Major impacts by Reservoir Sedimentation

下流の河床地形変化

Downstream Geomorphology

Degradation and Bed armoring

下流の生態系

Downstream Ecosystem

Reduced ecosystem health (Biodiversity, quality and quantity of food resources, water quality) with the combi-nation of changes in seasonal flow, flood frequency and magnitude

ダム堆砂の影響

ダムの安全

Dam Safety

Clogging of intake and outlet

貯水池の持続可能性

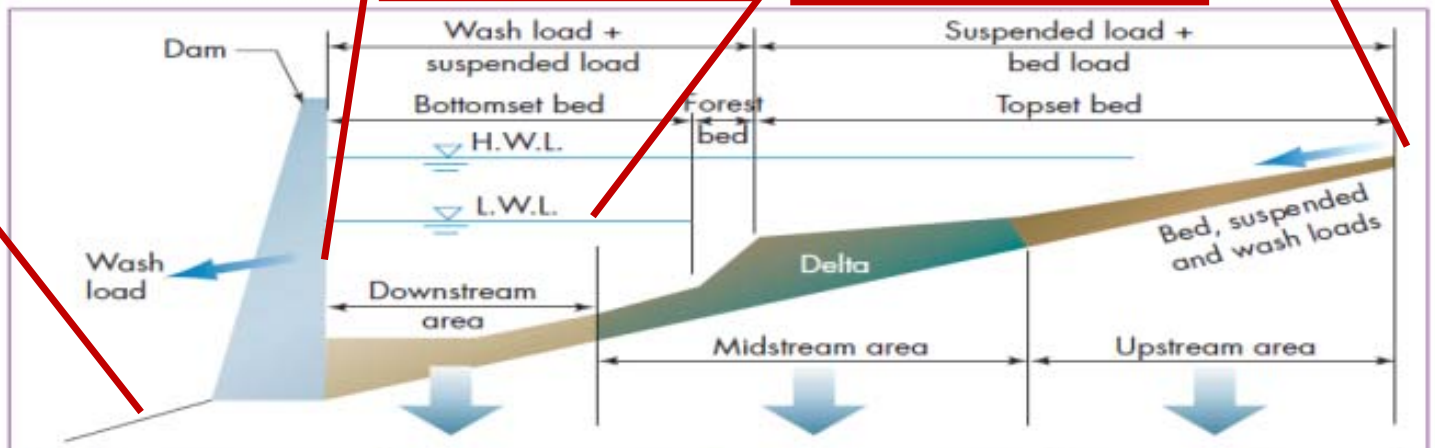
Reservoir Sustainability

Reduction of storage capacity

洪水リスク

Flood Risks

Upstream Channel Aggradation

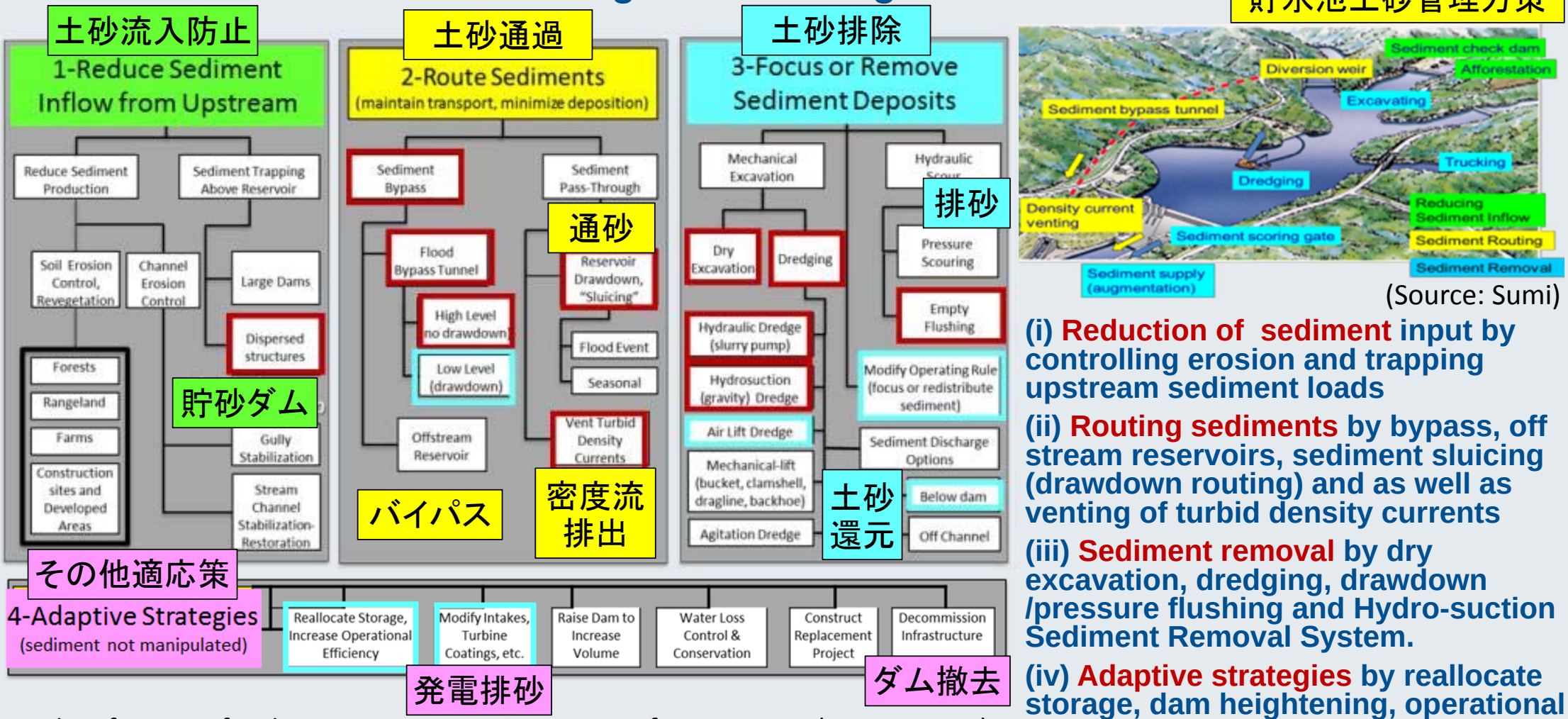


Sediment Property				
	Soil Classification	Main component: Clay and Silt	Main component: Sand	Main component: Gravel and Sand
	Average size grain distribution (%)	Gravel = 3, Sand = 11 Silt = 50, and Clay = 37	Gravel = 12, Sand = 41 Silt = 32, and Clay = 15	Gravel = 28, Sand = 43 Silt = 21, and Clay = 8
	Fine grained fraction, Fc	Fc = above 90%	Fc = about 50%	Fc = under 30%
	Natural water content, w	w = above 100%	w = about 50 to 60%	w = under 40%
	Density Porosity	Low ⟷		High
	Ignition Loss Ig	Ig = about 10%	Ig = about 7%	Ig = about 4%
	Organic materials /Nutrient	High ⟷		Low

Source: S. A Kantoush, T. Sumi and Y. Takemon 2011

Classification of sediment management strategies for reservoirs

貯水池土砂管理方策



Classification of sediment management strategies for reservoirs (Morris, 2015)

(Source: Sumi)

(i) **Reduction of sediment** input by controlling erosion and trapping upstream sediment loads

(ii) **Routing sediments** by bypass, off stream reservoirs, sediment sluicing (drawdown routing) and as well as venting of turbid density currents

(iii) **Sediment removal** by dry excavation, dredging, drawdown /pressure flushing and Hydro-suction Sediment Removal System.

(iv) **Adaptive strategies** by reallocate storage, dam heightening, operational control and dam decommissioning

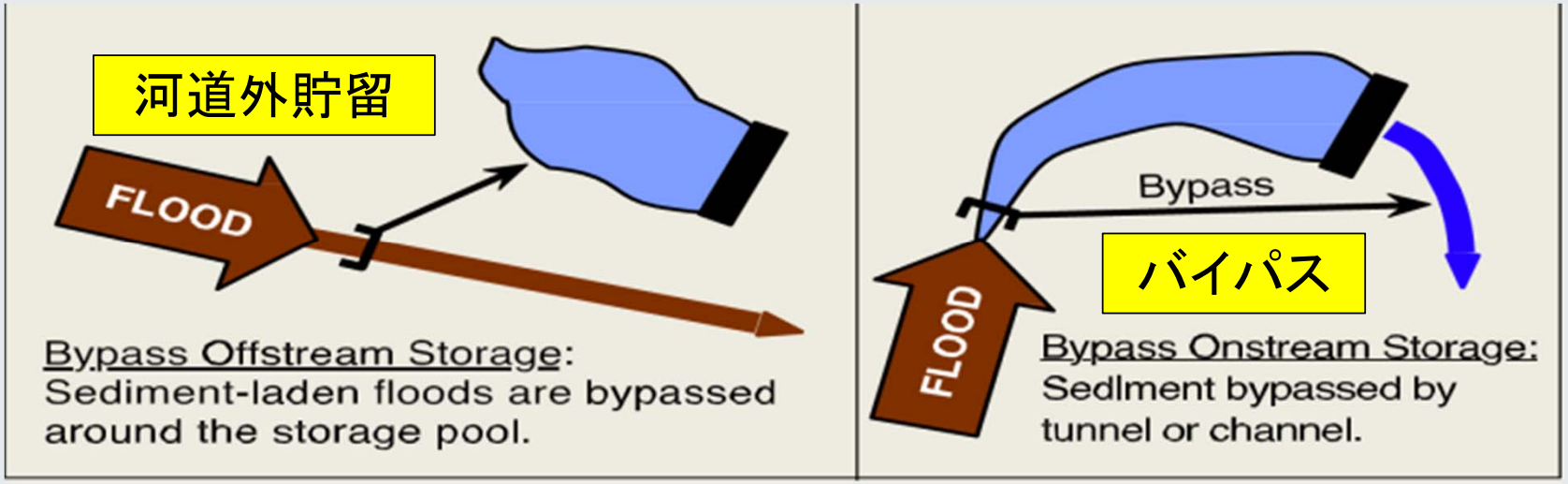
土砂通過対策 （通砂，バイパス，密度流排出）

Chapter 3. SEDIMENT ROUTING BY BOTTOM OUTLETS, SLUICING AND SEDIMENT BYPASS TUNNELS

Sediment Routing is to pass through sediments into the tailwater downstream of the dam.

Various effective techniques can be applied:

- ✓ **Direct bypassing around the dam using tunnels or channels**
- ✓ **Diverting to an off-channel reservoir**
- ✓ **Passing sediments through the reservoir by either sluicing or turbidity current venting**



(Source: Morris）

Sediment Bypass Tunnels バイパス

- **Worldwide, limited numbers of sediment bypass tunnels (SBTs) have been constructed because of topographical, hydrological or economic conditions.**
- **Bypass tunnels have many advantages**
  - Can be constructed even at existing dams
  - Prevents a loss of stored reservoir water caused by the lowering of the reservoir water level.
  - Relatively small impact on the environment downstream because inflow discharge can be passed through tunnels naturally during flood time.
- **Recently, Switzerland and Japan have started initiative**
  - 1st Workshop in Zurich (2016, ETH-VAW), 2nd Workshop in Kyoto (2017, KU-DPRI), 3rd Workshop in Taipei (2019, NTU).
- **In submitted four reports, (R.22) is summarizing all SBT data worldwide and Swiss and Japanese experiences are reported in (R.40) and (R.19).**
- **Upgrading anti-abrasion design for flood tunnel based on the Swiss experience is reported in (R.4).**

スイス

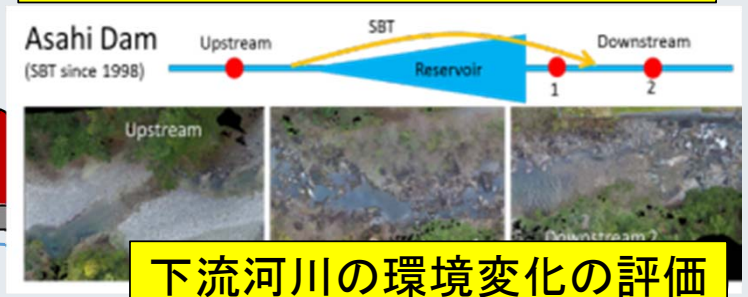
日本

トンネルインバートの摩耗対策

台湾

New challenges on Sediment Bypass Tunnel

第3回排砂バイパス国際会議
（2019, April 9–12）国立台湾大学



下流河川の環境変化の評価

History of SBT in Japan and Switzerland

排砂バイパストンネルの歴史

Japan

Tachigahata Dam(1905)
Nunobiki Dam(1908)
Muko-no-ike(1916)

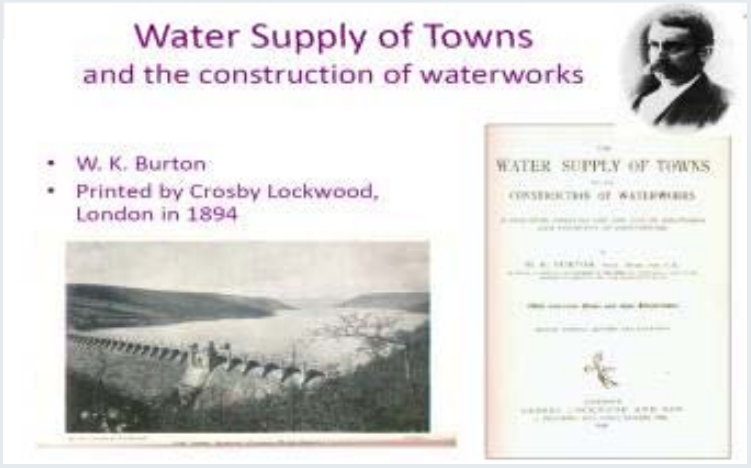
Asahi(1998)
Miwa(2005)
Koshibu(2016)
Matsukawa(2016)

Pfaffensprung(1922)

Runcahez(1962)
Egshi(1976)
Palagnedra(1977)

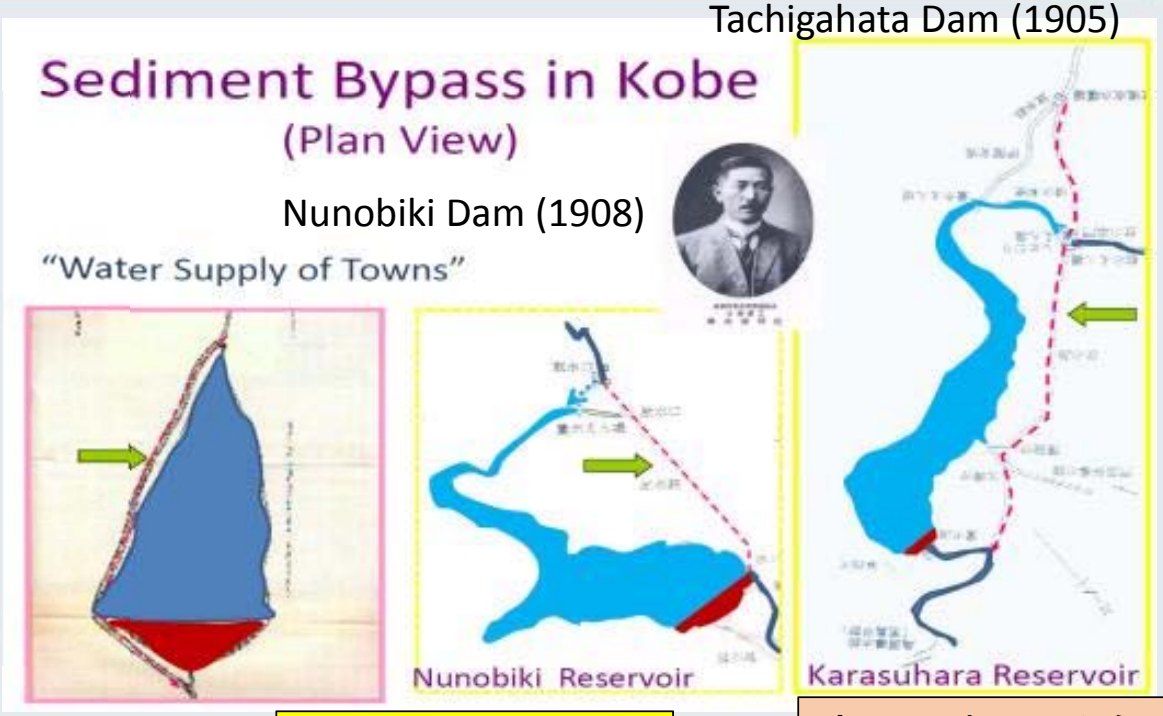
Rempen(1986)
Solis(2012)

Switzerland



ブラタモリ
（神戸港編）
2017.2.18
「赤道を越えても腐らない水」を供給＝有機物を含む土砂の流入防止、として紹介

Tachigahata Dam (1905)



1900 布引五本松ダム（バイパスなし）

流入土砂による堆積が顕著（危機感）

1905　立が畑ダム（当初からバイパスあり）

1908 布引五本松ダムに逆導入（バイパス設置）

土砂流入を効果的に防止

3rd International Workshop on

SEDIMENT BYPASS TUNNELS

2019 Taipei-Taiwan April 09-12

Home | Organization | Program | Submission | Registration | Travel / Tour

Submission Information

On-line Abstract Submission System Open
15th September, 2018

Deadline for Abstract Submission
15th November, 2018

Online Full Paper / Extended Abstract Submission System Open
15th January, 2019

Deadline for Full Paper Submission
15th March, 2019

Themes

We kindly invite you to submit your abstract on one of the following topics:

A. Upstream Aspects
- Hydrology
- Sediment yield

B. Tunnel / Reservoir
- Hydraulics & Sediment Transport
- Planning / Design
- Tunnel / Inlet / Outlet Works
- Invert Abrasion

C. Downstream Aspects
- Morphological Changes
- Ecological Effects

D. Other Aspects
- Construction
- Maintenance
- Monitoring
- Operation

第3回排砂バイパス
国際会議
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国立台湾大学

https://www.iwsbt2019.info/


Field trip 2.5 days (April 10 – April 12)
Taipei Main Station
HSR Chiayi Station
April 10 PM
Shihmen Reservoir
Tsengwen Reservoir
April 11 ~ April 12
Nanhua Reservoir
基隆市
Keelung City
臺北市
Taipei City
桃園市
Taoyuan City
新竹市
Hsinchu City
新竹縣
Hsinchu County
宜蘭縣
Yilan County
苗栗縣
Miaoli County
臺灣海峽
Taiwan Strait
臺中市
Taichung City
彰化縣
Changhua County
花蓮縣
Hualien County
雲林縣
Yunlin County
南投縣
Nantou County
澎湖縣
Penghu County
嘉義市
Chiayi City
嘉義縣
Chiayi County
臺南市
Tainan City
臺東縣
Taitung County
高雄市
Kaohsiung City
屏東縣
Pingtung County
太平洋
Pacific Ocean
南海
South China Sea
巴士海峽
Bashi Channel