

## SUPPLEMENTAL MATERIALS

*ASCE Journal of Water Resources Planning and Management*

# May the Odds be in Your Favor: Why Many Attempts to Reoperate Dams for the Environment Stall

Afua Owusu, Marloes Mul, Pieter van der Zaag, and Jill Slinger

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## 1- Participant expertise

You are participating in a research study titled **Dam re-operation for implementation of environmental flows**. This study is being done by Afua Owusu, Dr. Marloes Mul, Prof. Pieter van der Zaag and Prof. Jill Slinger from IHE Delft Institute for Water Education and TU Delft, Netherlands.

This survey will take you approximately **15** minutes to complete. The data will be used to identify the hurdles encountered in re-operating dams and how these hurdles have stalled the process or how they have been overcome. The results of the survey will be published in an open-access scientific journal.

Your participation in this study is entirely voluntary and you can withdraw at any time. No personal data will be shared and all personal data will be deleted 6 months after the end of the study.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. We will minimize any risks by safeguarding the list of respondents. Furthermore, responses will be anonymized and analysed based on the role of respondents with respect to dam re-operation (E.g.: dam operator, local government agency, and scientist).

Thank you in advance for participating in this survey.

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*This study is being conducted in line with the [Integrity Policy](#) of TU Delft, Netherlands. Kindly contact Afua Owusu at: [a.owusu@un-ihe.org](mailto:a.owusu@un-ihe.org) if you have any questions.*

This research is part of the EuroFLOW project (EUROpean training and research network for environmental FLOW management in river basins) funded by the European Union's Horizon 2020 Research and Innovation Programme under the

### Useful to know:

This study concerns existing dams which were originally designed and/or operated primarily for conventional purposes such as hydropower generation, flood protection and irrigation.

Dam re-operation is therefore defined as the change in flow release practices to provide environmental flows (e-flows) for downstream aquatic ecosystem needs.

What is your main role with respect to dam re-operation for environmental flows implementation?

- Civil society advocate/ environmentalist
- Dam operator
- Government agency official
- Scientist/ Researcher
- Other, please specify

How many years of experience do you have in this role?

- 0 - 5 years
- 6 - 10 years
- 11 - 20 years
- > 20 years

How many cases of dam re-operation have you been involved in?

- 1
- 2
- 3-5 cases
- More than 5 cases

How many different river systems do these cases cover?

- 1
- 2
- 3-5 river systems
- More than 5 river systems

## **2- To get info on specific case**

Of these cases, choose a case that you consider formative or significant and answer the following questions in the survey with

respect to this case.

Which dam(s) were part of the study?

In which river system are these dams located?

In which country is/are the dam(s) located?

What was the primary purpose of the dam at construction?  
(Select all that apply)

- Flood control
- Hydropower
- Irrigation
- Navigation
- Recreation

Water supply

Other, please specify

In which year did work on e-flows/ river restoration/ dam re-operation begin?

What was the motivation/goal for dam re-operation in this case? (Select all that apply)

- Habitat protection/ restoration
- To protect a commercial resource
- To protect an endangered species
- To enhance scientific knowledge
- Other, please specify

What were the triggers/ enabling conditions for the work on dam re-operation to begin? (Select all that apply)

- Legislation or policy on river/ dam/ environment
- Research base (eg: findings from environmental impact assessment on dam, models/ study on e-flow requirements of downstream ecosystems)
- Natural trigger event (eg: flood, drought)
- Man-made trigger event (eg: change in government, new dam operators)
- Planned upgrade or maintenance of dam
- Request for dam re-operation (including lawsuits)
- Other, please specify

What is the status of work on e-flows/river restoration/dam re-operation?

- On hold/ stalled/ abandoned
- Being implemented

### **3- (A- Info on stalled cases)**

What activities were implemented to re-operate the dam(s)?  
(select all that apply)

- Drafting/ updating of legislation or policy
- Flow experiments
- Workshops/ meetings with stakeholders

- Scientific studies (e.g.: environmental impact assessment of dam, trade-off studies, e-flow studies)
- Physical modification to dam
- Modelling
- Other, please specify

Which flow manipulation was targeted in dam re-operation?  
(Select all that apply)

- Minimum flow
- High flow pulse (where water levels remain in the main channel banks)
- Flood releases (where water levels over-top the main channel banks)
- Entire flow regime
- Ramping rates/ hydro-peaking rates
- Other, please specify

Who were the stakeholders involved in the case? (Select all that apply)

- National agencies
- Regional/State agencies
- Local government agencies



- Dam operator
- NGOs
- Civil society groups/ environmentalists
- Citizens/ general public
- Scientists
- Other, please specify

What was the main hurdle encountered? (i.e.: Why did the process of dam re-operation stall?)

How long after work started was this hurdle encountered?

At which stage in the process of dam re-operation was this main hurdle encountered? / At which stage did the process of dam re-operation stall?

- In establishing a shared understanding among stakeholders that dam re-operation/ e-flows are needed
- In determining e-flow requirements of downstream ecosystems
- In translating the e-flow requirements into specific flow releases from the dam
- In executing the dam release/flow recommendations (ie: moving from recommendation to actual implementation)
- Other, please specify

What was done to overcome this major hurdle?

In which year did work on e-flows/river restoration/dam re-operation actively stop?

Were there other hurdles to dam re-operation for e-flows implementation?

Yes, please list these other hurdles

No

What factors/actions would you say was missing in the effort to overcome the hurdles?

- Scientific basis to determine e-flows and downstream effects
- Supporting legislation or policy
- Public interest/engagement
- Flow experiments
- Natural trigger event (eg: flood, drought)
- Physical modification to dam
- Simulation or optimization modeling
- Synergy (little of no trade-off) with existing water uses of the dam
- An agreed/fixed timeline for dam re-operation
- Collaboration and commitment among stakeholders
- Other, please specify

In your opinion how important would these factors/actions have been to successfully overcoming the hurdles and successful

## dam re-operation overall?

	Extremely important	Very important	Moderately important	Slightly important
» Scientific basis to determine e-flows and downstream effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Supporting legislation or policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Public interest/engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Flow experiments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Natural trigger event (eg: flood, drought)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Physical modification to dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Simulation or optimization modeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Synergy (little of no trade-off) with existing water uses of the dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» An agreed/fixed timeline for dam re-operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Collaboration and commitment among stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Other, please specify	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<div style="border: 1px solid black; height: 80px; width: 100%;"></div>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rate the impact of this case in terms of the following:

- the biophysical world (eg: target species, downstream habitats)

- the stakeholder network
- the diffusion of the ideas/lessons and established network to other cases (including work beyond dam re-operation)

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Biophysical world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholder network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diffusion of ideas and established network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you share reports about this case and/or emails of others in your network who have information on this case?

NB: Due to privacy constraints and ethical considerations, your response to this survey has been anonymised, however if you are willing to share reports or emails of other resource persons with respect to this case, kindly share your name and email and you will be contacted by the research team. If not, please click 'Next' to proceed to the next question.

Yes

No

Have you been involved in another dam re-operation case that you consider formative or significant?

**NB:** Answering 'yes' to this question routes you to question number 5 of the survey for you to answer questions on this 2nd case. This will roughly double the time to complete the survey. Select 'No' to proceed to the end of this survey.)

Yes

No

## **N2- To get info on specific case (2)**

Of these cases, choose a case that you consider formative or significant and answer the following questions in the survey with respect to this case.

Which dam(s) were part of the study?

In which river system are these dams located?

In which country is/are the dam(s) located?

What was the primary purpose of the dam at construction?  
(Select all that apply)

- Flood control
- Hydropower
- Irrigation
- Navigation
- Recreation
- Water supply
- Other, please specify

In which year did work on e-flows/ river restoration/ dam re-operation begin?

What was the motivation/goal for dam re-operation in this case? (Select all that apply)

- Habitat protection/ restoration
- To protect a commercial resource
- To protect an endangered species
- To enhance scientific knowledge
- Other, please specify

What were the triggers/ enabling conditions for the work on dam re-operation to begin? (Select all that apply)

- Legislation or policy on river/ dam/ environment
- Research base (eg: findings from environmental impact assessment on dam, models/ study on e-flow requirements of downstream ecosystems)
- Natural trigger event (eg: flood, drought)
- Man-made trigger event (eg: change in government, new dam operators)
- Planned upgrade or maintenance of dam
- Request for dam re-operation (including lawsuits)
- Other, please specify



What is the status of work on e-flows/river restoration/dam re-operation?

- On hold/ stalled/ abandoned
- Being implemented

### **N3- (A- Info on stalled cases) (2)**

What activities were implemented to re-operate the dam(s)?  
(select all that apply)

- Drafting/ updating of legislation or policy
- Flow experiments
- Workshops/ meetings with stakeholders
- Scientific studies (e.g.: environmental impact assessment of dam, trade-off studies, e-flow studies)
- Physical modification to dam
- Modelling
- Other, please specify

Which flow manipulation was targeted in dam re-operation?  
(Select all that apply)

- Minimum flow
- High flow pulse (where water levels remain in the main channel banks)
- Flood releases (where water levels over-top the main channel banks)
- Entire flow regime
- Ramping rates/ hydro-peaking rates
- Other, please specify

Who were the stakeholders involved in the case? (Select all that apply)

- National agencies
- Regional/State agencies
- Local government agencies
- Dam operator
- NGOs
- Civil society groups/ environmentalists
- Citizens/ general public
- Scientists
- Other, please specify

What was the main hurdle encountered? (i.e.: Why did the process of dam re-operation stall?)

How long after work started was this hurdle encountered?

At which stage in the process of dam re-operation was this main hurdle encountered? / At which stage did the process of dam re-operation stall?

- In establishing a shared understanding among stakeholders that dam re-operation/ e-flows are needed
- In determining e-flow requirements of downstream ecosystems
- In translating the e-flow requirements into specific flow releases from the dam
- In executing the dam release/flow recommendations (ie: moving from recommendation to actual implementation)
- Other, please specify

What was done to overcome this major hurdle?

In which year did work on e-flows/river restoration/dam re-operation actively stop?

Were there other hurdles to dam re-operation for e-flows implementation?

Yes, please list these other hurdles

No

What factors/actions would you say was missing in the effort to overcome the hurdles?

Scientific basis to determine e-flows and downstream effects

- Supporting legislation or policy
- Public interest/engagement
- Flow experiments
- Natural trigger event (eg: flood, drought)
- Physical modification to dam
- Simulation or optimization modeling
- Synergy (little of no trade-off) with existing water uses of the dam
- An agreed/fixed timeline for dam re-operation
- Collaboration and commitment among stakeholders
- Other, please specify

In your opinion how important would these factors/actions have been to successfully overcoming the hurdles and successful dam re-operation overall?

	Extremely important	Very important	Moderately important	Slightly important
» Scientific basis to determine e-flows and downstream effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Supporting legislation or policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Public interest/engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Flow experiments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Natural trigger event (eg: flood, drought)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Extremely important	Very important	Moderately important	Slightly important
» Physical modification to dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Simulation or optimization modeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Synergy (little of no trade-off) with existing water uses of the dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» An agreed/fixed timeline for dam re-operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Collaboration and commitment among stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Other, please specify	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<div style="border: 1px solid black; height: 80px; width: 100%;"></div>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rate the impact of this case in terms of the following:

- the biophysical world (eg: target species, downstream habitats)
- the stakeholder network
- the diffusion of the ideas/lessons and established network to other cases (including work beyond dam re-operation)

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Biophysical world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholder network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Diffusion of ideas and established network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you share reports about this case and/or emails of others in your network who have information on this case?

**NB:** Due to privacy constraints and ethical considerations, your response to this survey has been anonymised, however if you are willing to share reports or emails of other resource persons with respect to this case, kindly share your name and email and you will be contacted by the research team. If not, please click 'Next' to proceed to the next question.

Yes

No

#### **N4- (B- Info on sucessful cases) (2)**

What activities were implemented to re-operate the dam(s) for e-flows? (select all that apply)

Drafting/ updating of legislation or policy

- Flow experiments
- Workshops/ meetings with stakeholders
- Scientific studies (e.g.: environmental impact assessment of dam, trade-off studies, e-flow studies)
- Physical modification to dam
- Modelling
- Other, please specify

Which flow manipulation was targeted in dam re-operation?  
(Select all that apply)

- Minimum flow
- High flow pulse (where water levels remain in the main channel banks)
- Flood releases (where water levels over-top the main channel banks)
- Entire flow regime
- Ramping rates/ hydro-peaking rates
- Other, please specify

Who were the stakeholders involved in the case? (Select all that apply)

- National agencies



- Regional/State agencies
- Local government agencies
- Dam operator
- NGOs
- Civil society groups/ environmentalists
- Citizens/ general public
- Scientists
- Other, please specify

Were any hurdles encountered?

- Yes
- No

## **N 5- (B- Info on hurdles in successful cases) (2)**

What was the main hurdle encountered in the process of dam re-operation?

How long after work started was this hurdle encountered?

At which stage in the process of dam re-operation was this main hurdle encountered?

- In establishing a shared understanding among stakeholders that dam re-operation/ e-flows are needed
- In determining e-flow requirements of downstream ecosystems
- In translating the e-flow requirements into specific flow releases from the dam
- In executing the dam release/flow recommendations (ie: moving from recommendation to actual implementation)
- Other, please specify

What was done to overcome this major hurdle?

How long did it take to overcome this major hurdle?

Were there other obstacles to dam re-operation for e-flows implementation?

Yes, please list these other hurdles

No

What factors/actions would you say were the keys to overcoming the hurdles?

- Scientific basis to determine e-flows and downstream effects
- Supporting legislation or policy
- Public interest/engagement
- Flow experiments
- Natural trigger event (eg: flood, drought)
- Physical modification to dam
- Simulation or optimization modeling
- Synergy (little or no trade-off) with existing water uses of the dam
- An agreed/fixed timeline for dam re-operation
- Collaboration and commitment among stakeholders

Other, please specify

In your opinion how important were these factors/actions to successfully overcoming the hurdles and successful dam re-operation overall?

	Extremely important	Very important	Moderately important	Slightly important
» Scientific basis to determine e-flows and downstream effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Supporting legislation or policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Public interest/engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Flow experiments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Natural trigger event (eg: flood, drought)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Physical modification to dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Simulation or optimization modeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Synergy (little of no trade-off) with existing water uses of the dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» An agreed/fixed timeline for dam re-operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Collaboration and commitment among stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

» Other, please specify

Extremely  
important

Very  
important

Moderately  
important

Slightly  
important

In which year was work on dam re-operation completed?

Which of the following best describes the approach taken to dam re-operation in this case:

- **Adaptive management** where prescribed dam releases for e-flows are essentially treated as flow experiments for scientific validation of hypothesis regarding flow components.
- **Blanket operation** where broad changes in dam operations are made based on available management and ecological information.
- **Episodic implementation** which is an opportunistic approach to dam re-operation driven by prevailing hydrological conditions allowing for modifications to dam operations.

Adaptive management

Blanket operation

Episodic implementation

How would you rate the impact of this case in terms of the following:

- the biophysical world (eg: target species, downstream habitats)
- the stakeholder network
- the diffusion of the ideas/lessons and established network to other cases (including work beyond dam re-operation)

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Biophysical world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholder network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diffusion of ideas and established network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you share reports about this case and/or emails of others in your network who have information on this case?

NB: Due to privacy constraints and ethical considerations, your response to this survey has been anonymised, however if you are willing to share reports or emails of other resource persons with respect to this case, kindly share your name and email and you will be contacted by the research team. If not, please click 'Next' to proceed to the next question.

Yes

No

## **N6- (B- Info on successful cases with no hurdles) (2)**

What factors/actions would you say were the keys to successful dam re-operation in this case?

- Scientific basis to determine e-flows and downstream effects
- Supporting legislation or policy
- Public interest/engagement
- Flow experiments
- Natural trigger event (eg: flood, drought)
- Physical modification to dam
- Simulation or optimization modeling
- Synergy (little of no trade-off) with existing water uses of the dam
- An agreed/fixed timeline for dam re-operation
- Collaboration and commitment among stakeholders
- Other, please specify

In your opinion how important were these factors/actions to successful dam re-operation overall?

	Extremely important	Very important	Moderately important	Slightly important
» Scientific basis to determine e-flows and downstream effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Supporting legislation or policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Public interest/engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Flow experiments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Natural trigger event (eg: flood, drought)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Physical modification to dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Simulation or optimization modeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Synergy (little of no trade-off) with existing water uses of the dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» An agreed/fixed timeline for dam re-operation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Collaboration and commitment among stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Other, please specify	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<div style="border: 1px solid black; height: 80px; width: 100%;"></div>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In which year was work on dam re-operation completed?



Which of the following best describes the approach taken to dam re-operation in this case:

- **Adaptive management** where prescribed dam releases for e-flows are essentially treated as flow experiments for scientific validation of hypothesis regarding flow components.
- **Blanket operation** where broad changes in dam operations are made based on available management and ecological information.
- **Episodic implementation** which is an opportunistic approach to dam re-operation driven by prevailing hydrological conditions allowing for modifications to dam operations.

- Adaptive management
- Blanket operation
- Episodic implementation

How would you rate the impact of this case in terms of the following:

- the biophysical world (eg: target species, downstream habitats)
- the stakeholder network

- the diffusion of the ideas/lessons and established network to other cases (including work beyond dam re-operation)

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Biophysical world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Actor or stakeholder network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diffusion of ideas and established network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you share reports about this case and/or emails of others in your network who have information on this case?

NB: Due to privacy constraints and ethical considerations, your response to this survey has been anonymised, however if you are willing to share reports or emails of other resource persons with respect to this case, kindly share your name and email and you will be contacted by the research team. If not, please click 'Next' to proceed to the end of the next question.

Yes

No

## 4- (B- Info on successful cases)

What activities were implemented to re-operate the dam(s) for e-flows? (select all that apply)

- Drafting/ updating of legislation or policy
- Flow experiments
- Workshops/ meetings with stakeholders
- Scientific studies (e.g.: environmental impact assessment of dam, trade-off studies, e-flow studies)
- Physical modification to dam
- Modelling
- Other, please specify

Which flow manipulation was targeted in dam re-operation?  
(Select all that apply)

- Minimum flow
- High flow pulse (where water levels remain in the main channel banks)
- Flood releases (where water levels over-top the main channel banks)
- Entire flow regime
- Ramping rates/ hydro-peaking rates
- Other, please specify

Who were the stakeholders involved in the case? (Select all that apply)

- National agencies
- Regional/State agencies
- Local government agencies
- Dam operator
- NGOs
- Civil society groups/ environmentalists
- Citizens/ general public
- Scientists
- Other, please specify

Were any hurdles encountered?

- Yes
- No

## 5- (B- Info on hurdles in successful cases)

What was the main hurdle encountered in the process of dam re-operation?

How long after work started was this hurdle encountered?

At which stage in the process of dam re-operation was this main hurdle encountered?

- In establishing a shared understanding among stakeholders that dam re-operation/ e-flows are needed
- In determining e-flow requirements of downstream ecosystems
- In translating the e-flow requirements into specific flow releases from the dam
- In executing the dam release/flow recommendations (ie: moving from recommendation to actual implementation)
- Other, please specify

What was done to overcome this major hurdle?

How long did it take to overcome this major hurdle?

Were there other obstacles to dam re-operation for e-flows implementation?

Yes, please list these other hurdles

No

What factors/actions would you say were the keys to overcoming the hurdles?

- Scientific basis to determine e-flows and downstream effects
- Supporting legislation or policy
- Public interest/engagement
- Flow experiments
- Natural trigger event (eg: flood, drought)
- Physical modification to dam

- Simulation or optimization modeling
- Synergy (little of no trade-off) with existing water uses of the dam
- An agreed/fixed timeline for dam re-operation
- Collaboration and commitment among stakeholders
- Other, please specify

In your opinion how important were these factors/actions to successfully overcoming the hurdles and successful dam re-operation overall?

	Extremely important	Very important	Moderately important	Slightly important
» Scientific basis to determine e-flows and downstream effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Supporting legislation or policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Public interest/engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Flow experiments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Natural trigger event (eg: flood, drought)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Physical modification to dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Simulation or optimization modeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Synergy (little of no trade-off) with existing water uses of the dam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

» An agreed/fixed timeline for dam re-operation

Extremely  
important

Very  
important

Moderately  
important

Slightly  
important

» Collaboration and commitment among stakeholders





» Other, please specify






In which year was work on dam re-operation completed?

Which of the following best describes the approach taken to dam re-operation in this case:

- **Adaptive management** where prescribed dam releases for e-flows are essentially treated as flow experiments for scientific validation of hypothesis regarding flow components.
- **Blanket operation** where broad changes in dam operations are made based on available management and ecological information.
- **Episodic implementation** which is an opportunistic approach to dam re-operation driven by prevailing



hydrological conditions allowing for modifications to dam operations.

- Adaptive management
- Blanket operation
- Episodic implementation

How would you rate the impact of this case in terms of the following:

- the biophysical world (eg: target species, downstream habitats)
- the stakeholder network
- the diffusion of the ideas/lessons and established network to other cases (including work beyond dam re-operation)

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Biophysical world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholder network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diffusion of ideas and established network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you share reports about this case and/or emails of others in your network who have information on this case?

**NB:** Due to privacy constraints and ethical considerations, your response to this survey has been anonymised, however if you are willing to share reports or emails of other resource persons with respect to this case, kindly share your name and email and you will be contacted by the research team. If not, please click 'Next' to proceed to the next question.

Yes

No

Have you been involved in another dam re-operation case that you consider formative or significant?

NB: Answering 'yes' to this question routes you to question number 5 of the survey for you to answer questions on this 2nd case. This will roughly double the time to complete the survey. Select 'No' to proceed to the end of this survey.)

Yes

No

## **6- (B- Info on successful cases with no hurdles)**

What factors/actions would you say were the keys to successful dam re-operation in this case?

- Scientific basis to determine e-flows and downstream effects
- Supporting legislation or policy
- Public interest/engagement
- Flow experiments
- Natural trigger event (eg: flood, drought)
- Physical modification to dam
- Simulation or optimization modeling
- synergy (little of no trade-off) with existing water uses of the dam
- An agreed/fixed timeline for dam re-operation
- Collaboration and commitment among stakeholders
- Other, please specify

In your opinion how important were these factors/actions to successful dam re-operation overall?

	Extremely important	Very important	Moderately important	Slightly important
» Scientific basis to determine e-flows and downstream effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Supporting legislation or policy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Public interest/engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Flow experiments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
» Natural trigger event (eg: flood, drought)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

around

» Physical modification to dam

Extremely  
important Very  
important Moderately  
important Slightly  
important 

» Simulation or optimization modeling

» Synergy (little of no trade-off) with existing water uses of the dam

» An agreed/fixed timeline for dam re-operation

» Collaboration and commitment among stakeholders

» Other, please specify



In which year was work on dam re-operation completed?

Which of the following best describes the approach taken to dam re-operation in this case:

- **Adaptive management** where prescribed dam releases for e-flows are essentially treated as flow experiments for scientific validation of hypothesis regarding flow components.

- **Blanket operation** where broad changes in dam operations are made based on available management and ecological information.
- **Episodic implementation** which is an opportunistic approach to dam re-operation driven by prevailing hydrological conditions allowing for modifications to dam operations.

- Adaptive management
- Blanket operation
- Episodic implementation

How would you rate the impact of this case in terms of the following:

- the biophysical world (eg: target species, downstream habitats)
- the stakeholder network
- the diffusion of the ideas/lessons and established network to other cases (including work beyond dam re-operation)

	1- no positive impact	2	3- moderate positive impact	4	5- high positive impact
Biophysical world	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholder network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Diffusion of ideas and established network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Can you share reports about this case and/or emails of others in your network who have information on this case?

**NB:** Due to privacy constraints and ethical considerations, your response to this survey has been anonymised, however if you are willing to share reports or emails of other resource persons with respect to this case, kindly share your name and email and you will be contacted by the research team. If not, please click 'Next' to proceed to the end of the next question.

Yes

No

Have you been involved in another dam re-operation case that you consider formative or significant?

**NB:** Answering 'yes' to this question routes you to question number 5 of the survey for you to answer questions on this 2nd case. This will roughly double the time to complete the survey. Select 'No' to proceed to the end of this survey.)

Yes

No

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