A Report on Training-cum-Workshop on "Fish Pass Design" conducted at National Water Academy, Pune (21-22 February 2018)

Prepared by

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1. Introduction and Objective

India has over 5,000 large dams constructed for various uses including irrigation, flood control, navigation and hydroelectric power generation. These dams provide the society with substantial benefits, but if poorly planned, designed or operated, they can also have adverse impact for the ecological health of rivers and the economic and social well-being of communities dependent upon the goods and services provided by healthy rivers. As the number of dams continue to increase, so too has concerns for their effects on fish populations. One of the most obvious and immediate effects when a water resources structure is constructed is the prevention of the longitudinal migration of fishes.

Any artificial obstruction which prevents the free passage of migratory fish to and from their spawning ground is naturally detrimental to fisheries, as it is bound to materially reduce or even prevent the propagation and perpetuation of stock by the loss of upstream spawning and rearing grounds. Migratory species are particularly affected by dams and other obstructions on water courses if they are unable to reach their spawning grounds, may become extinct ultimately.

In this background, the role of fish passes is paramount for maintaining sustainable riverine fish population. Thus, it is important to provide the fish passage to allow free movement of fishes on various water resources structures. It is essential that designers of Water Resources Structures also have knowledge about the mechanism of fish pass, design of fish pass, efficacy of fish pass under Indian conditions etc. Indeed, Capacity Building of Indian Professionals in Ecological, Hydrological, Hydraulic and Structural aspects of Fish Ladder design is very much important for longitudinal connectivity of rivers.

The NWA conducts training programs for Engineers from Central / State/ Public Sector/Undertakings/Private Organizations on design aspects of Water Resources Structures like Dams, Barrages, Weirs, Canal Network etc. In its efforts to build the capacity of concerned designers in understanding the mechanism of fish pass, design of fish pass, efficacy of fish pass under Indian conditions etc. NWA, Pune conducted two days Training-cum-Workshop on "Fish Pass Design" during 21-22 February 2018.

2. Broad Outline of Topics covered and Resource Persons during the program.

The program comprised of classroom sessions, case studies and discussions. The following topics were covered during the program.

- Status of Fish Pass in India – History, Present and Future Plans
- Role of Hydrology, Hydraulics in Designing of Fish Pass – case studies from Indian Rivers
- Fish Pass Design at Cross River obstacles
- Swimming and orientation behavior of fishes in upstream direction
- Common types of fish ways – examples of well-functioning of fish pass – an overview
- Maintenance of Fish Ways
- General Design of fish pass, fish lock in Farraka Barrage – experience
- Fish lifts and fish sluice; General hydraulic design;
- Technical details (design of intakes, outlets and lighting conditions)
- Open house discussion

The resource persons for this program were drawn from ICAR-CIFRI and Retired Experts in the field The schedule drawn for the program is enclosed as *Annex-A*.

3. Participants and Target Group

The program bulletin was widely circulated amongst the various Central, State, Public Sector Undertakings, Academic Organisations etc. who are involved in Design, Construction and Maintenance of

Water Resources Structures. The program was targeted for the officials in the rank of Superintending Engineer/ Executive Engineer / Assistant Executive Engineers etc. NWA received huge response for the course. In a short period of two weeks, NWA received 39 nominations. However, a total of 28 officials from the different Central, State, PSUs and Private Organisations reported for the Training-

Cum-Workshop. The detailed list of the participants is enclosed as *Annex – B.*

4. Activities during the program

The program was inaugurated by Dr B P Das, Former Engineer-in-Chief & Chief Advisor, Department of Water Resources, Odisha and Expert. In his address, he emphasized the need for development of

Water Resources Projects with due consideration to the Ecological and Environmental concerns. He emphasized that need for providing appropriate Fish Passes in all cross river water resources structures to facilitate easy movement of fishes to preserve the riverine ecosystem.

Dr B K Das, Director, CIFRI, in his address informed the expertise & facilities available with CIFRI, who can undertake studies of Fish characteristics and behavior for any stretch of river in India. He emphasized the need of a comprehensive study for appropriate hydrological and structural design of fish pass as per the biological characteristics of the Fish.

Shri Aditya Sharma, Director-in-Charge, NWA also addressed the gathering and informed that NWA is taking up training and Capacity Building in new areas. The Training-cum-Workshop on Fish Pass Design is being conducted for the first time in NWA and more such programs related to ecological provisions like e-flow; environment, social and economic aspects will be conducted.

Shri D S Chaskar, Director & Program Co-ordinator, NWA, and also addressed the gathering giving brief overview of Workshop.

The session plan was a blend of a class-room sessions coupled with open house discussion. The program had altogether 10

sessions. An interactive open house discussion was conducted before the Valedictory Function and all the Guest Faculty, Director-in-Charge, NWA, Program Co-ordinator, NWA and the participants of the Workshop participated in the Open House Discussion. Many of the participants shared their experiences and put forth various suggestions to improve interaction between biologists and engineers on the subject. Participants from CWC highlighted the importance of including the provision of fish ladder at the Detailed Project Report Stage. It was emphasized to formulate guidelines for points to be seen while appraisal of such provisions. During the discussions possibilities of providing Fish Passes in the existing barrages were also explored. Many issues like Fishing Holidays; River Fish Map; E-flow for lean season; Operation & Maintenance; need for biological data for fish ladder design etc. were discussed. Recommendations of the Workshop were formulated based on the discussions throughout the course as well as particularly during the Open House Discussions. A gist of recommendations emerged during the workshop are enclosed as *Annex-C.*

5. Conclusion

The Program has been found to be very successful, in view of keen interest of the participants and their laudable active participation in lectures, as well during open-house discussions. The Feedback of the program is very positive and encouraging. The analysis of the feedback taken by NWA is attached as *Annex-D.*

SITTING (L TO R) S/S: DR. A K SAHOO, DR. B K DAS, ADITYA SHARMA, DR. B P DAS, D S CHASKAR, HARKESH KUMAR

STANDING (L TO R) 1st row S/S: V R MURTHY, Y SATYA SRINIVAS, N GOPI, C D SAJEEV, N.V.R.N.S.V. PRASADA RAO, REVATI RAMAN, JEETA RAM, AJIT SAVADI, Y N SRIVASTAVA, M RAVITEJA, RAVI KUMAR GOEL, MOHD. AFAQ, ABHIJEET KASHLIWAL, MANAS HANS YADAV, S P SINGH

STANDING (L TO R) 2nd row S/S: MAYANK SUHIRID, TUSHAR J SHAH, NARESH R PATEL, AMIT GUPTA, ADITYA S S MOOLA, ANNEPU PRAVEEN, NAGARAJ V, VIVEK JOHARI, SAKET KRISHNA, SURJEET SINGH, SAMARTH AGARWAL, ASHWANI KUMAR VERMA

Annex-A

Central Water Commission

National Water Academy, Pune

Training-cum-Workshop on Fish Pass Design

Two days : 21-22 February 2018

Session Plan

	Timings (Hrs)	*Session*	*Faculty*	*Coverage*
Day 1	0930-1000			Registration
	1000-1030			Inauguration
	1030-1130	I	Dr B K Das, Director CIFRI	Status of Fish Pass in India – "History, Present and Future Plans"
	1145-1245	II	Dr B P Das Former EIC & CE DoWR,	Role of Hydrology, Hydraulics in Designing of Fish Pass – case studies from India Rivers
	1245-1345	III	Dr A K Sahoo Scientist, CIFRI	Fish pass Design at Cross river obstacles
	1330-1430 Hrs : Lunch Break			
	1430-1530	IV	Dr B K Das, Director CIFRI	Swimming and Orientation behaviour of fishes in upstream direction
	1600-1700	V	Dr B P Das Former EIC & CE DoWR,	Common Types of Fish ways – examples of well functioning of fish passes – an overview Maintenance of Fish Ways
Day 2	1000-1100	VI	Dr A K Sahoo Scientist, CIFRI	General design of fish passes, Fish lock in Farakka Barrage : Experience
	1130-1230	VII	Dr B P Das Former EIC & CE DoWR, Odisha	Fish lifts and fish sluices ; General hydraulic design
	1230-1330	VIII		Technical Details (design of intakes, outlets and lighting conditions
	1330-1430 Hrs : Lunch Break			
	1430-1530	IX	All Faculty	Open House Discussion / Recommendations
	1545-1645	X		Valedictory

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033-25920177, 08420229567 director.cifri@gmail.com, basantakumard@gmail.com

Dr. B P Das, Fomer EIC, DoWR, Odisha : 09937398730, bishnupdas@hotmail.com

Dr A K sahoo, Scientist, CIFRI : 09674301441 amiya.sahoo@icar.gov.in, amiya7@gmail.com

Annex-B

TRAINING-CUM-WORKSHOP ON FISH PASS DESIGN

21-22 February 2018

LIST OF PARTICIPANTS

Sr. No.	*Organisation, Name and Designation*
A	***CENTRAL WATER COMMISSION***
1.	Shri Harkesh Kumar, Director-Gates (E&NE) Dte., New Delhi
2.	Shri Samarth Agrawal, Deputy Director – Emb (E &NE) Dte., New Delhi
3.	Shri Saket Krishna, Deputy Director – Gates (E&NE) Dte., New Delhi
4.	Shri Manas Hans Yadav, Deputy Director-BCD (E&NE) Dte., New Delhi
5.	Shri Abhijit Kasliwal, Deputy Director- HCD (E&NE) Dte., New Delhi
6.	Shri Nagaraj V, Assistant Director-BCD (E&NE) Dte., New Delhi
7.	Shri Amit Gupta, Assistant Director-HCD (E&NE) Dte., New Delhi
8.	Shri Ashwani Kumar Verma, Assistant Director –ND&HW Dte., New Delhi
9.	Shri Vivek Johari, Assistant Director – BCD (N&W) Dte., New Delhi
10.	Shri Annepu Praveen, Assistant Director – BCD (N&W) Dte., New Delhi
11.	Shri C D Sajeev, Assistant Director –II, Hydrology (N) Dte., New Delhi
12.	Shri Jeeta Ram, Deputy Director, M&A Dte., Guwahati
13.	Shri Mayank Suhirid, Deputy Director, M&A Dte., Faridabad
14.	Shri Aditya S S Moola, Deputy Director (Appraisal), Nagpur
15.	Shri Ravi Kumar Goel, Deputy Director, M&A Dte., Vadodara
16.	Shri S P Singh, Deputy Director, M&A Dte., Lucknow
17.	Shri Mohd Afaq, Deputy Director, Mon Dte., Agra
B	***CENTRAL WATER AND POWER RESEARCH STATION, PUNE***
18.	Shri Y N Srivastava, Scientist ‘D’
	GOVERNMENT OF ANDHRA PRADESH
19.	Shri Y Satya Srinivas, Executive Engineer, Planning
20.	Shri N V R N S V Prasada Rao, Deputy Executive Engineer, Planning
21.	Shri N Gopi, Assistant Executive Engineer, Planning
22.	Shri Raviteja, Assistant Executive Engineer, PIPHW Circle
C	***GOVERNMENT OF GUJARAT***
23.	Shri V R Murthy, Deputy Executive Engineer, NWRS & KD, Vadodara
24.	Shri T J Shah, Assistant Engineer, NWRS & KD, Vadodara, Gujarat
25.	Shri N R Patel, NWRS & KD, Gandhinagar
D	***M/S S J V N LIMITED***
26.	Shri Revati Raman, Sr Manager
27.	Shri Surjeet Singh, Manager
E	***M/S ARUP INDIA PRIVATE LIMITED, Mumbai***
28.	Shri Ajit Savadi, Head of Infrastructure

Annex C

A gist of recommendations emerged during the workshop

i. Every cross river obstacle like Dam, Barrage, Weir etc. should have a provision of Fish Pass at suitable location based on the scientific study. Numbers of Fish Passes and length of fish pass to be provided on the structure should be decided based on type of migratory fish species and their pattern of fish migration including flow pattern across the structure.

ii. The requirement of Fish Pass for Dams, Barrages and Weirs etc. should be taken in account at Detailed Project Report (DPR) Stage itself and suitable provision should be made based on the preliminary short term survey and secondary data available.

iii. The design of Fish Passes should take into account the biological requirement of fish species of that river along with the hydrological, hydraulic & structural aspects.

iv. Comprehensive study for fish behavior, fish migration, fish size etc and other biological & ecological aspects should be undertaken before designing a Fish Pass.

v. ICAR-CIFRI, CWC & other State Organizations should work in close co-ordination with each other for finalizing the design parameters for Fish Passes.

vi. Collaborative efforts between biologist (fishery) and engineers (hydraulics and design) are must to design appropriate Fish Pass and to ensure its efficacy.

vii. The existing Fish Passes need to be surveyed for their efficacy. Based on the study, proper suggestions or guidelines must be formulated for suitable operation & maintenance schedule. Further, a standard operation & maintenance manual needs to be prepared for easy reference.

viii. If the existing Fish Passes are not functioning effectively, the reasons must be analyzed properly for its structural suitability, proper positioning and operation protocol etc. The hydraulic efficacy needs to be evaluated using Modeling Techniques. The fish pass may be remodeled, repaired or renovatedas needed based on the analysis.

ix. Every effort should be made to bring international expertise about Fish Pass Design into India to share their experience, so that Indian fish pass design could be modeled/structured based on local fish species. Experts from Australia, Europe, UK, USA who have worked extensively on the subject can be involved in the various trainings, conferences, seminars organized on the subject.

x. Comprehensive database should be created for all river basins along all major stretches in India giving details about the fish species, their behavior, migration, pattern etc. so that designers have ready access to the data while designing the water resources structures.

xi. Capacity building of Biologists as well as engineers dealing the subject may be taken up in a big way for the officers from Central, State, PSUs and Consultants as well.

xii. Committee of Experts may be formed comprising of officers from CWC, CWPRS, CIFRI, NWA, MOEF &CC for development of modeling techniques and protocols for hydrologic, hydraulic aspects of Fish pass as well as other aspects such as noise modeling, lightning modeling etc.

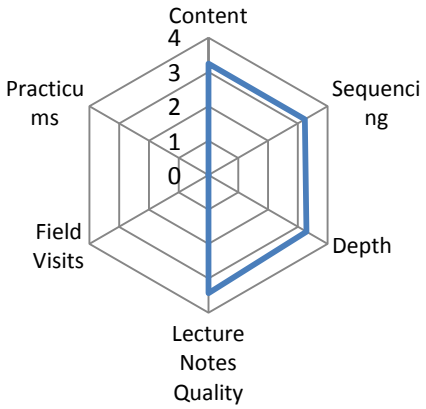
xiii. Every state should depute two officers from the Department of Fisheries to Water Resources Department to co-ordinate with the designers of Water Resources Structures.

Annex-D

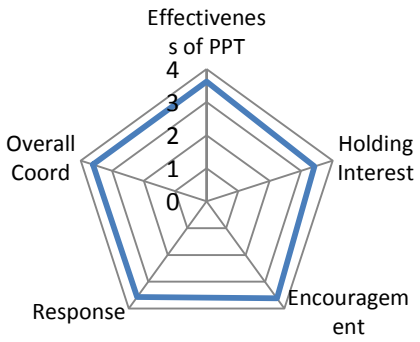
COURSE FEEDBACK ANALYSIS

Name of the Program : Fish Pass Design
Duration of the Program : 21-22 FEBRUARY 2018
Total No. of Participants : 28

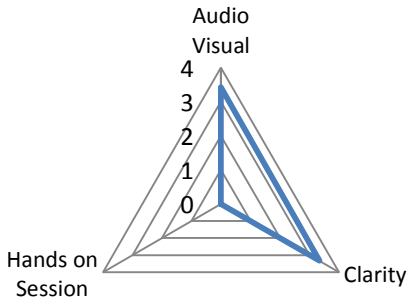
Coverage and Content



Faculty and Coordination



Teaching Aids & Resources



Overall Course Grading by Participants
(On scale of 0 to 10)

8.8

Pace of the Program

Duration of the Program