003	10	20	30

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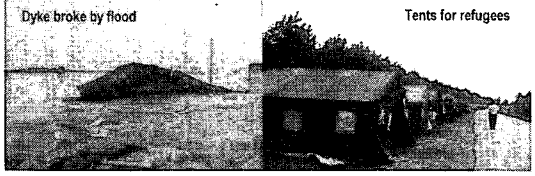
2. Huai River Flood in 2003

- Affected population:
- Inundated farmland:
- Total direct losses :



Dyke broke by flood

Tents for refugees

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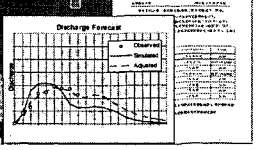
3. Flood Forecasts and Prediction

During the 20 days flood period, BOH issued flood forecasting and prediction about 350 station-times.



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3. Flood Forecasts and Prediction

Three results :

(1) Forecasting continually to the whole river system combining with QPF to increase lead-time as soon as possible for early warning.

(2) Forecasting aiming at the needs of flood control, water dispatching and water projects operation .

(3)Forecasting for flood disaster rehabilitation .

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3. Flood Forecasts and Prediction

(1)Forecasting continually to the whole river system combining with QPF to increase lead-time for early warning.

❖make the best of Quantitive Precipitation Prediction (QPF) from department of meteorology to produce daily stream flood prediction up to in advance for decision making of flood disaster preparedness including dweller evacuation from flood prone area and material redeploying for flood defense.

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3. Flood Forecasts and Prediction

Table Flood Predictions combining with QPF

Flood No.	Station	I. T. m d h	Rainfall Prediction	Rainfall Observed	Error	Flood Predicted P. T.	Flood Predicted P. L.	Flood Predicted L.T.	Flood Observed P. T.	Flood Observed P. L.
1	WangJB	6 30 14	115mm(3d)	101mm	+13%	7 03 20	29.20	3d	7 03 04	29.41
	Runheji	7 02 13	100mm(3d)	67mm	+50%	7 07 02	27.50	5d	7 06 02	27.32
	ZhengYG	6 30 14	155mm(3d)	76mm	+103%	7 06 02	26.90	6d	7 06 15	26.55
	Wujiadu	7 04 15	145mm(4d)	57mm	+154%	7 10 08	22.60	6d	7 06 22	22.05
2	Waugjiaba	7 06 15	96mm(4d)	55mm	+74%	7 11 20	28.80	5d	7 11 2	28.87
	Runheji	7 10 20	25mm(1d)	21mm	-19%	7 13	27.70	3d	7 11 17	28.65
	ZhengYG	7 10 15	30mm(1d)	24mm	+25%	7 13	26.80	3d	7 12 19	26.90
	Wujiadu	7 10 20	45mm(1d)	24mm	+87%	7 15	22.30	5d	7 14 01	21.85
	Hongzehu	7 10 20	20mm(1d)	16mm	+25%	7 15	14.50	4d	7 14 16	14.37

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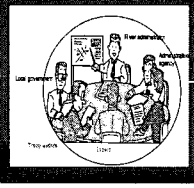
3. Flood Forecasts and Prediction

(2) Forecasting aiming at the needs of flood control,water dispatching and water projects operation.

Based upon real-time information of rainfall, river stream flow and water projects produced continual flood forecasting to the whole river system from upstream to downstream up to in advance for flood disaster prevention including flood water dispatching, water projects operation and flood fighting.



Decision-making

Flood warning issuing;
Dweller evacuation;
Material redeploying;
Flood fighting forces preparedness;
.....

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3. Flood Forecasts and Prediction

Table The list of some results of Forecasts

Flood No.	Station	I.T. m d h	Forecasted P.T.	Forecasted P.L.	L.T.	Action on water projects	Observed P.T.	Observed P.L.
1	WangJB	7 02 14	7 03 12	29.55	1d	Operarte Mengwa Detention area	7 03 04	29.41
	Runheji	7 04 08	7 04 12	27.30	4h	Operarte Cihuaixinhe Waterway and TangDH detention area	7 06 02	27.32
	ZhengYG	7 05 08	7 07 08	26.70	1d		7 06 15	26.55
	Wujiadu	7 04 15	7 07	22.30	3d	Operarte taihongxin Waterway	7 05 22	22.05
	Hongza Lake	7 09 08	7 14 08	14.40	5d	Operarte Ruhai Waterway	7 14 15	14.37
2	Wangjiaba	7 10 15	7 11	28.80	1d		7 11 2	28.87
	Runheji	7 11 08	7 12	27.80	1d	Operate Mengwa, ChengDH, Qiujiahu detention areas and XiangHD Reservoirs	7 11 17	28.65
	ZhengYG	7 11 08	7 13	26.90	2d		7 12 19	26.80
		7 12 08	7 13	26.78	1d			
	Runheji	7 13 19	7 14 20	<27.18	1d	Close Mengwa, Changdonghu detention areas	7 14 14	27.08
	ZhengYG	7 13 19	7 14 08	<26.58	1d		7 14 12	26.49
	Wujiadu	7 10 15	7 15	22.10	5d	Operarte Huaihengxinhe waterway	7 14 01	21.85
	Hongza Lake	7 10 20	7 14	14.40	4d	Operate Ruhai waterway	7 14 16	14.37
3	Wangjiaba	7 21 20	7 23 23	28.60			7 24 05	28.54

Note: I.T.—Issue Time; P.T.—Peak Time; P.L.—Peak Level; L.T.—Lead Time.

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3. Flood Forecasts and Prediction

(3) Forecasting for flood disaster rehabilitation.

❖In order to meet the demands of promoting what is beneficial and abolishing what is harmful, hydrologists provided the recession prediction up to in advance in the later period of Huai river flood.

Flood disaster rehabilitation including:
drainage from inundated area,
flood-water utilization,
reconstruction of water projects,
dwellers allocation and
etc.

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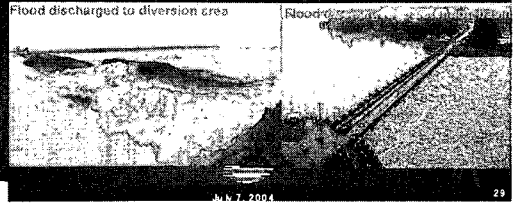
4. Flood Dispatching

The new idea, namely from man passively conquer nature to that man positively steer nature has been put into full operation in whole period of flood in 2003.

The main , and were operated on man's own initiative, the maximum flood control benefit brought into play.



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4. Flood Dispatching

During 2003 Huai river flood, 5 main reservoirs played remarkable role in storing floodwater and reducing flood peak. Total about 2 billion m^3 floodwater was stored.

Name	Max. water level (m)	Max. Storage volume (10^8m^3)	Time (m.d.h)	Max. in flow Q (m^3/s)	Max. in flow Time (m.d.h)	Max. out flow Q (m^3/s)	Max. out flow Time (m.d.h)	Reducing ratio (%)
Xuyahu	54.20	4.46	7.05.07	2090	7.02.02	844	7.08.06	59.6
LianYSH	109.31	6.21	7.11.22	1810	7.10.11	667	7.10.17	63.1
Meishan	131.31	15.8	7.11.16	7400	7.10.12	975	7.11.16	86.8
XiangHD	129.11	14.8	7.12.13	5810	7.10.10	884	7.10.22	84.8
Fuziling	119.01	2.7	7.10.19	2890	7.10.15	1840	7.10.19	37.1

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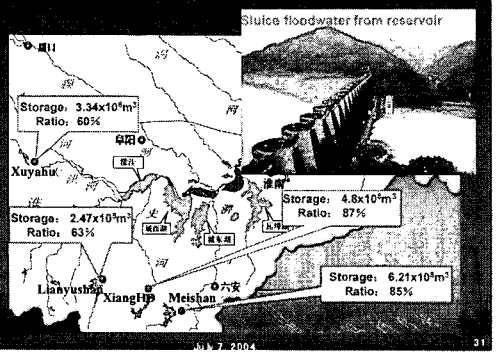
4. Flood Dispatching

Sluice floodwater from reservoir



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4. Flood Dispatching

During the 2003 Huai river flood, totally there were 2 detention basins and 7 diversion areas to be put into use for flood detention.

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4. Flood Dispatching

The total retarded water volume was about $28 \times 10^8 m^3$.

Name	Control station name	Flood No. 1 Oprtn Time	Flood No. 1 Water Volume	Flood No. 2 Oprtn Time	Flood No. 2 Water Volume	Flood No. 3 Oprtn Time	Flood No. 3 Water Volume
		m d h	$10^8 m^3$	m d h	$10^8 m^3$	m d h	$10^8 m^3$
Mengwa	WangJB	7.03.01	2.03				
Chengdongjin	DongHZH			7.11.14	3.00		
Qiujiahu	Wangji			7.11.17	2.77	7.24.20	0.39
Tangduohu	ZhengYG	7.06.15	4.80	7.12.22	0.84	7.25.10	0.62
Up Linfangti Down	Fengtai	7.06.16	1.78	7.13.02	0.00	7.25.16	0.15
Shiyaoduan			1.23		0.24		0.07
Luohewa	Huainan	7.06.21	1.80	7.13.22	0.14	7.23.00	0.1
Jishanhu					4.09		0.16

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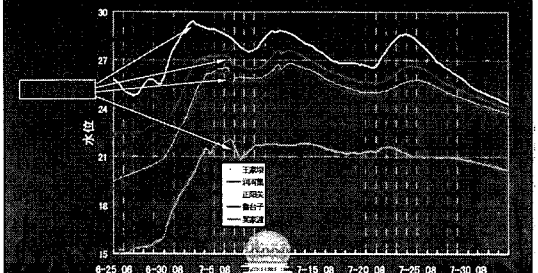
4. Flood Dispatching

The operation of detention basins played very important role to reduce the water level of middle reach of main river.



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4. Flood Dispatching

Station	First flood Peak level	First flood Dropped	Second flood Peak level	Second flood Dropped
WangJB	29.42m	0.36m	28.87m	0.13m
Runheji	27.32m	0.58m	27.66m	0.26m
ZhengYG	26.55m	1.13m	26.80m	0.32m
Lutaizi	26.31m	0.97m	26.49m	0.24m
Huainan	24.37m	1.25m	24.18m	0.07m
Wujiedu	22.05m	1.22m	21.85m	

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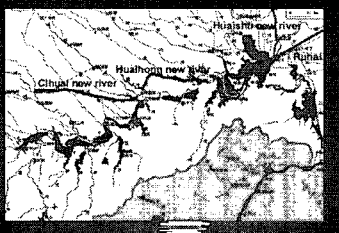
4. Flood Dispatching

During the 2003 Huai river flood, some important man-made waterways were put into use for floodwater diversion and played a key role for flood control.



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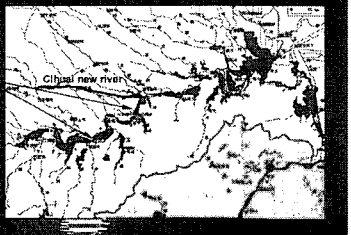
4. Flood Dispatching

that links Ying river and the down reach of middle stream of Huai river. It was operated 4 times and diverted $4.58 \times 10^8 m^3$ of floodwater.

The water level of reach from Zhengyangguan to Huainan was decreased about 0.15m.



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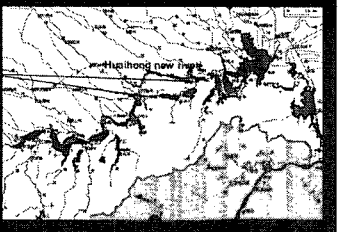
4. Flood Dispatching

that links the down reach of middle stream of Huai river and Hongze Lake. It was operated 3 times and diverted $16.7 \times 10^8 m^3$ of floodwater.

The water level from Bangbu to Xiaoliuxiang was played down about 0.5m.



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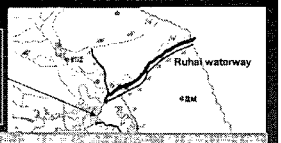
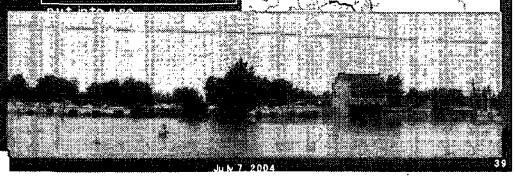
4. Flood Dispatching

that conducts water from Hongze Lake to Yellow Sea. The gate was opened on July 4 and closed on August 6. It discharged $44x10^8m^3$ of water from Hongze Lake and lowered water level 0.4m.

The water level of Hongze Lake would be 14.77m instead of 14.37m if Ruhai waterway could not be





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4. Flood Dispatching

Table Comparison of Flood Disaster in 1991 and 2003

Year	Inundated farmland (million hm^2)	Affected people (million)	Died people	Ruin house (million)	Total losses (billion Yuan)
2003	3.85	37.30	29	0.77	28.6
1991	5.52	54.23	572	1.96	33.9
1954	4.31	No data	1930	1.98	No data
1990's	2.07	No data	-	0.35	10.3

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5. Conclusions

Real-time flood forecasts and prediction must be closely integrated with the actual demands of flood disaster prevention, reduction and mitigation so that the real-time flood forecasting and prediction can play more key effect in the supporting of flood control decision-making.

A new conception, i.e. from man conquer flood to that man should harmoniously co-exist with flood, from the practice of preventing water from harming man to that of paying special attention to effectively manage water, is understood and receipted by people day by day.

Scientific regulation of flood added with effective administration of government is the key to successful control of flood in 2003.

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Second Asia Pacific Hydrology and Water Resources Conference
5-8 July 2004, Singapore

Thanks!

LIU Jinping
Bureau of Hydrology
Ministry of Water Resources, China
E-mail: JPLiu@MWR.GOV.CN

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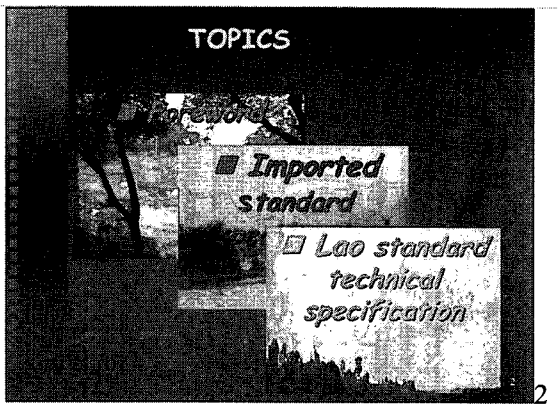
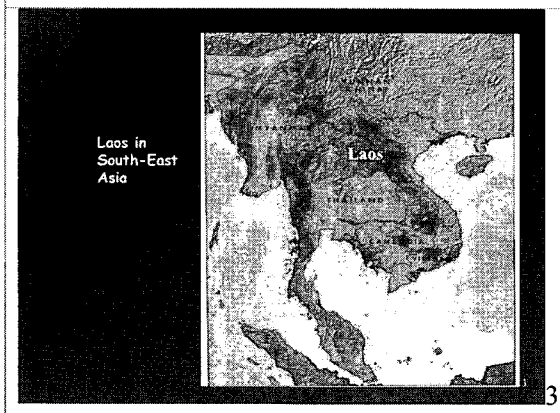
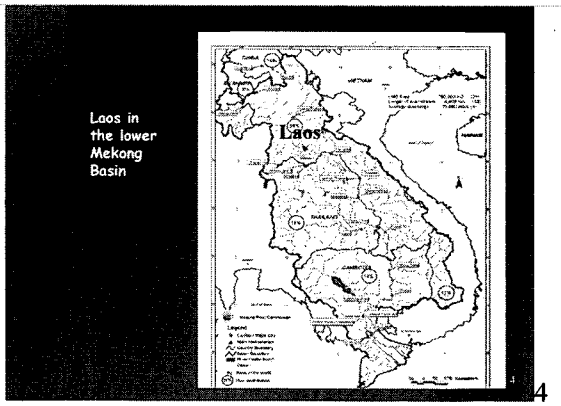
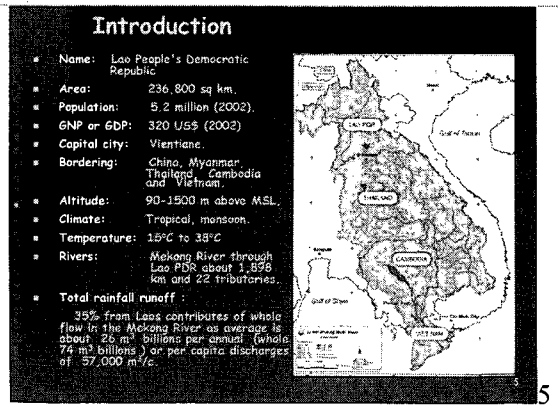
NATIONAL STANDARDS TECHNICAL SPECIFICATION FOR RIVER WORKS IN LAO PDR

Bounphet Phommachanh (Lao PDR)



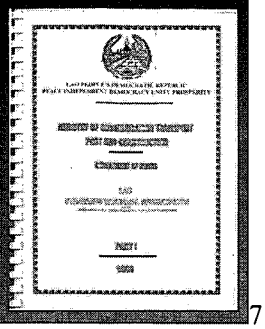






WE HAVE LAO STANDARD TECHNICAL SPECIFICATION FOR ROAD, WHAT IS REQUIRED IS A NSTS FOR RIVER WORKS

DIVISION 0: General requirement
DIVISION 1: General provision
DIVISION 2: Earth works
DIVISION 3: Pavement structure
DIVISION 4: Concrete structure
DIVISION 5: Drainage, protection and strengthening work
DIVISION 9: Road appurtenances, special and miscellaneous work



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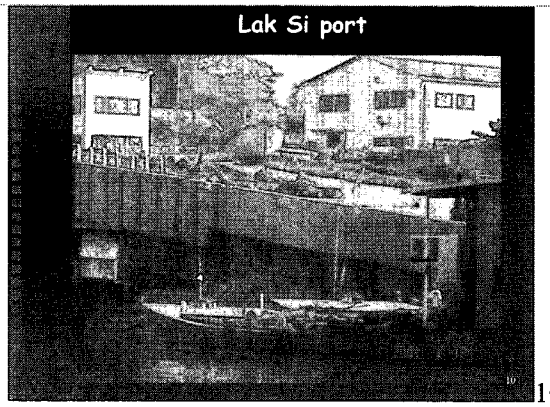

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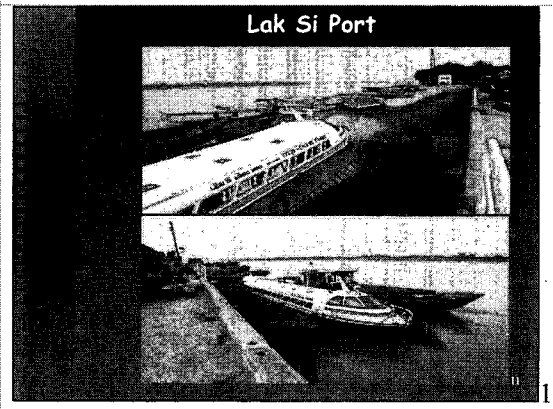

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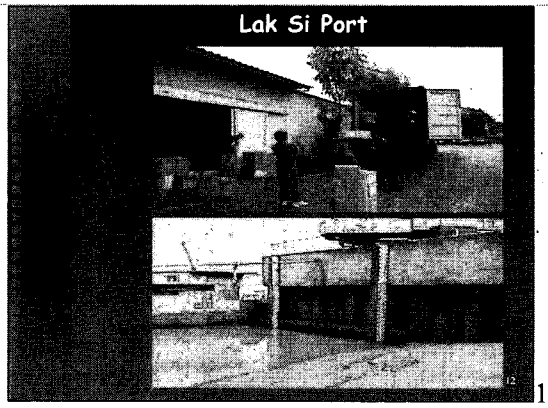

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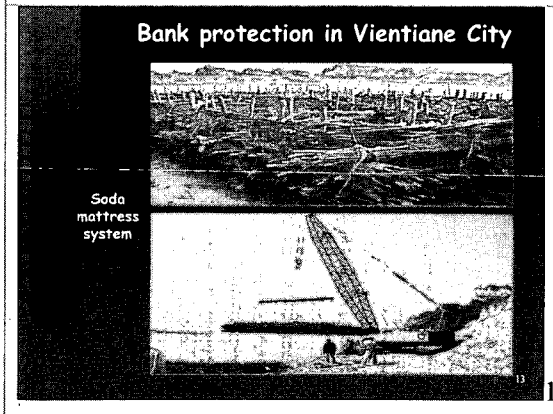

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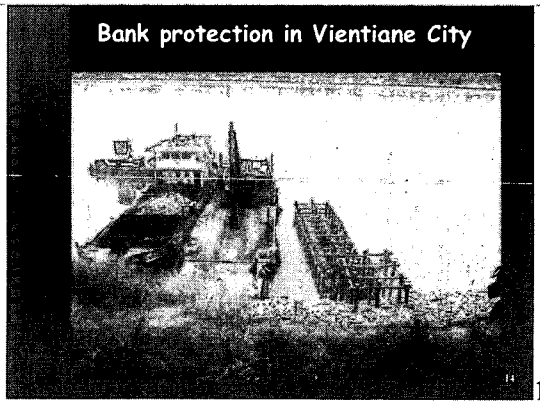

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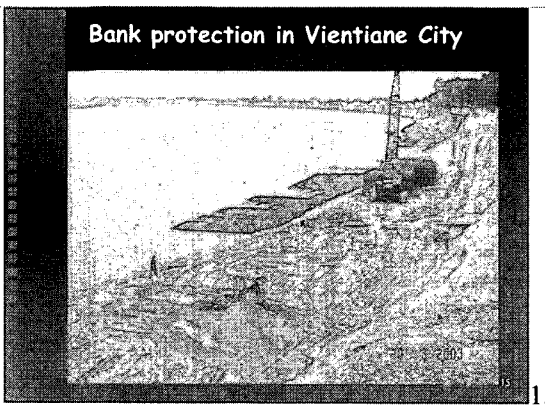

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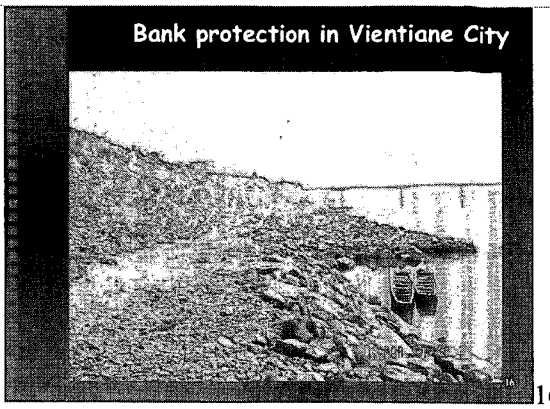

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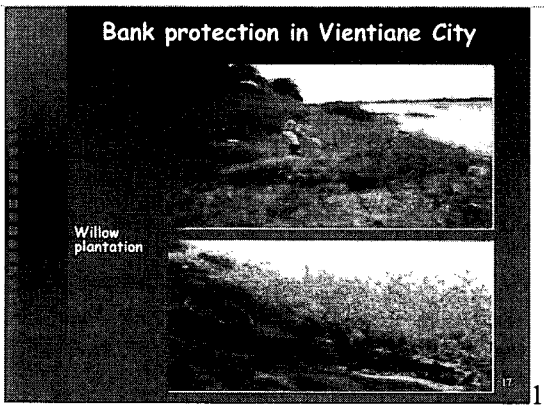

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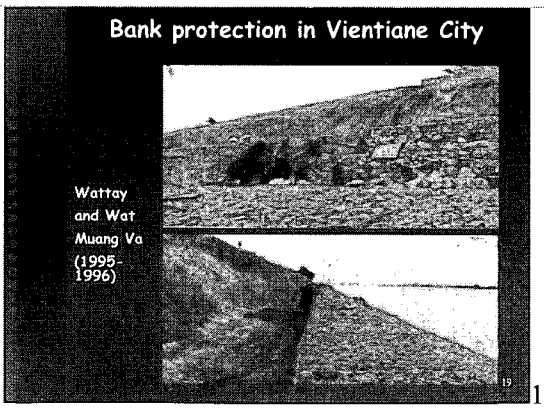

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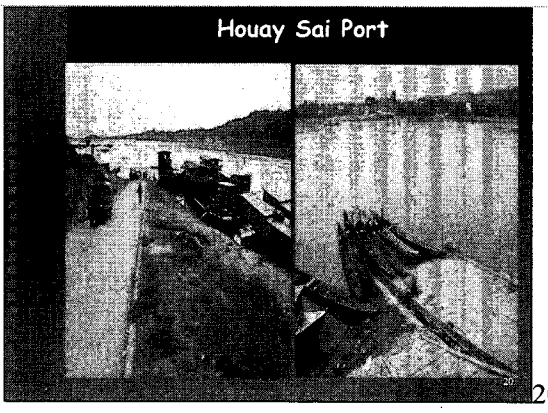

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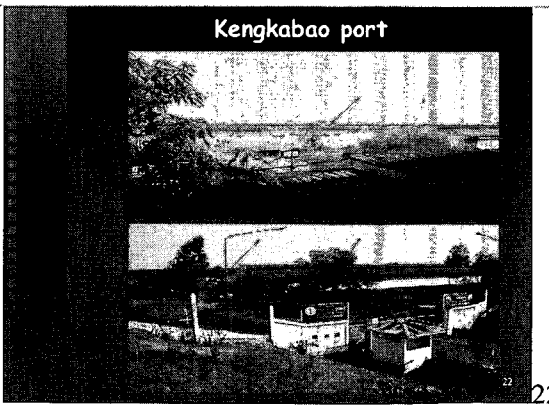

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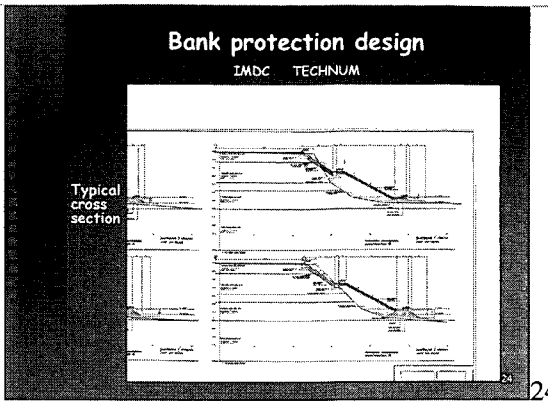

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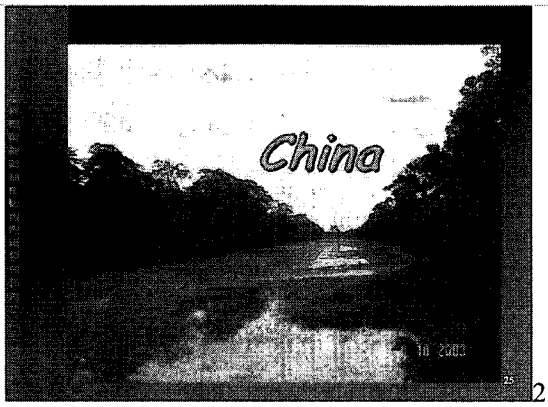

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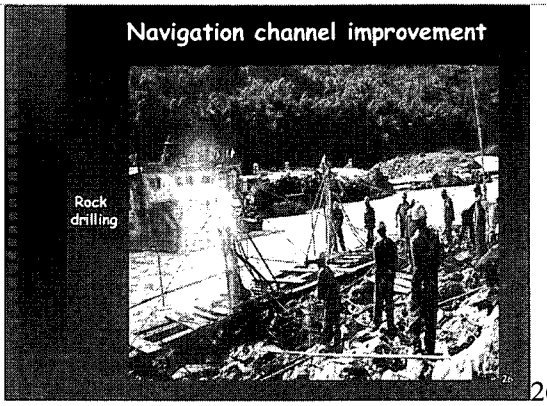

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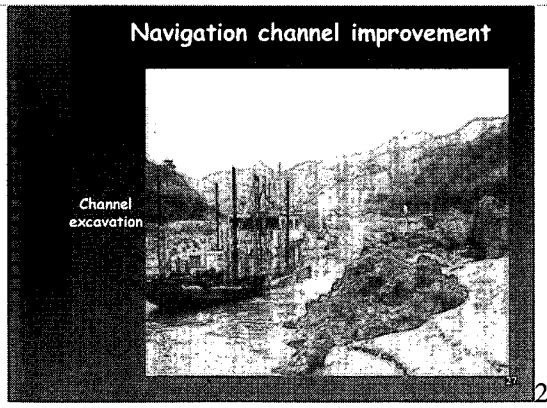

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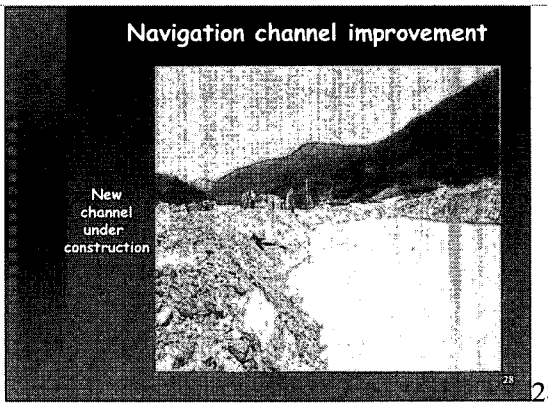

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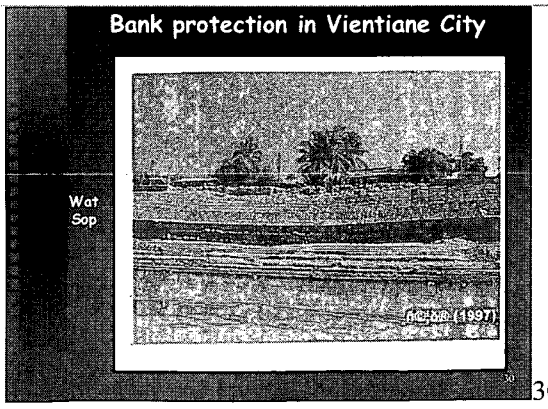

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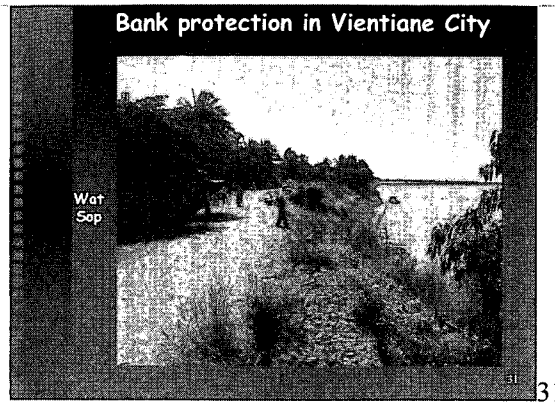

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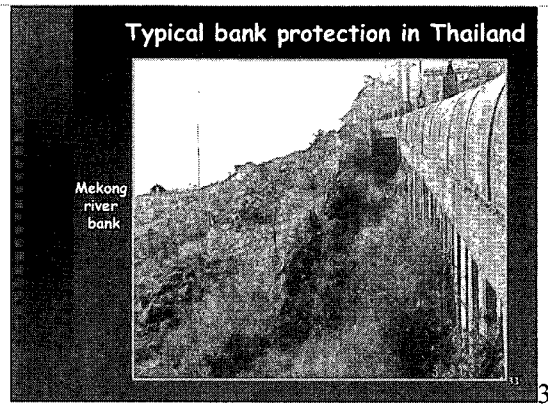

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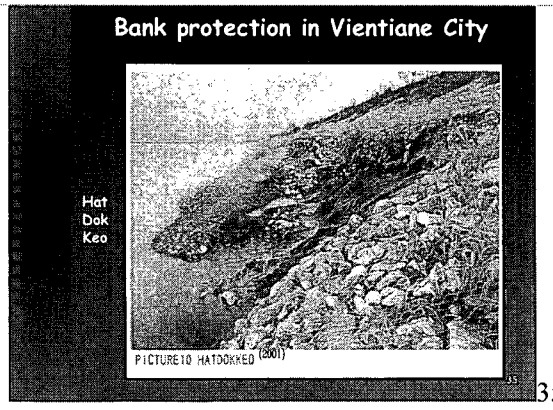

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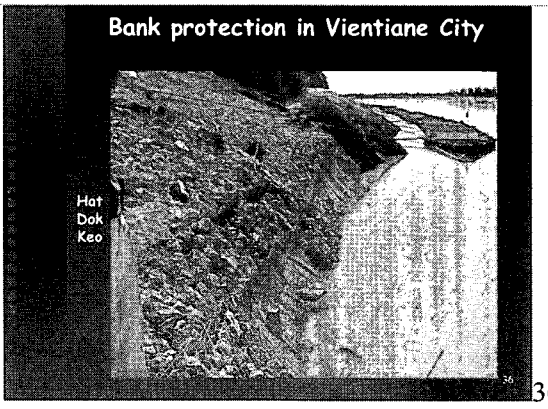

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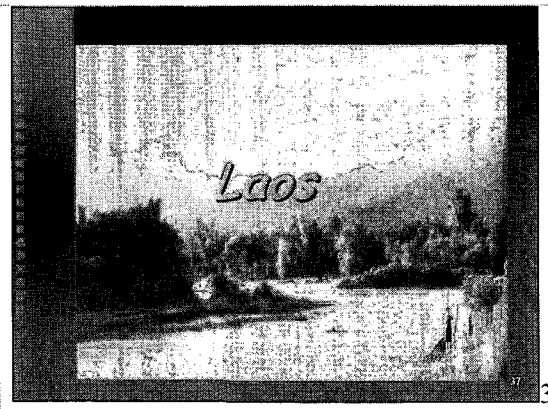

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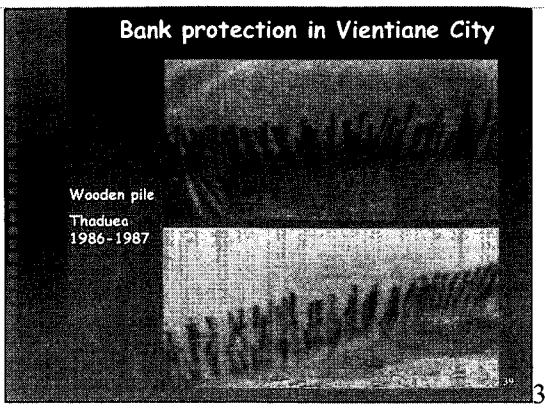

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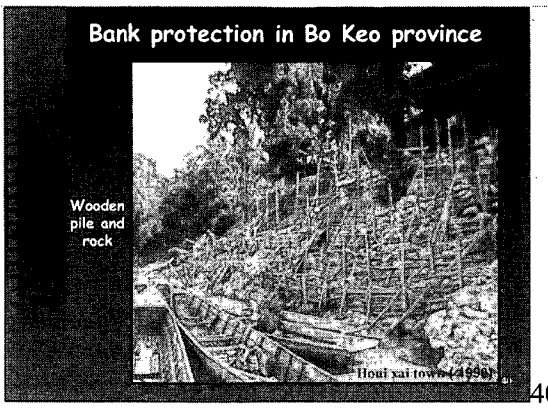

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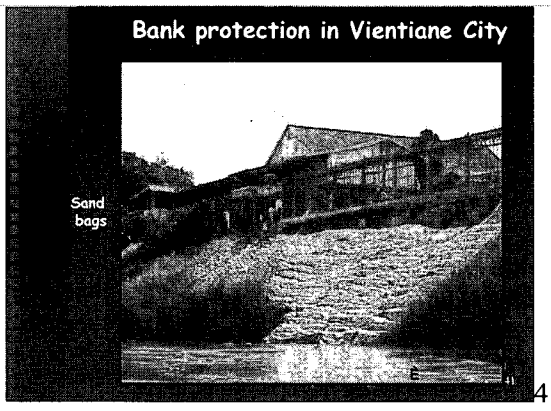

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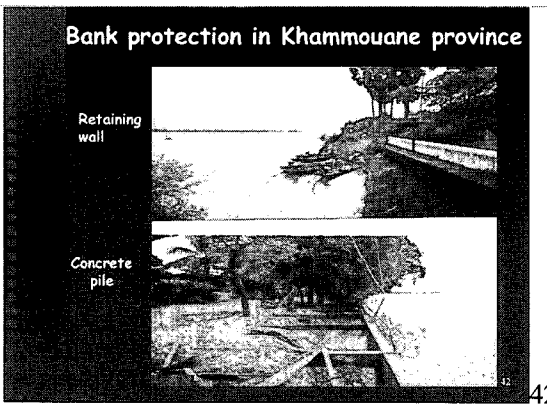

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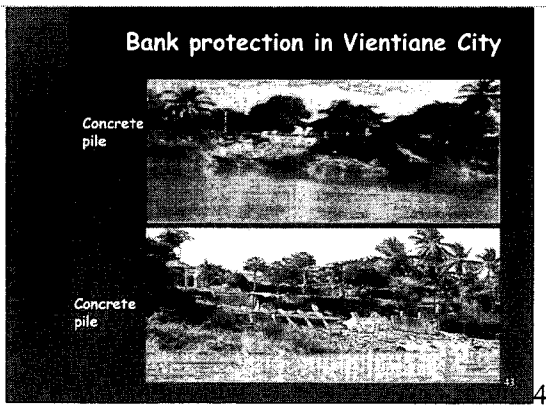

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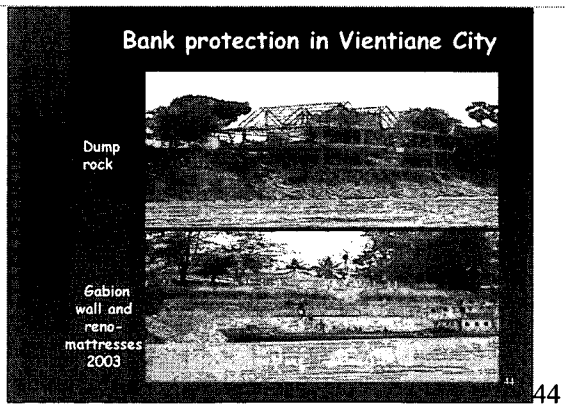

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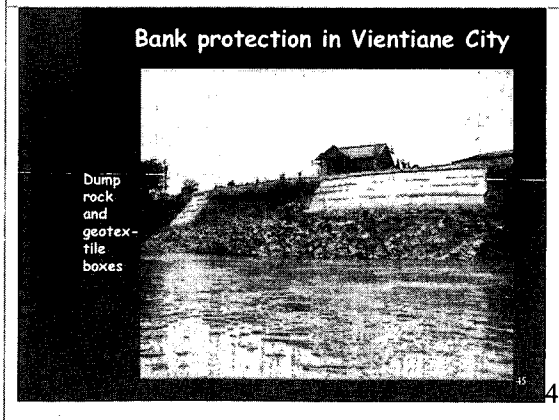

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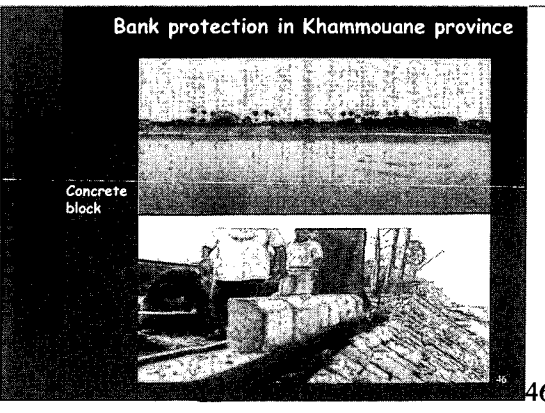

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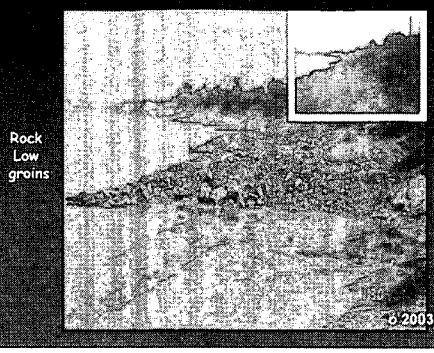
Bank protection in Bo Keo province



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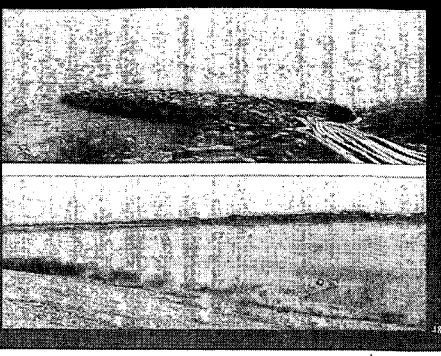
Rock Low groins



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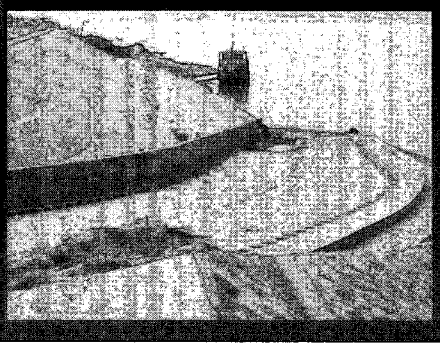
Ban Mom Port



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CONCLUSION

- Ministry of Communication Transport Post and Construction, Department of Roads, Waterways Administration Division is responsible for establishing the national standard technical specification for river works,
- International technical experts to work with the Lao technical staff to develop the CODE for standard technical specification for river works,
- One country need one standard technical specification,

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Conclusion (cont. 1)

- Technical cooperation should base on the national standard technical specification,
- Strengthening of the national capacity building for planning and management,
- NSTS is tool for government staff to manage and monitor the river works in term of planning and supervision,

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Conclusion (cont. 2)

- Several studies were carried out by international experts and consultants, but no one study has come up to the requires NSTS level,
- Difference in the standard technical specification makes it difficult for management and supervision,
- National standard technical specification is critical needed to unity the specification and to avoid the many diverse on imported standard,

52

Conclusion (cont. 3)

- Difficult to work on the macro level with planning and budgeting,
- Low efficiency on project management,
- Lack of unity of standards,
- National staff not interest to set up their own standards.

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Conclusion (cont. 4)

- Donor money is powerful and we might say [illegible] to things we would not have chosen otherwise,
- Donor countries represent different standards; each country naturally favors its own standards,
- Some international standard may not appropriate for Lao condition resulting in the failure on (being entirely unstable) of some river project after hand over.

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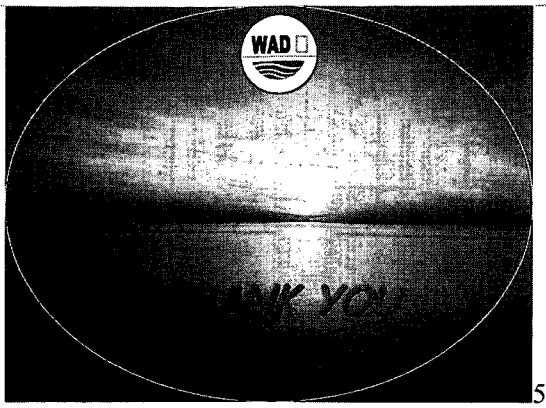

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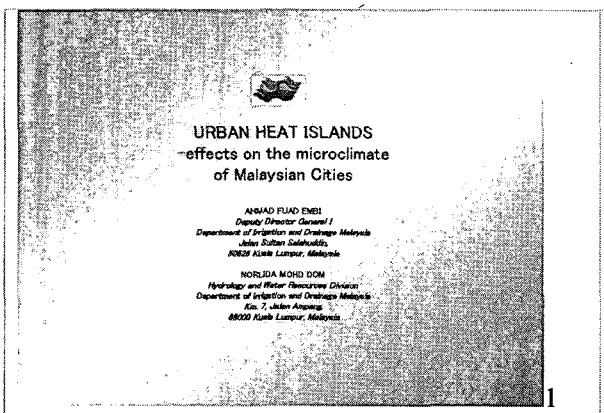
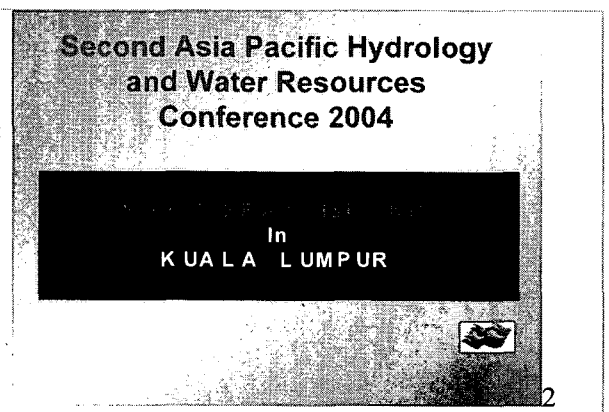
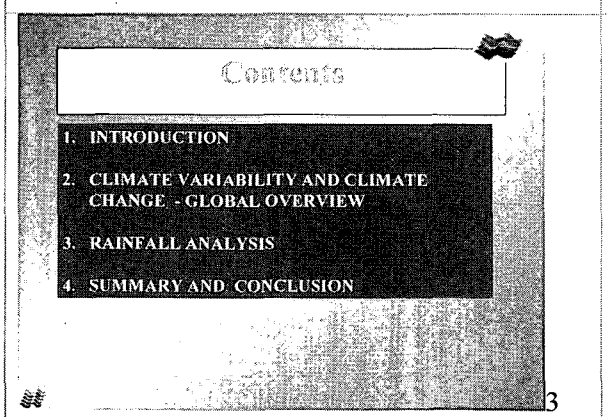
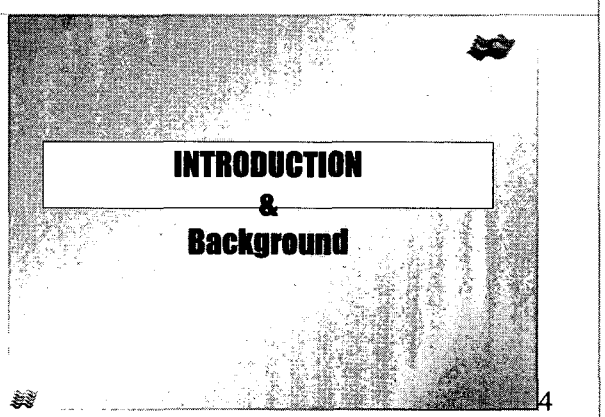
URBAN HEAT ISLANDS -EFFECTS ON THE MICROCLIMATE OF MALAYSIAN CITIES

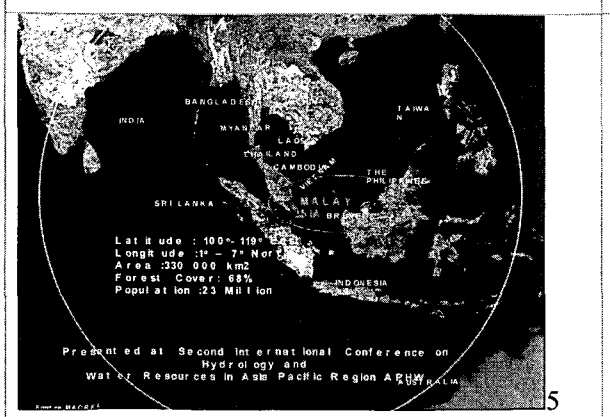
Norlida Mohd Dom (Malaysia)

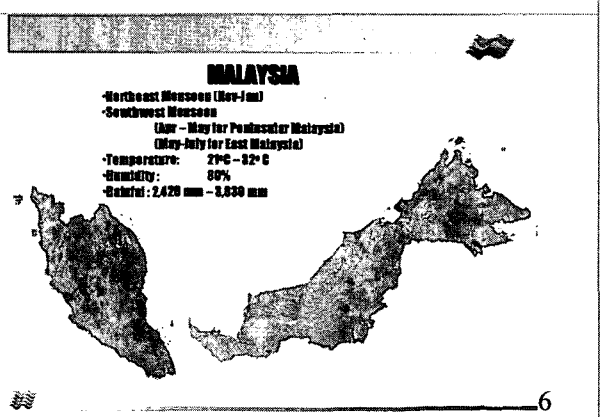


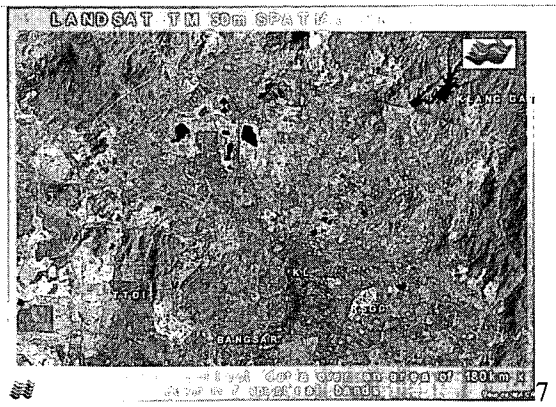












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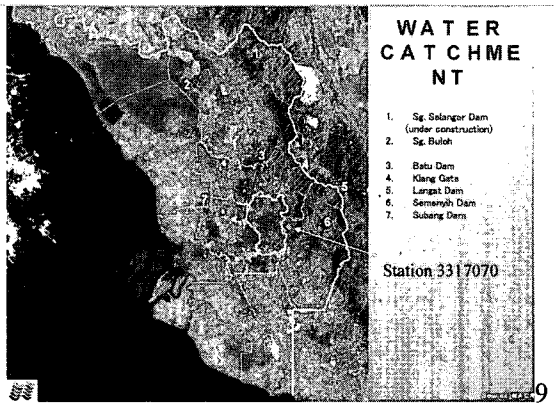

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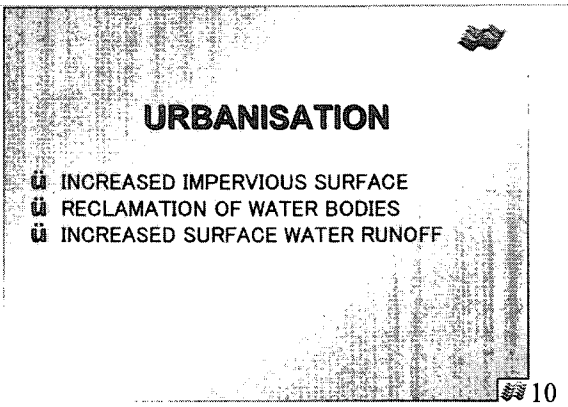

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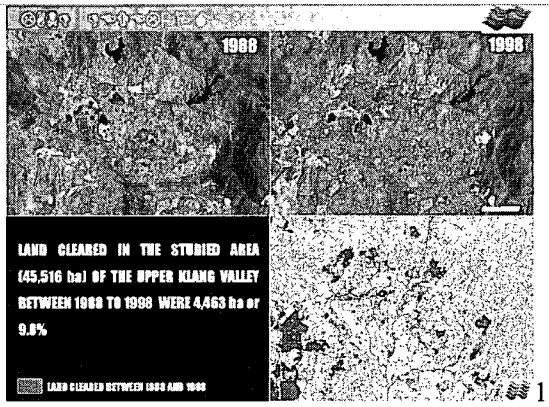

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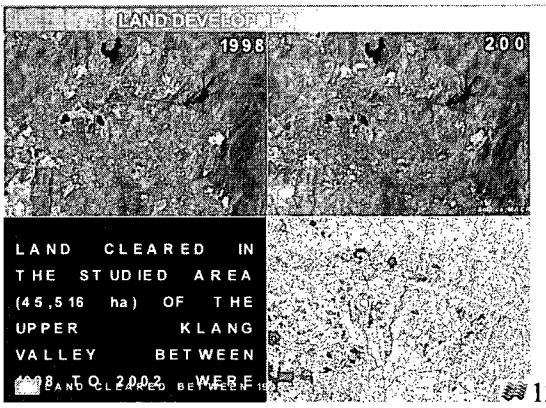

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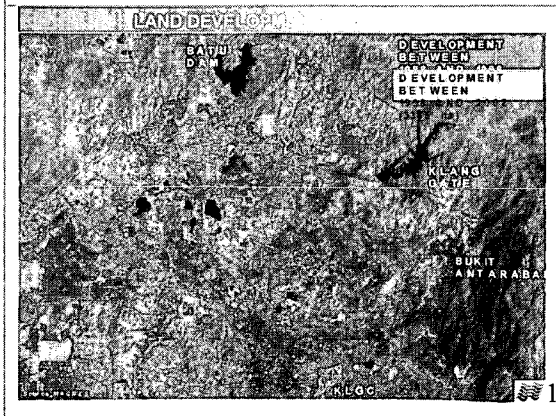

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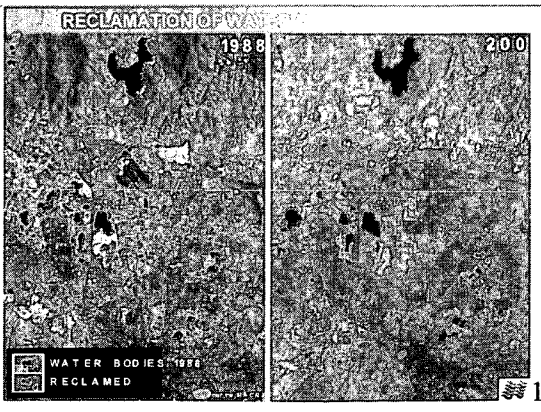

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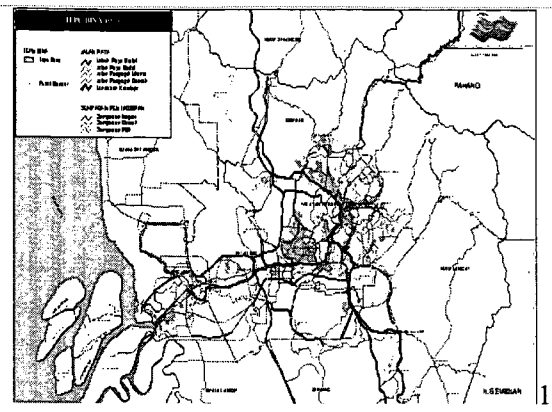

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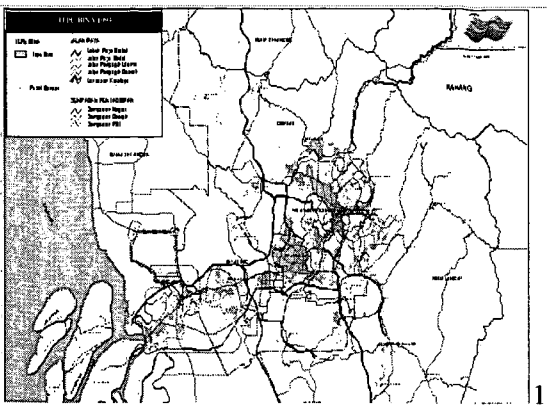

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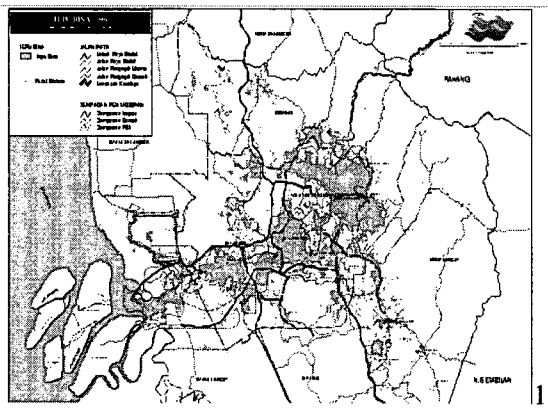

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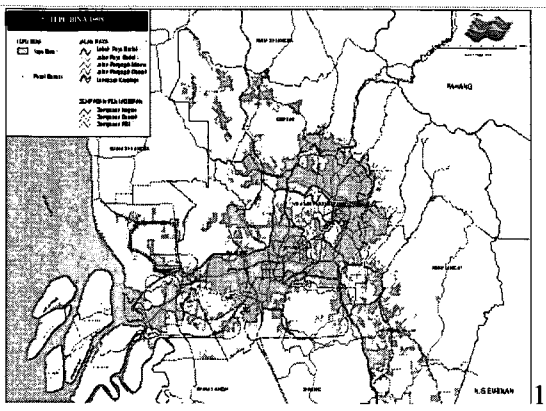

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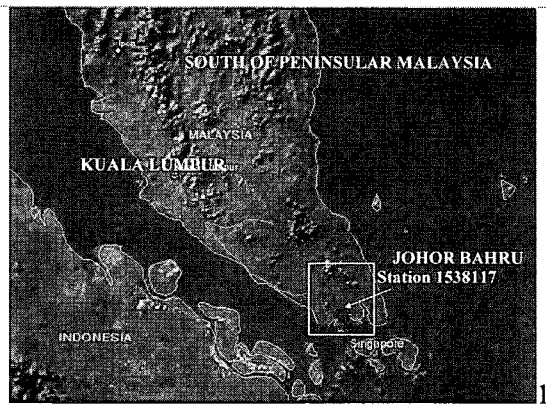


19

"The respiration of humans and animals, above all the fumes of innumerable chimneys, maintain above Paris a rust-colored haze which blocks the sun… it is impossible that (Paris) should not have a notably higher temperature than the surrounding country."

– Emilien Renou, 1855.

"… the temperature difference between the countryside (and the city) is about 1o (C)"

– Emilien Renou, 1868.

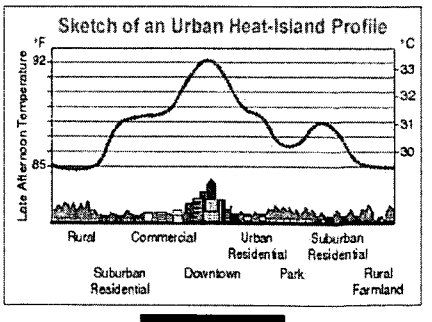
20

Definition of Urban Heat Island (UHI)

"An area of higher temperatures in an urban setting compared to the temperatures of the suburban and rural surroundings. It appears as an 'island' in the pattern of isotherms on a surface map."

- Glossary of Weather and Climate, Ira Geer, Ed.

21



PROFILE OF UHI

Tulane University

From: Heat Island Group Lawrence Berkeley National Laboratory

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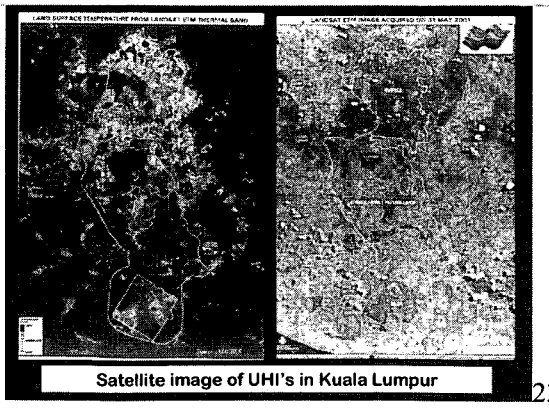
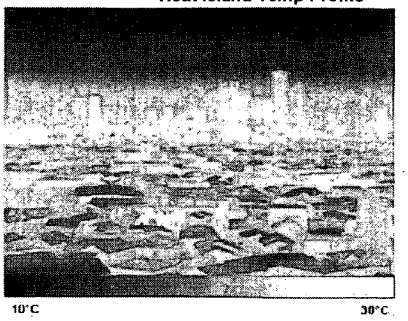


Satellite image of UHI's in Kuala Lumpur

23

Tokyo, JAPAN

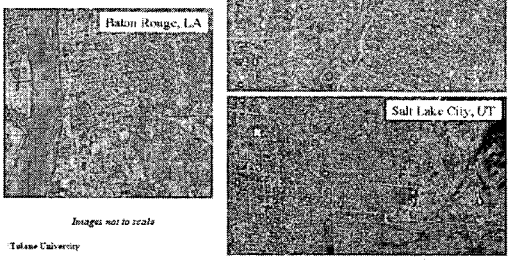
Heat Island Temp Profile



Images from: J. Voogt, U. Western Ontario and M. Roth, National University of Singapore

24

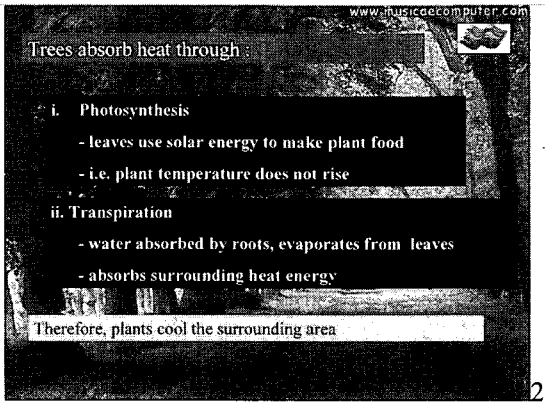
Remotely-sensed urban heat islands



Images not to scale

Tulane University

25



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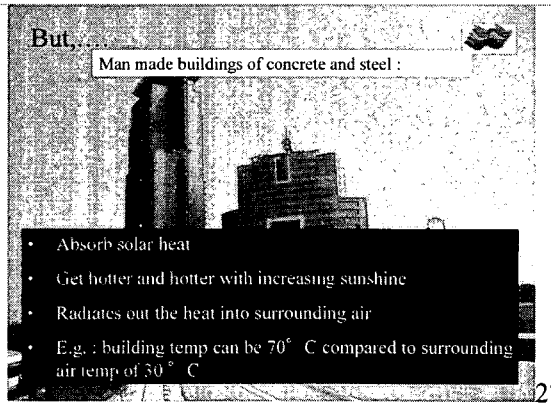

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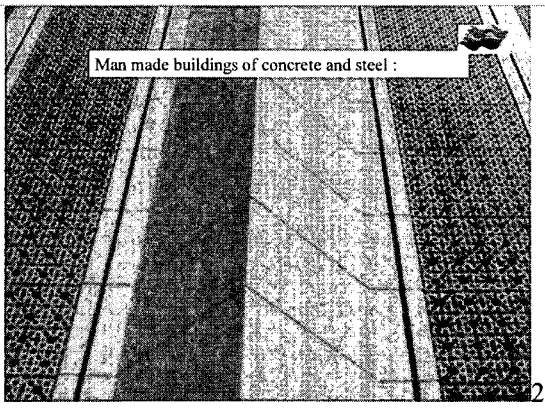

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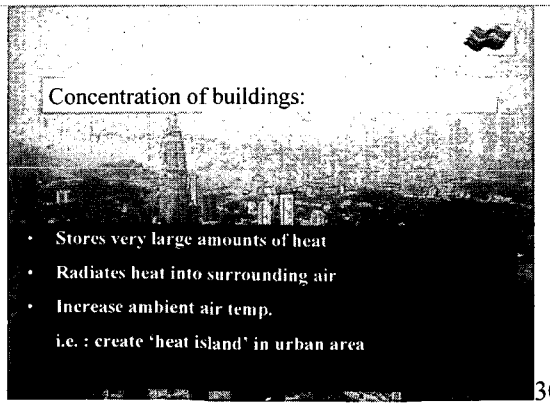

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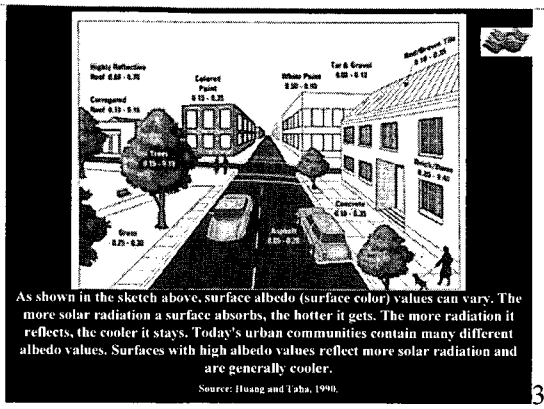


As shown in the sketch above, surface albedo (surface color) values can vary. The more solar radiation a surface absorbs, the hotter it gets. The more radiation it reflects, the cooler it stays. Today's urban communities contain many different albedo values. Surfaces with high albedo values reflect more solar radiation and are generally cooler.

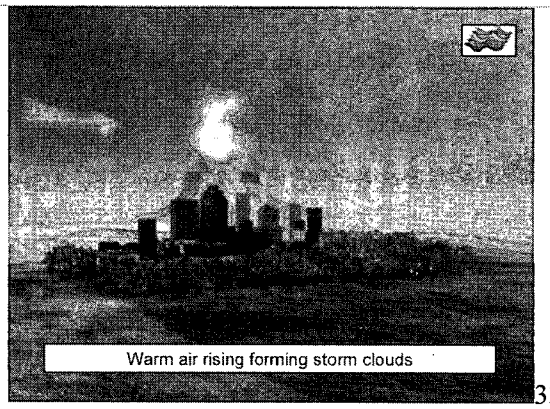
Source: Huang and Taha, 1990.

31

Effects of UHI :

- Large power consumption to cool down buildings
- Increase in ozone and chemical reactions causing smog and air pollution (when air temps rise)
- Hot day time temps in city > can be 10° C above rural temps
- Warm nights in city area – due to large latent heat energy stored during day time
- Increase in intensity and frequency of storm events (statistically proven for KL city)
  - resulting in increase of flood events

32



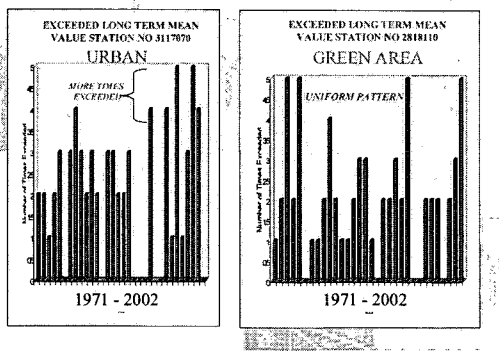
Warm air rising forming storm clouds

33

Storm showers can be pushed down wind

34

COMPARISON



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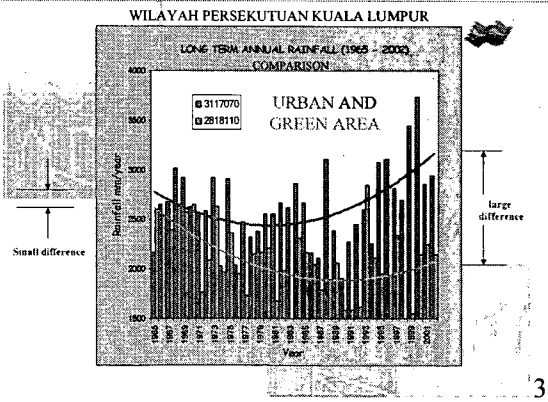

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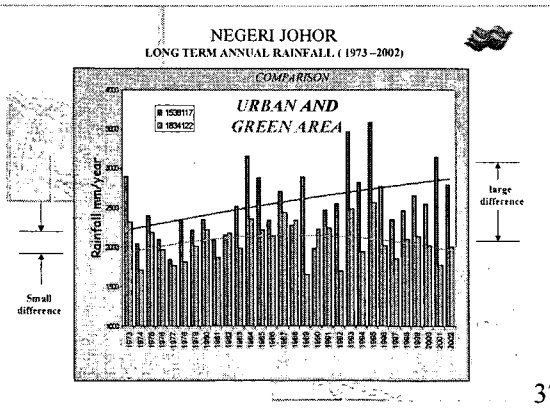

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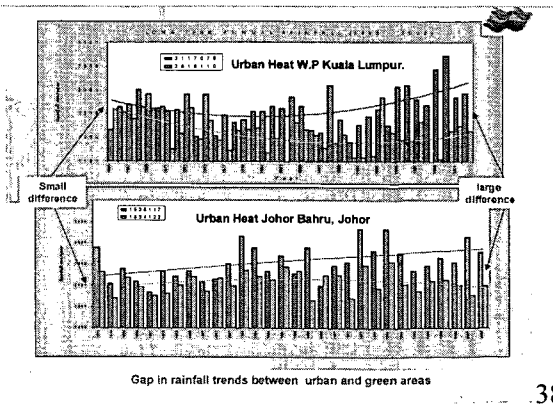
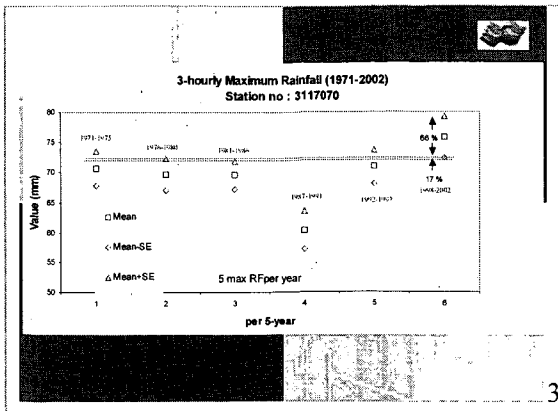


Gap in rainfall trends between urban and green areas

38



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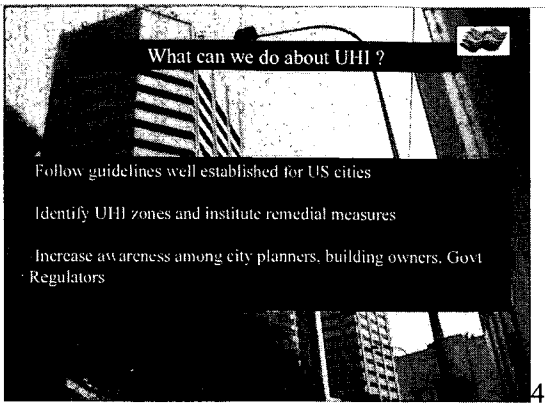

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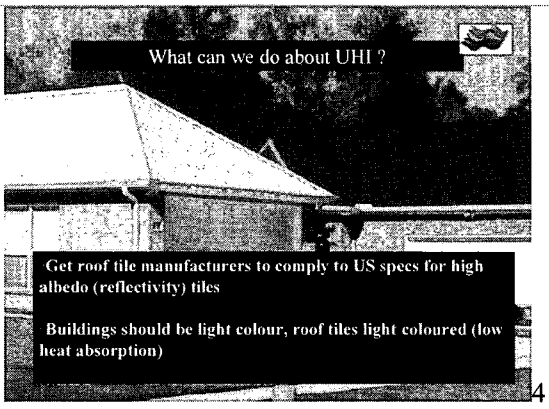

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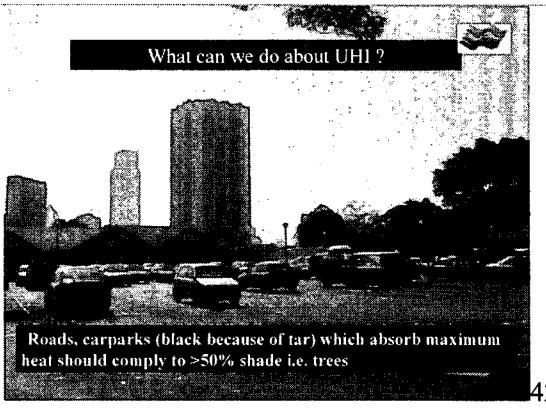

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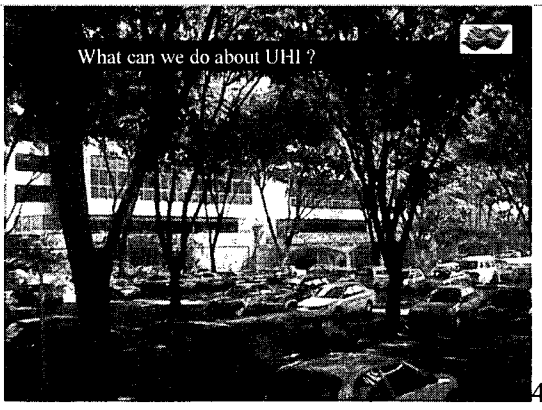

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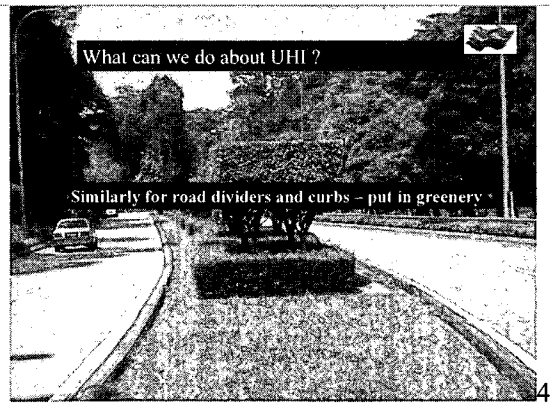

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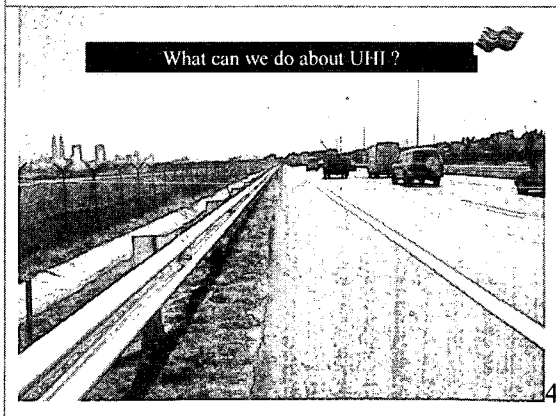

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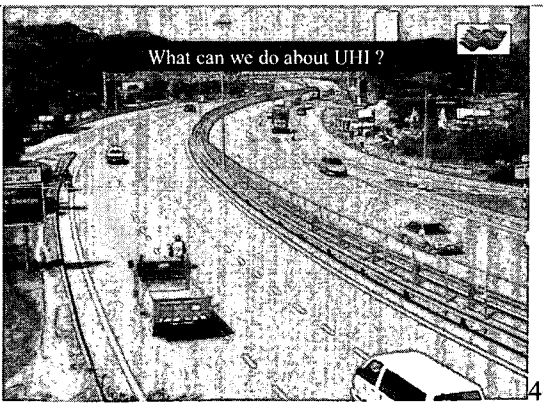

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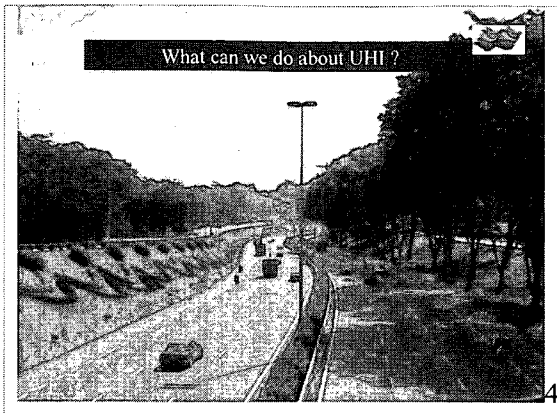

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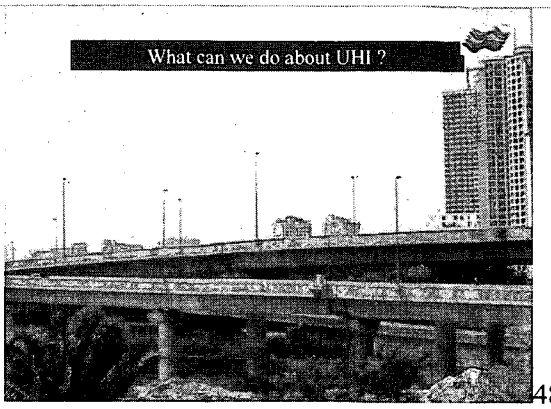

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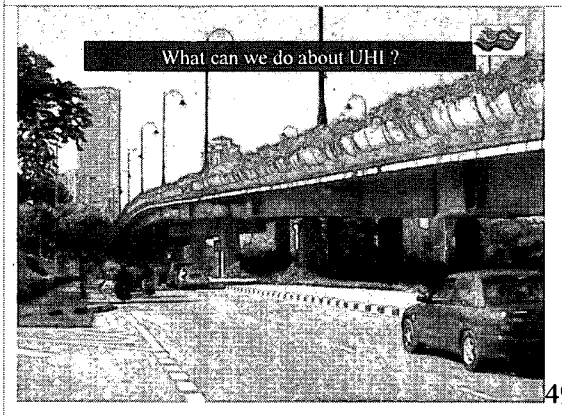

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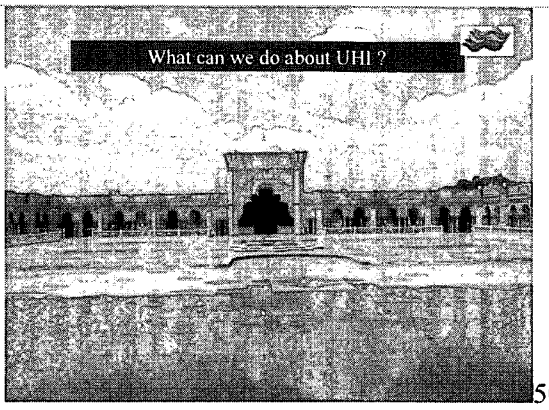

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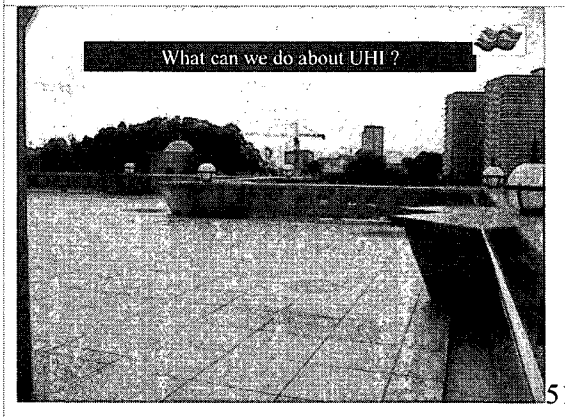

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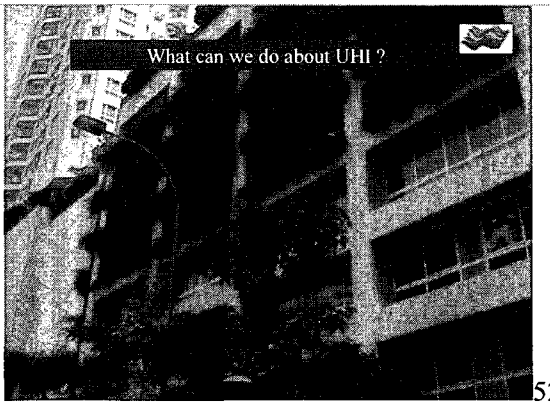

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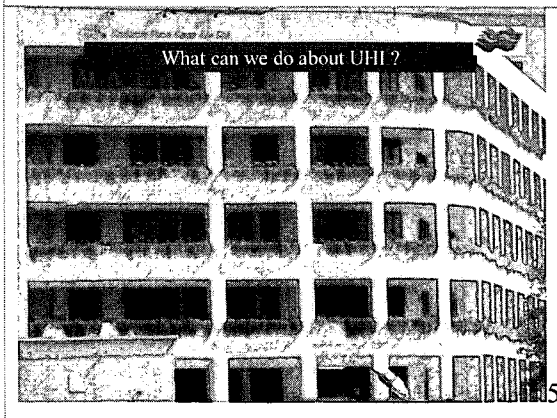

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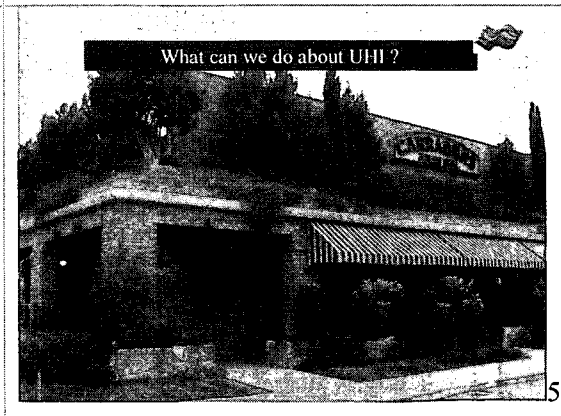

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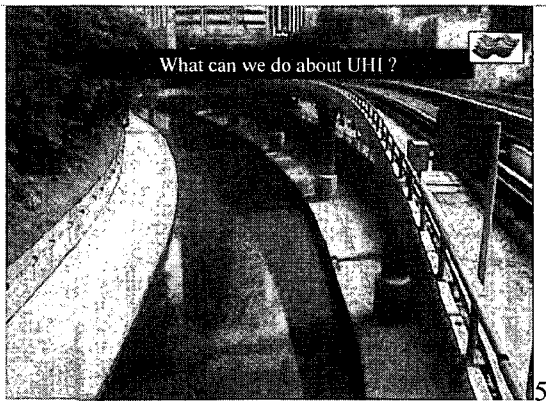

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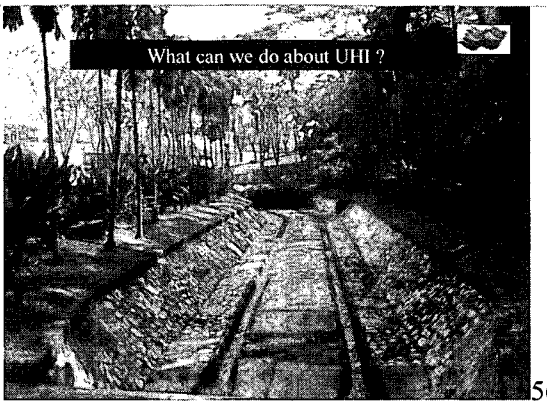

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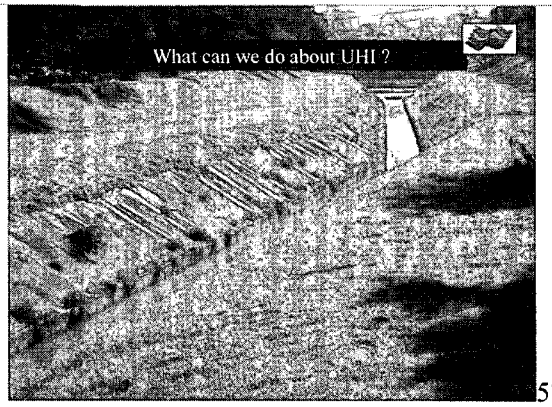

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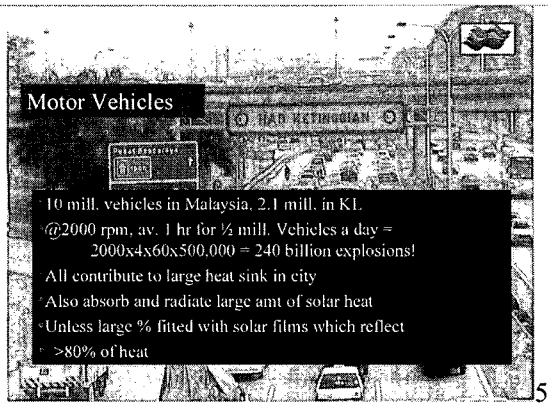

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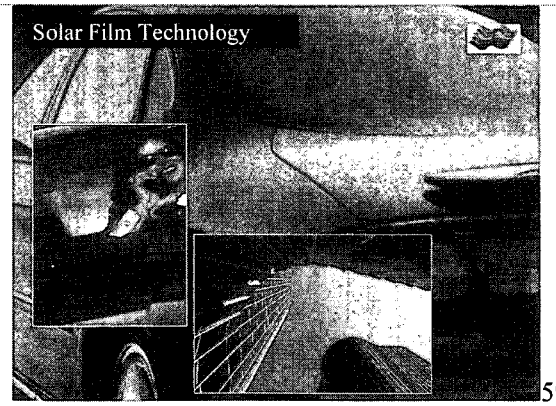

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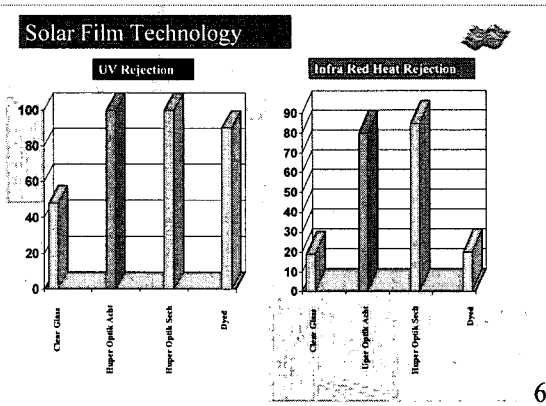

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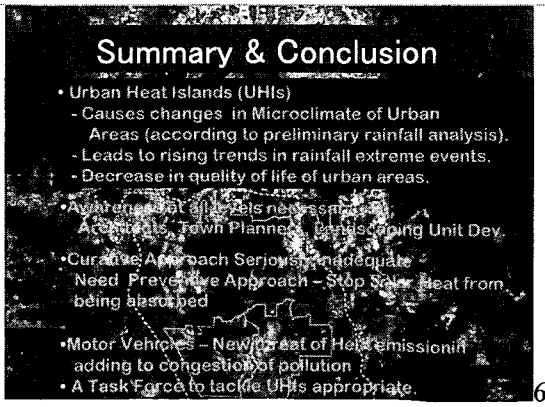

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The Challenges in the Water Resources Management in the Philippines

Pacita F. Barba (Philippines)

THE CHALLENGES IN WATER RESOURCES MANAGEMENT IN THE PHILLIPINES

Pacita F. Barba
National Water Resources Board
8F, NIA Building, EDSA, Quezon City,
the Philippines

Second International Conference on Hydrology and Water Resources in Asia Pacific Region
July 5-9, 2004, Singapore

1

PRESENTATION OUTLINE

I. Available Water Resources
II. Water Supply Service Coverage
III. Challenges in Water Resources Management
IV. Towards Effective Water Resources Management

2

AVAILABLE WATER RESOURCES

Average annual rainfall	= 2,500 mm
Dependable surface water	= 126,000 MCM/year
Groundwater safe yield	= 20,200 MCM/year
Total available water resources	= 146,200 MCM/year

Source: Study on Water Resources Master Plan in the Philippines, JICA, 1998

3

WATER SUPPLY SERVICE COVERAGE

In 1995 assessment-

Access to safe water drinking:
- 69% of the total population of about 73 million

Irrigation:
- 44% of the potential irrigable area of 3.16 million hectares

Source: Study on Water Resources Master Plan in the Philippines, JICA, 1998

4

The NEED for IWRM

With the rapid population growth, rising industrialization, increasing environmental degradation and pollution, and the specter of a dwindling resource, the government is now emphasizing the need for integrated water resources management in a comprehensive and holistic manner.

5

CHALLENGES

1. Weak Institutional Framework
2. Disparities Between Water Supply and Demand
3. Environmental Degradation/Water Related Disaster
4. Partial Access of Water
5. Creation of River Basin Organization

6

CHALLENGES

1. Weak Institutional Framework

   i. Fragmented management

   - there are over 30 government agencies and department separately dealing with water supply, irrigation, hydropower, flood control, pollution, watershed management, etc.

7

CHALLENGES

1. Weak Institutional Framework

   ii. Lack of water allocation formula

   - the principle of "first in time, priority in right"
   - insufficient procedure on water allocation
   - tradable water rights is not allowed by the Code
   - the necessary cultural, legal and institutional elements for lease or transfer of water rights are not yet in place

8

CHALLENGES

1. Weak Institutional Framework

   iii. Weak water use regulation and enforcement

   - lack of manpower
   - budgetary constraints
   - no "enforcement power"

9

CHALLENGES

1. Weak Institutional Framework

   iv. Outdated frameworks plans and research

   - updating of the frameworks plans
   - very little effort is directed to the commissioning of similar studies and research.

10

CHALLENGES

1. Weak Institutional Framework

   v. Economic pricing

   - does not reflect the realities of scarcity or abundance of water
   - has minimal attention on economic value of water .
   - does not allocate the scarce resource to the most productive users
   - does not provide economic incentive for efficient use and conservation of water.

11

CHALLENGES

2. Disparities Between Water Supply and Demand

   i. Limited water resources and their spatial and their spatial distribution

   - the distribution of these resources varies widely in time and place
   - climate change and extreme events

12

CHALLENGES

2. Disparities Between Water Supply and Demand

   ii. Inefficient water use

   - water supply projects are inadequately managed,
   - tremendous waste of water in distribution lines, irrigation canals and at homes.
   - absence of regulations, economic incentives and institutional arrangements needed to promote water conservation and rational use of water

13

CHALLENGES

2. Disparities Between Water Supply and Demand

   iii. Lack of data

   - observation stations for meteorological, hydrological, geological and water quality monitoring are not sufficient
   - data are being collected and processed by various concerned agencies and kept in their independent database.

14

CHALLENGES

3. Environmental Degradation/Water -Related Disasters

i. Watershed degradation

Most of the watershed in the Philippines are in critical condition as manifested from recent and recurring calamities such as flashfloods in Southern Leyte and Northern Mindanao and greater frequency of El Nino in Luzon that reduces the water levels in dams. The man's activities in the watersheds had caused erosion and siltation problems in the country's rivers.

15

CHALLENGES

3. Environmental Degradation/Water -Related Disasters

ii. Poor water quality

The water quality in the country has been impaired severely owing to population growth and misuse of water and land. Domestic sewage contribute about 52% of the population load, while industry contributes the remaining 48%.

16

CHALLENGES

3. Environmental Degradation/Water -Related Disasters

iii. Indiscriminate groundwater abstraction

- salt intrusion were noticeable in Metro Manila and Cavite in Region IV, Iloilo in Region VI and Cebu in Region VII due to indiscriminate groundwater extraction

17

CHALLENGES

4. Partial Access of Water

- public participation
- decentralization
- role of women in water sector

18

CHALLENGES

5. Creation of River Basin Organization

- insufficient funding support
- lack of adequate trained staff
- lack of political will to exercise their broad powers and authority effectively
- insufficient authority to exercise the general mandate of basin authority

19

TOWARD EFFECTIVE WATER RESOURCES MANAGEMENT

1. The government called for immediate adoption and subsequent implementation of the IWRM
2. The government pushed for the strengthening of a working commitment toward a more wide-ranging course of action to effectively deal with the country's water related issues.
3. The enactment of the Philippine Clean Water Act, the law that provides for a comprehensive water management program to protect the country's water bodies from land based sources of pollution
4. The enactment of the Executive Order No. 123, it is the strengthening of the National Water Resources Board which involves strengthening the planning, monitoring and enforcement capability of the agency and the modification of the Philippine Water Code and its IRR.

20

THANK YOU

21

Recent Flood Control Issues in Japan and Legislation for Preventing Flood Damages in Urban Areas

Atsushi Hattori (Japan)

Recent Flood Control Issues in Japan
and
Enactment of a New Law
to Prevent Urban Flood Disasters

Atsushi HATTORI

Senior Researcher of
National Institute for Land and Infrastructure Management,
Ministry of Land, Infrastructure, and Transport, JAPAN

1

Introduction

- In recent years, inundation damage has been increasing in urban areas.
  To address such circumstances,
  "Designated Urban River Inundation Prevention Act" was enacted in June 2003, and has been enforced since May 2004.
- Presentation Overview
  1. Outline of Recent Flood Disasters and Flood Control Measures in Japan
  2. Characteristics and Issues of Recent Flood Disasters in Japan
  3. Essential Points of the New Law "Designated Urban River Inundation Prevention Act"

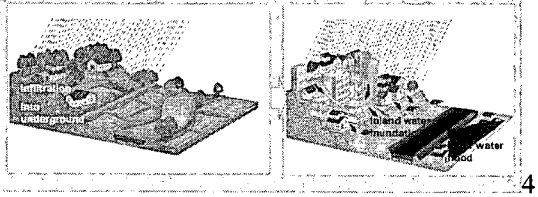
2

1. Outline of Recent Flood Disasters and Flood Control Measures in Japan

3

Major Flood Disasters in Two Decades since 1965

- Rapid urbanization accelerated by the high economic growth impaired water retention and retarding functions of river basins.
- Increasing flood runoff and peak discharge imposed further flood hazard risk.
- Concentration of population and assets due to urbanization implied a larger risk in a disaster.



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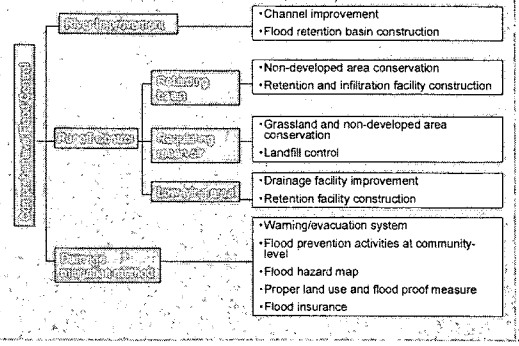
Flood Control Measures in two decades since 1965 (Comprehensive Flood Control Measures)



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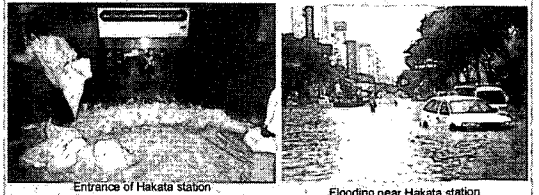
Major Disasters From 1985 to Present
Fukuoka Flood Disaster (1999)

- Heavy rain with 77 mm of maximum precipitation per hour hit around Fukuoka-shi
- It caused overflow of the Mikasa river that runs through Fukuoka-shi.
- Underground facilities such as basement of the buildings, underground stations and malls were submerged.



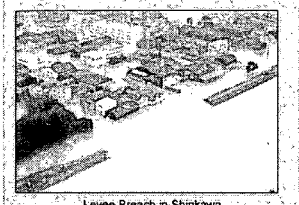
Entrance of Hakata station of Fukuoka City Underground

Flooding near Hakata station

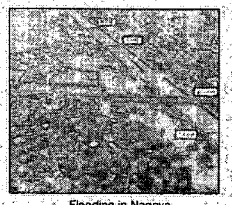
6

Major Disasters From 1985 to Present
Tokai Flood Disaster (2000)

- Maximum precipitation per hour reached 99 mm.
- The total amount of damage in Aichi pref. run up to 865 billion yen.
- The damage is the second worst of all post-war disasters, and the worst among urban flood disasters.



Levee Breach in Shinkawa



Flooding in Nagoya

7

2. Characteristics and Issues of Recent Flood Disasters in Japan

8

Characteristics of Recent Flood Disasters

1) Extensive Damage in Urban Areas
→ Concentration of Population and Assets due to Urbanization

2) Increase of Runoff and Peak Flood Discharge
→ Degradation of Storm Water Retention/Infiltration Function
→ Lack of Coordination with the Sewage System

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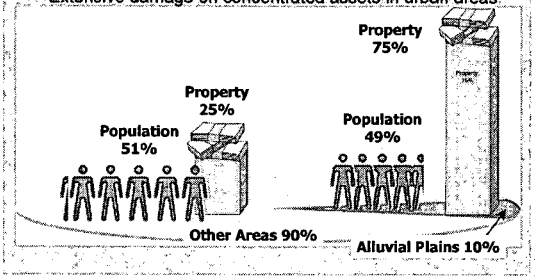
Concentration of Population and Assets due to Urbanization

- River flooding in urban areas
→Extensive damage on concentrated assets in urban areas



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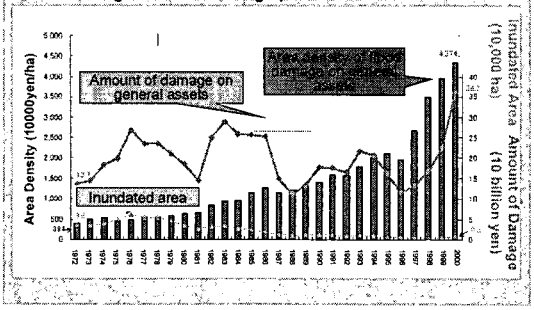
Concentration of Population and Assets due to Urbanization

- Increasing amount of damage per inundated area



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Degradation of storm water Retention / Infiltration function

- Storm water detention ponds were filled up due to lack of the scheme of preservation

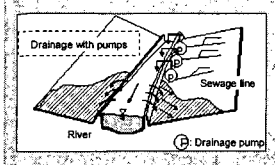
Original storm water detention pond (approx. 500m³ capacity)

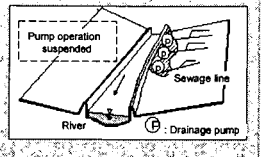
Overview after landfill

12

Lack of coordination with the sewage system

- In case of flooding in low-lying areas, excess water is discharged by drainage pumps such as those of the sewage system.
- The pump operation mitigates inland flood.
- River flood may be caused by increased discharge.
- Restricted pump operation may aggravate inland flood damage around the pump station.





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3. Essential Points of the New Law "Designated Urban River Inundation Prevention Act"

14

Objectives

- To conduct the following three measures for urban basins where severe inundation has occurred or is likely to occur and where urbanization precludes the use of inundation mitigation measures such as channel improvement etc.

1. Designation of urban river and urban river basin

2. Formulation of river basin inundation prevention plan for comprehensive inundation prevention measures

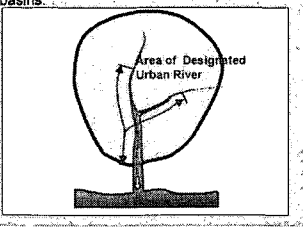
3. Other required practices such as installation of storm water retention and infiltration facilities by river administrators etc.

15

(1) Designation of Urban River and Urban River Basin

- Designation of Urban River

① The River runs through urban areas
② Severe inundation damage has occurred or is likely to occur in basins
③ Urbanization precludes the use of conventional inundation mitigation measures such as channel improvement, flood control dams and retarding basins.



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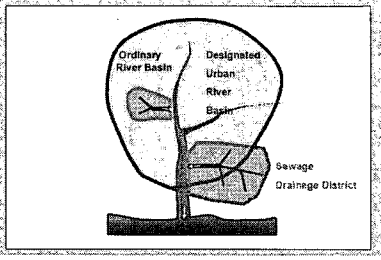
(1) Designation of Urban River and Urban River Basin

- Designation of Urban River Basin

A sewage drainage district outside the designated river basin shall also be included if discharge from the district flows into the designated river.



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(2) Formulation of River Basin Inundation Prevention Plan

- Planner

River administrator, Sewage administrator, Disaster prevention authority

- Planning Items

1. Basic policy of inundation prevention
2. Targeting rainfall for preventing urban flood or urban inundation
3. Improvement of designated urban river and maintenance of storm water retention /infiltration facility and sewage system by river administrator in designated urban basin
4. Storm water retention and infiltration implemented by local authorities
5. Practice to prevent extensive damage in case of inundation
6. Operation control of drainage pump facilities

- Implementation

It is stipulated that administrative bodies (planners) shall make efforts towards the plan enforcement, and that citizens and business owners in the designated basin shall offer support to them.

18

(3) Regulations to Rainfall Flow Limit in Designated Urban River Basins

Permission system for acts that may hamper storm water infiltration etc.

- Acts that may hamper storm water infiltration needs a permission from prefectural governor
- Installation of storm water retention/infiltration function in accordance with technical requirements is required.
- Acts that may hamper functions of storm water retention and infiltration facilities needs a permission from prefectural governor

19

(3) Regulations to Rainfall Flow Limit in Designated Urban River Basins

Notification of acts regarding large storm water detention pond

- Prefectural governor shall designate a storm water detention pond of 100 m^3 or over as a preserved reservoir
- Acts that may prevent functions of the preserved reservoir are required to notify the governor.
- Required measures are suggested and recommended by the prefectural governor.

Management agreement on the preserved reservoir

- Local authorities may supervise the preserved reservoir if there is an agreement with the owner.
- In this case, the agreement is effective to the grantee as well.

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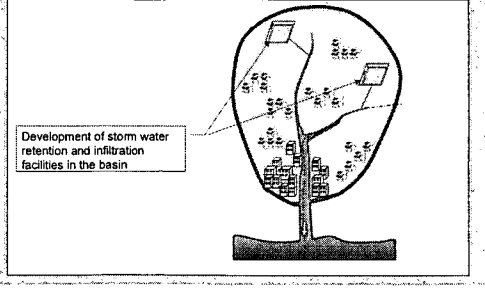
(4) Measures Based on River Basin Inundation Prevention Plan

- Storm water retention and infiltration facilities controlled by river administrators



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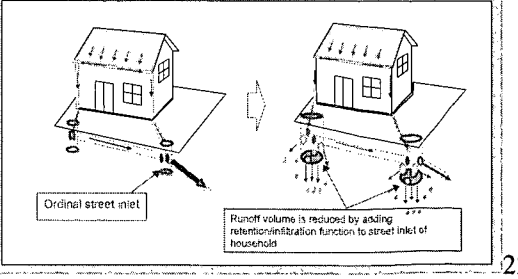
(4) Measures Based on River Basin Inundation Prevention Plan

- Special case regarding technical requirements of drainage facilities



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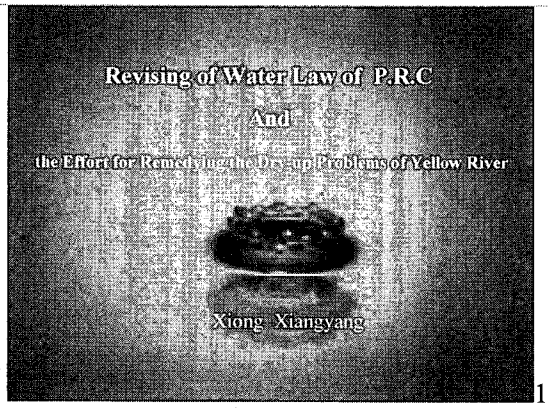
Conclusion

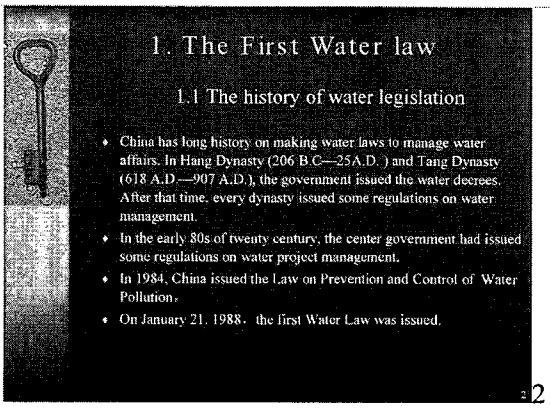
- This presentation provided characteristics and issues of the urban flood disaster, and an illustration of the newly established law as a countermeasure against the recent urban flood disaster.
- The new law has been enforced since May 2004, and it may take some years until significant outcome is achieved in the situation of an actual disaster. It is sincerely hoped that this law may be able to contribute to resolving issues of urban flood disasters.

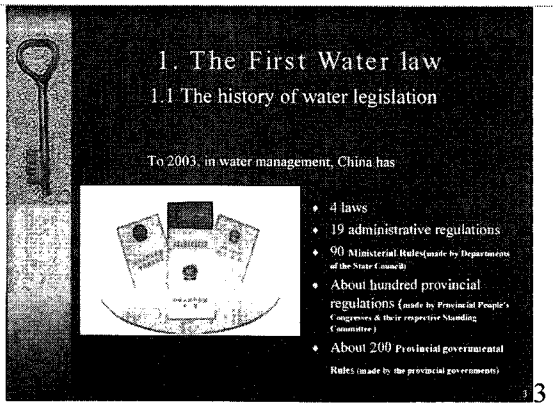
23

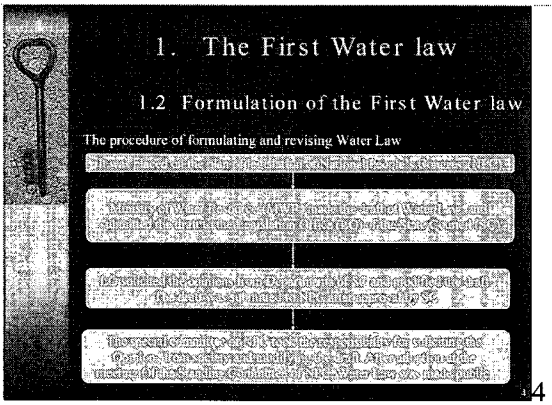
The Revision of Water Law of P.R.C. and the Efforts for Remedying the Dry-up Problems of Yellow River

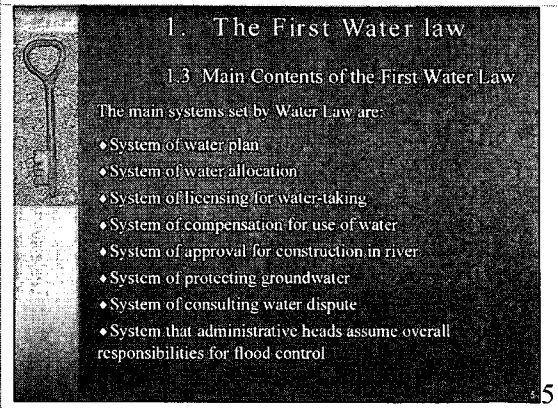
Xiong Xiangyang (China)

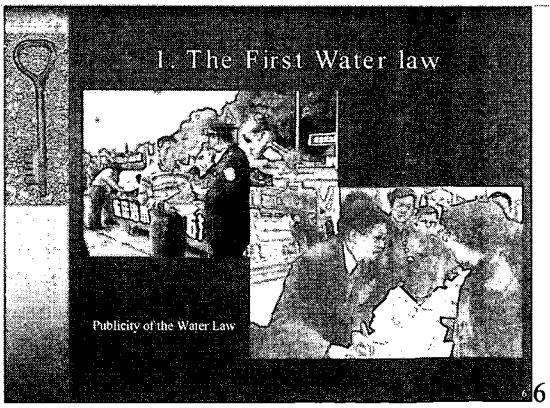












1. The First Water law

1.4 The achievements of carrying out Water Law

- More and more people have realized the importance of regulating water affairs.
- A system of regulation has been set. Every affair concerning water can be regulated by these regulations and laws.
- The system of unified management and supervision is setting up step by step. Policies concerning water management have been partly unified.
- The order of development and utilization of water resources is getting better.

7 7

2. Revision of Water Law

Since 90's, the situations of society and economy and water resources have got great changes. Revising old Water Law became an urgent task. In 1994, the revision of Water Law was placed on the plan of legislation of 8th National People's Congress. In 2002, the new Water Law was made public and effective. In new Water Law, some new administrative systems have been added and some principles have been replaced by more rational principles.

8 8

2. Revision of Water Law

Deliberation of New Water Law in the Meeting of the Standing committee of the Ninth National People's Congress

9 9

2. Revision of Water Law

2.1 The necessity of revising water law

In 90's, the issues of water shortage, flood disaster and water environment degradation were not solved. In some areas, these issues became more and more serious. (Water shortage has become one of the major constraints on stable development of national economy, especially the sustainable development of agriculture. Nearly half of the river courses suffered from various degrees of pollution.Flood disaster is still the troublemaker of the Chinese nation.) Meanwhile, China was facing the greater and greater challenges caused by population growth, social and economic development.

10 10

2. Revision of Water Law

2.3 The main parts revised

Comparing the old Water Law, the main parts revised are followed:

- Emphasizing the unified management of water resources.

  The system of unified administration on water resources in association with administration at various levels and by various departments has been replaced by that the administrative departments for water resources of governments are responsible for unified management and supervision over the water resources.
- Stressing the proper allocation of water resources.

  The water resources in every river basin should be allocated according to the principle of amount control. Every region will get a amount of using water, and the remains of water resources should maintain a proper flow of rivers and keep the lakes, reservoirs and groundwater at a proper water lever. The local governments must control the needs to water resources and distribute the water to all the user under the amount allocated.

11 11

2. Revision of Water Law

2.3 The main parts revised

- Strengthening the measures of macro-management.

  The planning, allocating, dispatching and supervising of water resources should be undertaken with the river basin as basic unit.

  The State shall formulate national water resources strategic plan.

  The system of river basin management combining with management of administrative region should be applied. The river basin authorities will play more important roles in water resources management especially in allocation of water resources, supervision of drawing and using water resources, management of plan, dispatch of surface water and groundwater.
- Emphasizing the harmony of water resources and population, development of economy and ecological environment.

  The system of dividing and managing water function zone, the system of establishing conservation districts for drinking water source, the system of total discharge of various pollutants, the system of managing sewage discharge outlet, the system of defining the prohibited area and restricted area of groundwater exploitation and the system of prohibiting the reclamation of river shall be strictly applied nationwide.

12 12

2. Revision of Water Law

2.3 The main parts revised

- Enhancing the water-saving.

  The State applies the system for the use of water under which control over the total volume is combined with control over the quotas.

  The water-saving facilities shall be designed, constructed and put into operation simultaneously with the principal part of project.

  The State gradually eliminates the techniques, equipment and products that are outdated and are of high water-consumption.

  Some policies will be made to encourage the use of recycled water.

  Two-step water pricing mechanism will be taken. Under the quotas, the price will cover the cost and profit. Above the quotas, the price will increase with the amount.
- Strengthening the management of river and water project.

  The State applies the licensing system for sand quarrying in river courses.

  The scope of management and protection of the waterworks shall be defined.

13 13

2. Revision of Water Law

2.4 Implementation of New Water Law

After the new Water Law was issued, MWR speeded up formulating the regulations and rules in order to implement the new Water Law. The provincial People's Congresses also began to revise the local Water Regulations. Some regions have already issued the new water regulations.

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3. The Efforts to Remedy the dry-up problems of Yellow River

The location of Yellow River

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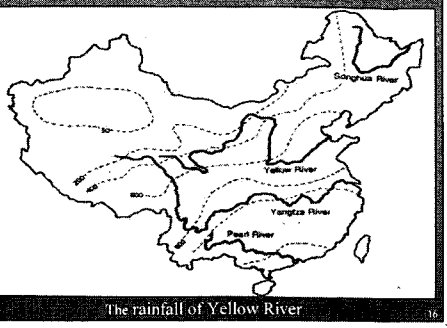
3. The Efforts to Remedy the dry-up problems of Yellow River



The rainfall of Yellow River

16

3. The Efforts to Remedy the dry-up problems

3.1 The basic facts of Yellow River basin

- The Yellow River is the second longest river in China.
- It runs through 9 provinces and autonomous regions.
- The main course of the Yellow River is 5465 km in length and its basin area is about 795.000km^2.
- Its average runoff is about 500 mm and the total amount of runoff is 66.1 billions m^3 per year.
- The population in Yellow River basin is 99.22 millions.

17

3. The Efforts to Remedy the dry-up problems

3.2 The briefing of the dry-up problems of Yellow River

- The dry-up problems of Yellow River began in 1972.
- Since that time sustained drought has led to a sharp decrease in water flow in upper reaches, causing some sections of the river to go dry in the lower reaches. The problem was more and more serious in 1990's.
- Sections of the Yellow River dried up for as long as 226 days in 1997 which was the most serious year. The dry-up length was about 700 kilometers which is 83% of length of the lower reach. In this year, the dry-up even happened in flood season.

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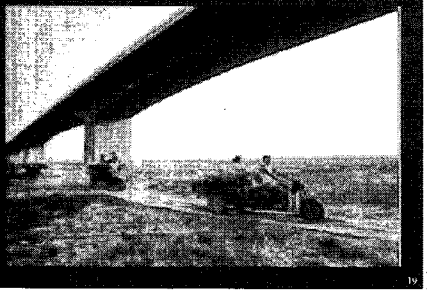
3. The Efforts to Remedy the dry-up problems

3.2 The briefing of the dry-up problems of Yellow River



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3. The Efforts to Remedy the dry-up problems

3.2 The briefing of the dry-up problems of Yellow River

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3. The Efforts to Remedy the dry-up problems

3.3 The impacts of the dry-up problems

- The losses of agriculture and industry were more than one billion Yuan annually in 70's and 80's, and three billions in 90's.
- The river was filled up more and more seriously, and its capacity of releasing floodwater sharply decrease.
- The water quality and the ecological environment of river degraded obviously.
- The wetlands decreased sharply to half, fish 60% and birds 70%.
- The intrusion of seawater and salinization of soil were serious.

21

3. The Efforts to Remedy the dry-up problems

3.4 The reasons of the dry-up problems

- The shortage of water resources and uneven timing and spatial distribution of water resources in Yellow River
- The sustained drought
- The sharp rise of demands for water resources
- A low price of water
- Too many reservoirs along the river which store too much water and are dispatched according to different targets
- A weak authority of river basin management which did not have the enough power to adjust and control the total amount of drawing water of regions

22

3. The Efforts to Remedy the dry-up problems

3.5 The measures to remedy the dry-up problems

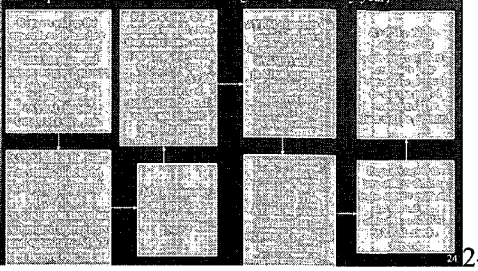
- Formulating the plan of water allocation of river basin. This plan defined region's total amount of drawing water from Yellow River and the proper flow of river. In 1997, the plan was approved by the State Council.
- Formulating the Administrative Regulation of Water Dispatch in Yellow River. The Regulation that endows the authority of Yellow River Management with power to adjust and control the regions' amount of drawing water and sets up the procedure of the water amount management was issued in 1998.
- Setting up the special institute taking charge of adjusting and controlling the regions' amount of drawing water.
- Building the water project aiming at adjusting water amount and controlling floods.
- Rising the water price. The price for irrigation at the lower reach of Yellow River rise to twice of the original and for industry 11 times of the original.
- Publicizing the policies of water saving.

23 23

3. The Efforts to Remedy the dry-up problems

3.5 The measures to solve the dry-up problems

The procedure of water amount management (In ordinary year)



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3. The Efforts to Remedy the dry-up problems

3.5 The measures to solve the dry-up problems

The procedure of water amount management (In serious dry season)

- AYRW submits the report of entering the emergency period of water dispatch to MWR. MWR checks and submits it to the State Council for approving in 10 days.
- After the report is approved, the National office of Flood Control and AYRW take charge of dispatching the water projects and runoff of Yellow River.
- Regions report the amounts of drawing water day by day to AYRW.
- The regional plans of drawing and using water will be made month by month and they can be adjusted every 10 days.

25 25

3. The Efforts to Remedy the dry-up problems

3.6 The effect of taking the measures

- Since the Administrative Regulation of water dispatch was implemented in 1999, the situation of Yellow River has been getting better. In 1999, the dry period of the lower reach was shortened by 8 days. From 2000 to 2003, Yellow River did not go dry. In 2001 and 2003, Yellow River even supplied water to solve the problem of water shortage in Tianjin City which is out of Yellow River Basin.
- The ecological environment of Yellow River has been gradually recovering.
- The essential demands for water in whole basin has been ensured.
- The effect of water-saving is obvious. In Ninxia Autonomous Regions and Inner Mongolia Autonomous Region, the total amount of using water in 2000 decreased 1.27 billions m^3 .

26 26

3. The Efforts to Remedy the dry-up problems

3.7 The further measures to improve the management of Yellow river basin

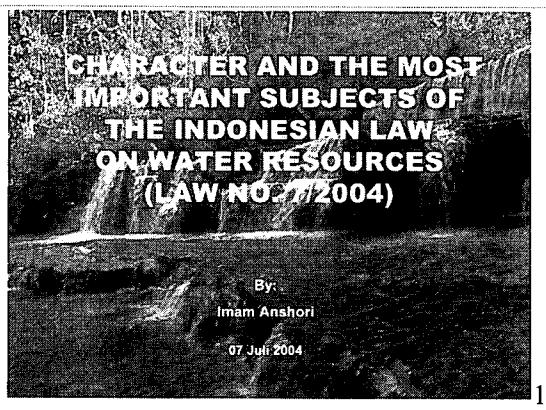
- Formulating the Yellow River Law. The research of this law is on the way now.
- Strengthening the management of water quality. The regulation of water resources protection in Yellow River has been formulating.
- Improving the administrative systems according to New Water Law.
- Setting up the system of water rights of Yellow River step by step. Some regions are launching the trade of water rights as the pioneers.
- Setting up gradually the new system of river basin management. In the new system, the regions and users will play more important roles in making policies on river basin management.

27 27

28

CHARACTER AND THE MOST IMPORTANT SUBJECTS OF THE INDONESIAN LAW ON WATER RESOURCES

Imam Anshori (Indonesia)



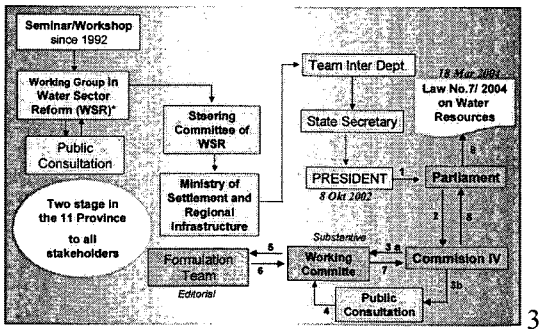
1

Why we need to revise The Existing LAW No. 11/ 1974 ?

1. to anticipate complexity in the development of issues on water resources
2. to put water in harmoniously social, environmental and economic dimensions;
3. to attain integrity in water resources management (WRM);
4. to accommodate the demand for decentralization and regional autonomy;
5. to give better attention to the basic human rights to water;
6. to put the mechanism and process of formulating policies and a more democratic plans of WRM in place .

2

PROCES TO FORMULATE OF THE NEW LAW ON WATER RESOURCES



3

CHARACTERISTIC OF THE NEW LAW No.7/ 2004 on WR

1. no longer focused on the construction (development) of WR infrastructures, but on the provision of conditions for sensible, sustainable WRM
2. not only covering the domains of WRM, but also the process of WRM.
3. The law's scope is aimed at integrating WRM in all its aspects → a coherent integral approach is adopted.
4. openness and encourage participation of stakeholders.
5. The law is integrating social function and economic values.

4

Philosophic and Basic Consideration

Basic Philosophic

1. WR are a blessing of the One and Only God that give benefits for the welfare of the whole people.
2. Water is a source of life.

Administ. Consideration

Article 33, para (3) of National Constitution 1945: "Water resources are controlled by The State and are use for the maximum benefits of the people in a fair manner".

Techical Consideration

1. Water is renewable natural resources.
2. Water are mostly constant in quantity, but the availablity of water depend on climatic conditions of an area.
3. Surface water & Groundwater are linking in one hidrological system.
4. Water is actually dynamic resource by nature, flowing to lower places without distinguishing the administrative regions .

5

Comparison: The Old and The New Law

Law No. 11/ 1974	
Chapt I.	GENERAL PROVISIONS
Chapt II.	FUNCTION
Chapt III	MASTERY RIGHT AND AUTHORITY
Chapt IV	PLANNING AND DESIGN
Chapt V	SUPERVISION
Chapt VI	EXERTION
Chapt VII	EXPLOITATION AND MAINTENANCE
Chapt VIII	CONSERVATION
Chapt IX	FINANCING
Chapt X	CRIMINAL PENALTIES
Chapt XI	TRANSITIONAL PROVISIONS
Chapt XII	CONCLUDING PROVISIONS
Total = 17 Articles	

Law No. 7/ 2004 on WR	
Ch I.	GENERAL PROVISIONS
Ch II.	*AUTHORITY AND RESPONSIBILITY*
Ch III.	WATER RESOURCES CONSERVATION
Ch IV.	WATER RESOURCES UTILIZATION
Ch V.	CONTROL OF WATER DESTRUCTIVE POWER
Ch VI.	PLANNING
Ch VII.	CONSTRUCTION, OPERATION & MAINTENANCE
Ch VIII.	*WATER RESOURCES INFORMATION SYSTEM*
Ch IX.	*EMPOWERMENT AND SUPERVISION*
Ch X.	FINANCING
Ch XI.	*RIGHTS, OBLIGATION AND ROLES OF THE COMMUNITY*
Ch XII.	*COORDINATION*
Ch XIII.	*SETTLEMENT OF DISPUTES*
Ch XIV.	*COMPLAINTS BY THE COMMUNITY AND ORGANIZATIONS*
Ch XV.	*INVESTIGATION*
Ch XVI.	CRIMINAL PENALTIES
Ch XVII.	TRANSITIONAL PROVISIONS
Ch XVIII.	CONCLUDING PROVISIONS
Total = 100 Articles	

6

THE MOST IMPORTANT SUBJECTS

7

1. Water Use Right

1. WUR mean the rights are only limited to use and to utilize the amount of water for various purposes that user is allowed to take at any particular time from natural water resources such as river, lake, canal or aquifer.
2. The volume of allocation determined in this respect is not conclusive and must be in compliance with the volume stated in the permit.
3. This law gives more protection to the interests of weak economic groups of the society, by applying the principles of WRM that will ensure the harmony of social, environmental and economic functions.
4. the basic daily needs of individuals and the people's agriculture activities located within an irrigation system will be protected by the Government or the Regional Governments.

8

2. Institutional Aspects.

1. The authority and responsibilities in the WRM by the Government, the Provincial Governments, and the District/Municipal Governments are arranged in accordance with the situation of the River Basins.
2. The law already provided for the establishment of coordination committees on WRM at different administrative levels. (The National, and The Provincial, and The District/Municipality, and The River Basin).
3. In line with the principles of democracy, the community will not only be given the role in the preparation of WRM policy, but also the role in the process of planning, construction, operation and maintenance, monitoring and supervision of the WRM .

9

3. WR Utilization.

1. WR utilization comprises a broad range of activities, i.e.: supply, usage, development and exploitation of water resources.
2. The provision of WR in each river basin shall be done in accordance with the usage arrangements of the WR determined in the bid to serve.
3. The utilization of water resources shall be done by giving priority to the social function by considering the principles of water users to pay for management service fees. This provision does not imply to the water user for basic daily needs and people's agriculture.
4. All other forms of water use are subject to license, except of water use for people's irrigation within the existing irrigation system, no license is therefore required and free of charge.
5. Water supply to serve the human basic needs shall be the top priority in the provision of WR over all other needs. The second priority given to the people's irrigation within existing irrigation system.
6. The order of priorities in the provision of WR for the other uses of water shall be determined in each river basin by the Government or the respective regional governments in accordance with their authorities.

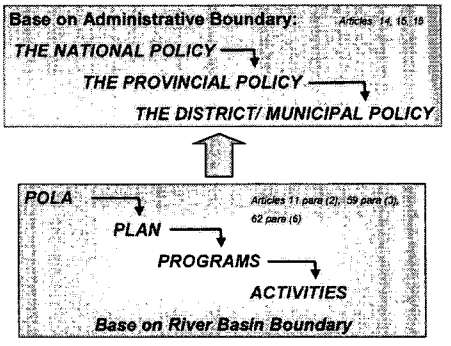
10

4. WR Conservation.

1. WR conservation shall be conducted through the activities of protection of WR, water preservation, and water quality management & water pollution control base on the WRM scheme determined for each river basin.
2. Water source protection and preservation are meant to protect and conserve water sources and their environment from any destruction or disturbances by natural forces, including draught and man-made activities.
3. Water preservation is meant to maintain the existence and availability of water and water quality, in its functions and benefits.
4. The water quality management shall be done by improving the quality of the water in the water resources.
5. The water pollution control shall be done by preventing the entry of water pollutant into the water body.
6. Every person or enterprise shall not do any activities that will cause the destruction of the water body, impediments in the water preservation activities and/or water pollution.

11

5. WR Planning Systems



12

6. Management of Irrigation Systems.

1. The authority and responsibility for the development and O&M of primary and secondary irrigation systems:
   - across provinces shall be within The National Government.
   - across districts/cities shall be within the provincial government;
   - in a single district/city shall be within the concerned district/city government
2. The right and responsibility for the development and O&M of tertiary irrigation systems shall be with the water user associations
3. The development and O&M of primary and secondary irrigation systems shall be arranged with participation of the community; and
4. The water user associations or other parties in accordance with their needs and abilities may do the development and O&M of primary and secondary irrigation systems

13

7. WR Information Systems.

Water resources information systems have an appropriate place in this new law, such as:

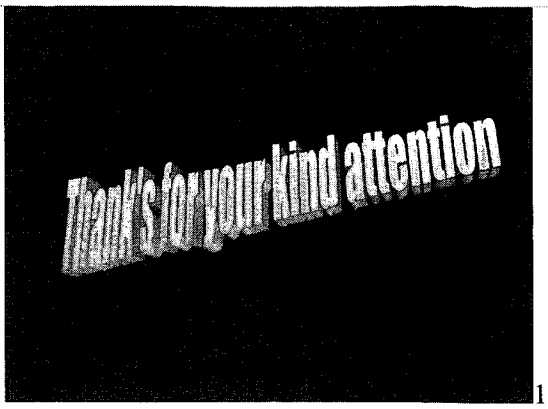
- The information systems consist of the hydrological, hydro-meteorological, hydro-geological conditions, WR policies, infrastructures, technologies, environment, and the socio-economic activities related to the water resources.
- The National Government and the regional governments may set up their technical implementation units to operate water resources information system.
- The National Government and the regional governments as well as the WRM shall in their respective authorities provide water resources information for all parties interested in water resources.

14

7. WRM Financing.

1. **The funding sources for each type of WRM financing may come from:**
   a. **the state budget;**
   b. **private sector budget; and/or**
   c. **revenues of WRM services.**
2. **The water users for basic daily needs and for people's agriculture shall not be charged WRM fee.**
3. **The users of water resources other than for the purposes shall be charged the WRM fee.**
4. **The amount of WRM fee for each type of WR used shall be based on the considerations of the economic abilities of the users' groups and the volume of WR use.**

15



16

Water Use in Metro Manila and Metro Cebu
Cleofin G. Bumatay (Philippines)

WATER USE IN METRO MANILA AND METRO CEBU

CLEOFIN G. BUMATAY
National Water Resources Board
8F, NIA Building, EDSA, Quezon City Philippines

WATER USE IN METRO MANILA AND METRO CEBU

Metro Manila is the main and largest city and national capital region of the Philippines

Metro Cebu is the second largest city in the Philippines and lies at the center of the island of Cebu Province in Region VII

WATER USE IN METRO MANILA AND METRO CEBU

Institutional Framework

Metropolitan Waterworks and Sewerage System (MWSS) is responsible for providing domestic and industrial supply in Metro Manila. Its operations was privatized.

Metropolitan Cebu Water District (MCWD) is responsible for supplying water to Metro Cebu.

WATER USE IN METRO MANILA AND METRO CEBU

Service Coverage

In 2000, MWSS piped water connections is about 67% of Metro Manila's population of about12 million

MCWD serves about 40% of the population of Metro Cebu of about 1.2 million

WATER USE IN METRO MANILA AND METRO CEBU

Water Supply and Demand

The estimated water demand of Metro Manila in year 2000 was 3,800 MLD and projected to increase to 8,000 MLD by 2025. At present, the water supply capacity of MWSS water system is 4,000 MLD.

On the other hand, the estimated water demand of Metro Cebu was 254 MLD and expected to reach 520 MLD by 2025. MCWD's present water supply capacity is 130 MLD

WATER USE IN METRO MANILA AND METRO CEBU

Performance Assessment

The current supply of MWSS is available on average for only 16 hours per day. An average of nearly 60 percent of the water produced by MWSS is non-revenue water, or water that is not billed or unaccounted-for due to illegal connections, leakage, and other reasons.

The Metro Cebu Water District supplies water at an average of 18 hours a day. Its rate of non-revenue water is also relatively high at 38 per cent of the water produced.

WATER USE IN METRO MANILA AND METRO CEBU

Activities for Sustainable Water Supply

Watershed Protection

To protect the water sources as to quantity and quality, MWSS and MCWD are the forefront in the ecological and environmental issues. Other concerned organizations are coordinated in protecting water sources from contaminating, restricting the development of the watershed areas, and in reforestations. Information campaign was also launched to get the public involvement in the ecological and environmental concerns.

WATER USE IN METRO MANILA AND METRO CEBU

Activities for Sustainable Water Supply

Water Conservation

The activities on water conservation include: i) improving the systems' efficiency; ii) improving the metering efficiency and monitoring the unauthorized use of water; iii) encouraging the use of saving devices, application of clean technologies and recycling; and iv) conducting intensive public education programmes on water conservation.

WATER USE IN METRO MANILA AND METRO CEBU

Issues in the Water Supply Sector

The major issues are:

- insufficient system capacity
- competing demands from other uses
- environmental degradation
- outdated and inefficient water distribution system
- rapid growth population
- fragmented and weak development planning
- water pricing

WATER USE IN METRO MANILA AND METRO CEBU

Recommendations

Some of the above issues must be resolved through

- larger public investment in developing new water infrastructure,
- improved efficiency of service delivery and water use,
- high recovery of project costs and economic pricing of water.
- institutional strengthening of water utilities and regulatory agencies,
- greater participation by beneficiaries in project planning and implementation, and
- increased private sector involvement in water supply services would encourage more efficient use of water.

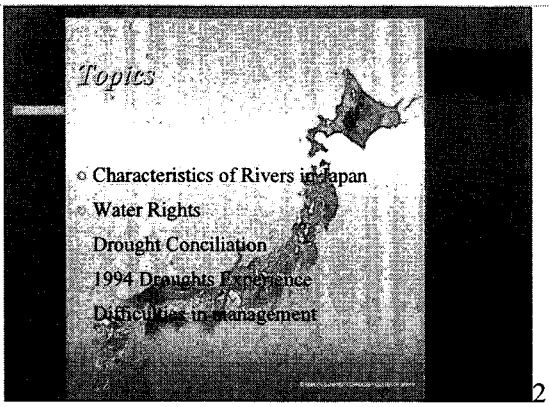
WATER USE IN METRO MANILA AND METRO CEBU

THANK YOU

Systematic Review of Water Management during Drought in Japan

Masahiko Murase (Japan)

1



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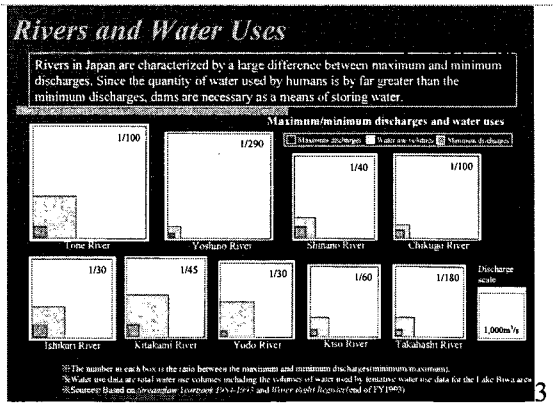

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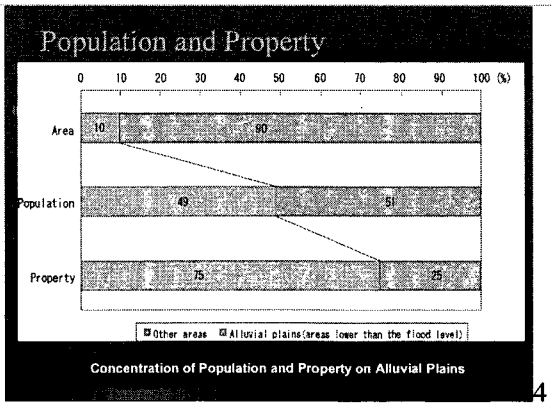

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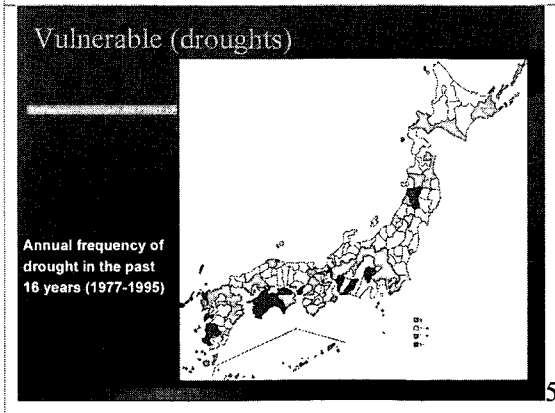

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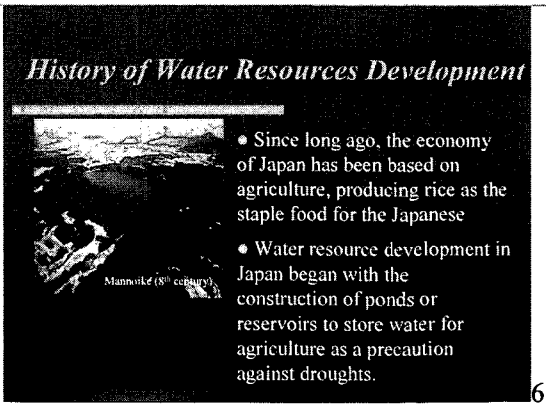


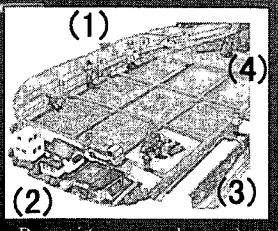
6

History of Water Rights in Japan

- autonomous
- based on conciliation

but,

- vested interests



Example. Ban-sui (use water by turn)
(1) (2) (3) (4)...based on conciliation

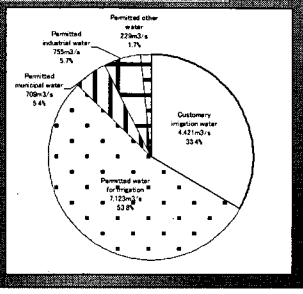
7

River Law – water rights

- Modern system - the backdrop of a system of water rights that had already been endorsed as a customary order and especially of vested rights for the exclusive private use of river water in river basins.
- The old River Law established in 1896 ruled that "those intending to use river locations or river water for private purposes should seek the approval of the Department for Administrative Affairs (Article 18) or that those already in possession of customary water rights "should be deemed as having obtained (such) approval" (Article 11 of the Enforcement Ordinance pertaining to the Water Law).
- The 1964 River Law defines the rules applicable to **the approval of private river water use** (Article 23) and for the consideration given customary water rights as being "**approved de facto**" (Article 87).

8

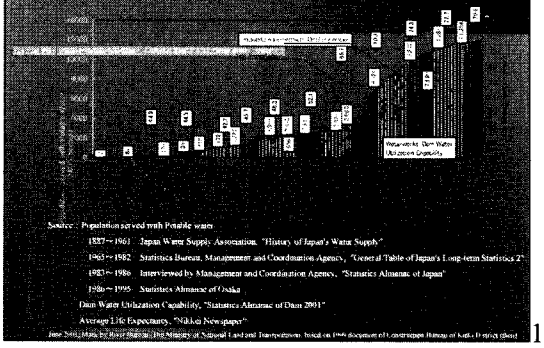
Specification of Water Rights



Vested water rights 33.4%

9

Changes of Average Life Expectancy and Population served with Potable Water



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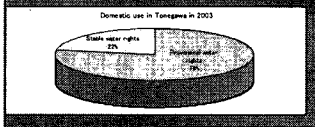
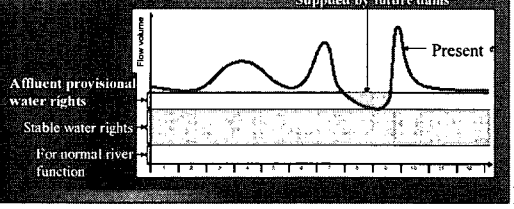
Affluent Water Rights -provisional





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River Law – drought conciliation

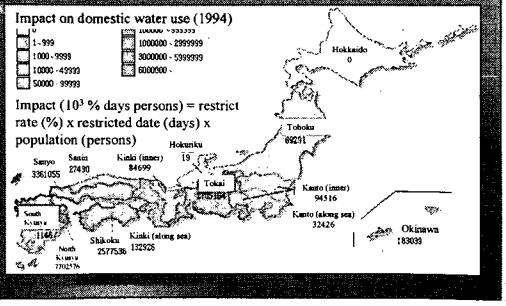
For a case in which an *unusual drought* makes it difficult to adequately use the river water for the permitted utilization purposes or when such a situation is expected, the persons who have obtained permission to use the water (hereinafter, permitted water uses) shall make efforts to consult with one another. In this case, *river administrators* shall exert themselves to provide necessary information for water use conciliation to achieve smooth consultations.

2 In conducting consultations according to the preceding paragraph, permitted water users shall respect the uses of the others.

3 For a case in which no agreement is reached through consultations according to Paragraph 1, the *river administrator* may, when it is requested by the permitted water users or when he deems it would seriously harm the public benefit unless urgent coordination of water uses is effected, conduct the necessary intermediation for coordination of water uses.

12

Droughts in 1994



13

Tonegawa River

	Restriction rate		
	Agricultural	Industrial	Domestic
July 13, 1994 2nd session	0%	0%	0%
July 19, 1994 3rd session	10%	10%	10%
July 28, 1994 4th session	20%	20%	20%
August 15, 1994 5th session	30%	30%	30%
August 29, 1994 6th session	20%	20%	20%
September 19, 1994 (end)	-	-	-

14

Kisogawa River

Agr: agricultural use
Ind: industrial use
Do: domestic use

	Restriction rate (%)							
	Makio Dam			Akigawa Dam		Iwaya Dam		
	Agr	Ind	Do	Ind	Do	Agr	Ind	Do
June 1, 1994	5	10	5	-	-	-	-	-
June 7, 1994	15	20	10	-	-	-	-	-
June 9, 1994						15	15	10
June 11, 1994	25	25	15					
June 13, 1994						20	20	15
June 14, 1994	35	35	20					
June 15, 1994						25	25	17
June 17, 1994	40	40	22	-	-	30	30	20
June 25, 1994	25	25	15	-	-			
July 5, 1994	35	35	20	-	-			
July 7, 1994						35	35	21
July 9, 1994						50	50	25
July 11, 1994	45	40	22	20	11			
July 14, 1994	55	55	30	55	30	55	55	30
August 22, 1994	65	65	35	65	35	65	65	35
September 1, 1994	65	65	33	65	33	65	65	33
October 1, 1994	40	40	20	40	20	40	40	20
October 17, 1994	20	20	10	20	10	20	20	20
November 14, 1994 (end)	-	-	-	-	-	-	-	-

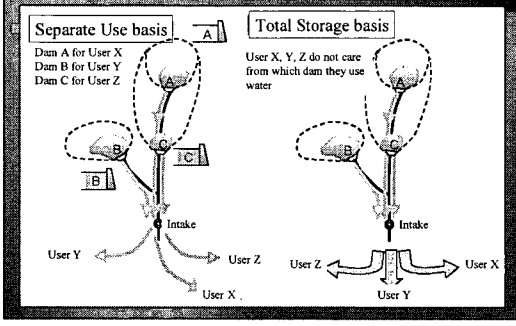
15

Yoshinogawa River

	Restriction rate		
	Kagawa	Tokushima	
		New rights	Priority rights
June 20, 1994	30%	30%	0%
July 4, 1994	60%	60%	0%
July 12, 1994	75%	75%	0%
July 24, 1994	0%	0%	0%
July 27, 1994	60%	60%	0%
August 10, 1994	0%	0%	0%
	* continued after August 31, 1994*		
November 14, 1994 (end)	-	-	-

16

Water Development Styles



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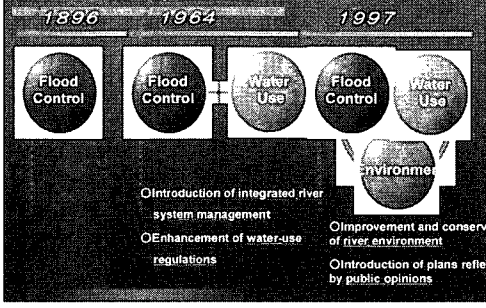
Change in need and River law

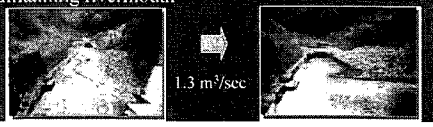


- Introduction of integrated river system management
- Enhancement of water-use regulations
- Improvement and conservation of river environment
- Introduction of plans reflected by public opinions

18

Needs for the Environment

- Navigation
- Fishery
- Sightseeing
- Water quality
- Salinity
- Maintaining rivermouth
- Maintaining river facilities
- Groundwater level
- Landscape
- Habitats
- Recreation and so on…



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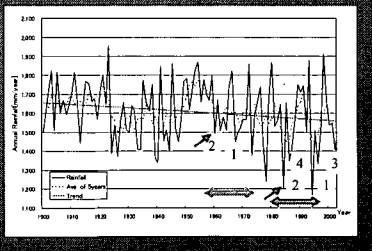
Water Cycle Variability



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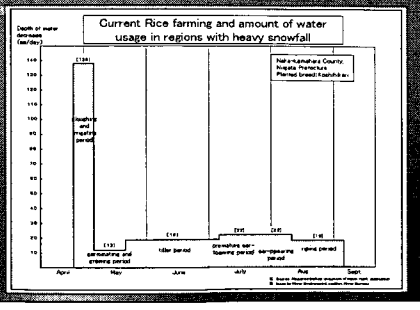
Rice Farming



21

A Case Study in Japan

Sharing information
Collecting data
Sharing database
Establishing models

Clarification of the problems
Modeling of groundwater

Solving the problems

Support Tools

Water for dry-up river

22

Summary

Water rights and 1994 Drought experience
- Historical Backgrounds
- Legislation
- Drought Conciliation

Diverse needs and difficulty in development
- Consensus building

It is effective to share knowledge through exchanging experience in Asia.

23

Join our information exchange!

Contact: murase-m92ft@nilim.go.jp

Thank you!

24

国土技術政策総合研究所資料
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