

Terms of Reference for the World Organization of Dredging Associations Working Group on Reservoir Dredging

I. Introduction

Because water is one of the most important resources on the planet and meanwhile one of the most essential materials to sustain life on earth, water reservoirs are built all over the world to store water. Reservoirs are created by building a dam in a river, and then impounding a large quantity of water behind it. Reservoirs have different purposes from the production of hydro power; flood risk reduction; storage of water for irrigation, municipal and industrial needs; navigation and recreation.

Reservoirs have become essential for today's society. Hydro power is seen as a clean source of energy although the social issues must not be neglected. It is a green power alternative to fossil fuels. This leads to hydro power as an attractive form of sustainable development. Dams are also used for flood risk reduction, by intercepting the flood wave and more slowly releasing the water downstream. Reservoirs for drinking water and irrigation store river discharges of peak times, so that the stored water can be used over longer time periods. Considering the influence of climate change, these reservoir functions will become more and more important. Therefore, reservoirs and reservoir related issues are significant topics for today's society.

In a 1987 technical paper released by the World Bank, the yearly replacement costs of reservoir storage lost due to sedimentation were estimated at \$6 billion (Mahmood, 1987). These were the costs for only replacing the storage volume loss due to sedimentation using a fixed price per km^3 . In 2003, the annual replacement costs of lost storage were estimated to be \$13 billion, and the annual storage loss was estimated to be between 0.5% and 1.0% (Palmieri et al., 2003). More recently, Annandale et al. (2016) indicate that the global total net reservoir storage space, after accounting for storage loss due to sedimentation, has been constantly decreasing since about 2000, while global storage space per capita has decreased since about 1980. The per capita net reservoir storage space at the year 2016 roughly equals what it was in 1965.

In the recent decade, engineers and scientists are searching for solutions to tackle this problem. Results show that sedimentation of many big reservoirs is severe all around the world, and it is proposed that one of the solutions is dredging. It is expected that the treatment on each reservoir will be different since each reservoir has its own characteristics, thus it becomes necessary to analyse these characteristics. It is proposed to build an inventory of the relevant data regarding the reservoirs of interests. However, the data currently available with respect to the reservoirs is inadequate for dredging applications. The detailed information of the sediments in the reservoirs are of crucial importance for reservoir dredging and this information in most cases is unavailable.

In April 2019, the 22nd World Dredging Congress & Exposition (WODCON XXII) was held in Shanghai. During this conference, the World Organization of Dredging Associations (WODA) has announced the Shanghai Consensus for Promoting Sustainable Dredging Development (WODA board, 2019). The consensus declares that the world dredging community is fully committed to the global sustainable development and should play a crucial role in the process. According to this spirit, meanwhile considering the complexity of the

problem and the scarcity of the information, WODA decided to establish a Reservoir Dredging Working Group (ResDred WG) to improve the exchange of information and the generation of knowledge. By utilizing the wisdom of the international dredging community, WODA believes that these difficult problems can be well analysed and good solutions can be generated to restore our reservoirs.

II. Objectives

The first objective of the ResDred WG is to provide useful information for the target audiences. The target audiences are the relevant parties involved in reservoirs, including the authorities managing the dams and reservoirs, the stakeholders and decision makers, the consultants, the universities, the equipment manufacturers and contractors. The following information will be provided:

1. Guidance on how to extend the life time of a reservoir in a sustainable way, among which the implementation of dredging techniques will be the main focus.
2. Guidance on how to improve the productivity of a reservoir within its lifetime, in which the focus is to maintain its capacity of water storage by dredging techniques, so that the functions of the reservoir will be secured.
3. Guidance on how to include dredging as a long-term operation and maintenance action into the early design and planning phase of new reservoir and dam projects.
4. Guidance on how to utilize dredging techniques to improve the ecosystem in the reservoir area.
5. The best practices and case studies which have been carried out with regard to the reservoir sedimentation management. The case studies will present the best practices and the pitfalls to avoid.

The above mentioned information will be included in a WG report.

The second objective is to promote the exchange of knowledge during the process. It is expected during the work activity of the WG, experts from different disciplines and different geographic areas will learn from each other and build up friendship with each other. In this way this WG is expected to set a good example for the later other WODA WGs.

III. Work Scope

The ResDred WG focuses on the following products:

1. Building the inventory of the main problems and their causes regarding the reservoir sedimentation.
2. Characterization of the different types of reservoirs according to their shapes, purposes and types of sedimentations. This helps to determine what type of sediment management would be feasible for a certain type of reservoir.
3. Building the inventory of solutions for restoring and improving the reservoir functions, and also for extending the reservoir lifetimes.
4. Description of direct and indirect positive and negative consequences of solutions, including the ecological, economic and social effects.
5. Showing examples and case studies. The case studies will present the best practices and the pitfalls to avoid.
6. Bringing the solutions into the design period of the reservoirs and dams to improve the dredging availability, e.g., by reserving spaces for certain impermanent dredging systems.
7. The benefit-cost analysis with regard to reservoir dredging and non-dredging solutions.

IV. Deliverables

The ResDred WG delivers the following products:

1. The findings of the WG, as described in Section III, will be summarised in a WODA Guidance on Reservoir Dredging, the format of which is to be decided at a later stage. This document will be published with an ISBN number, and it will provide the professional community with an overview of the best solutions to reservoir sedimentation problems, including the social, economic and environmental effects.
2. A dedicated section on the WODA website, Woda.org., where the WG will regularly publish updates about their activities and results. The link to the website shall be accessible via the official websites of CEDA, EADA and WEDA.
3. The WG will also broadcast regular updates via social media.
4. The WG will give presentations about its work on the major conferences of the dredging associations (CEDA, EADA, WEDA and WODA), and also on the other relevant conferences.
5. Only when it is necessary and feasible, the WG can collaborate with the International Organization for Standardization (ISO), to publish technical standards on reservoir dredging.

V. Timetable

1. The WG will have its first meeting in the form of videoconferencing in September 2020 at which point the Draft Terms of Reference will be finalised and a Work Plan will be developed.
2. At the 23rd World Dredging Congress (WODCON XXIII), April 2022, the WG will deliver a presentation, introducing the progress.
3. The WG is expected to deliver their report by the end of 2022.

VI. Membership

By disciplines, WODA WG ResDred is envisaged as an international multi-discipline group comprising experts with knowledge and experience with the dredging technology, the reservoir management, the reservoir siltation and removal, and the reservoir ecosystem. Besides, experts on the environment and ecosystem, and also economists are welcome to join the WG.

By geographic distribution, a broad membership from all the WODA regions is expected.

Members shall be voluntary and competent. Members shall have the passion to contribute to the world dredging community, and be able to participate in the meetings and events organized by the WG, and bear the expenses required to attend the WG meetings. Members shall complete the tasks of the WG on time.

WG members will receive a certificate for the membership issued by WODA.

VII. Organisation

The WG is expected to have about 50 to 60 members. Three regional associations, CEDA, EADA and WEDA contribute around 15 members respectively. Small fluctuation of the numbers is allowed depends on the willingness from each region.

The daily coordination and management is carried out by the WG committee, the committee consists of the following members:

- Polite Laboyrie (Chairman)
- Johan Pennekamp (CEDA)
- Cees van Rhee (CEDA)
- David Padman (EADA)
- Xianguo Qian (EADA)
- Marcel Hermans (WEDA)
- Tim Randle (WEDA)
- Xiuhan Chen (General Secretary)

It is the duty of the WG committee to divide the tasks, organize the meetings, contact the WG members of their own region and periodically communicate with the WODA Technical Orientation Committee (TOC), in the form of status reports. These status reports will include a summary of the knowledge and results generated by the WG based on the work scope described in Section III, as well as the points that require discussion with, and/or guidance from the TOC. The status reports will also include the record of staff composition of the WG, and the record of the main activities that have been carried out by the WG.

For reasons of efficiency, it is expected that the major part of the work of the WG will be conducted in the digital space. The WG is encouraged to schedule their face-to-face meetings alongside regional conferences of WEDA, CEDA, EADA, and the WODCON. For online meetings with more than ten participants, a host will be appointed to control the process and order of the meeting. By principle, members of the WG committee shall take the responsibility of hosting.

References

Annandale, G., Morris, G. & Karki, P. (2016). Extending the life of reservoirs: sustainable sediment management for dams and run-of-river hydropower. *Washington, D.C.: World Bank Group.*

Mahmood, K. (1987). Reservoir sedimentation: impact, extent, and mitigation. World Bank technical paper; no. WTP 71. *Washington, D.C.: The World Bank.*

Palmieri, A., Shah, F., Annandale, G. & Dinar, A. (2003). Reservoir conservation volume I: the RESCON approach - economics and engineering evaluation of alternative strategies for managing sedimentation in storage reservoirs. *Washington, D.C.: The World Bank.*

World Organization of Dredging Associations (WODA) board. (2019). WODCON XXII —Shanghai Consensus for Promoting Sustainable Dredging Development, *the 22nd World Dredging Congress & Exposition*, April 22nd-26th, Shanghai, China.

About WODA

The World Organisation of Dredging Associations (WODA) is composed of three independent sister associations with separate corporate structures: the Western Dredging Association (WEDA) serving the Americas, the Central Dredging Association (CEDA) serving Europe, Africa, and the Middle East, and the Eastern Dredging Association (EADA) serving the Asian and Pacific region. www.woda.org

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