



# GEORGIA



INSPECTION OF DAMS  
WORKSHOP/ FIELD VISITS

## INSPECTION OF DAMS

### KEY COMPONENTS OF INTEREST

Tbilisi, 6 November 2015

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Comments to 1st slide.

- ***WHY INSPECTIONS?***
- ***BECAUSE OF SAFETY CONCERNS***
- ***WHERE IS THE ORGANISATIONAL PLACE FOR INSPECTIONS?***
- ***WHAT IS THE USE OF INSPECTIONS?***
- ***HOW ARE INSPECTIONS ORGANISED?***

# INSPECTIONS OF DAMS – AND WRS

- **WHY INSPECTIONS ?**

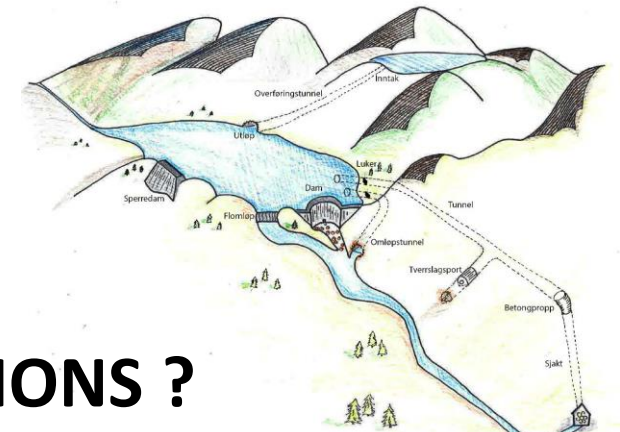
**WRS = WATER RETAINING STRUCTURES**

- **WHAT IS THE USE OF INSPECTIONS ?**

- **WHERE IS THE ORGANISATIONAL PLACE FOR INSPECTIONS ?**

- **HOW ARE INSPECTIONS ORGANISED ?**

- **WHERE DO WE NEED INSPECTIONS ?**



***ANSWERS IN PRESENTATION***

***BECAUSE OF:***

***SAFETY***

***DURABILITY***

***ECONOMY***

***QUALITY AND RELIABILITY FOR ---WATER-ENERGY-***

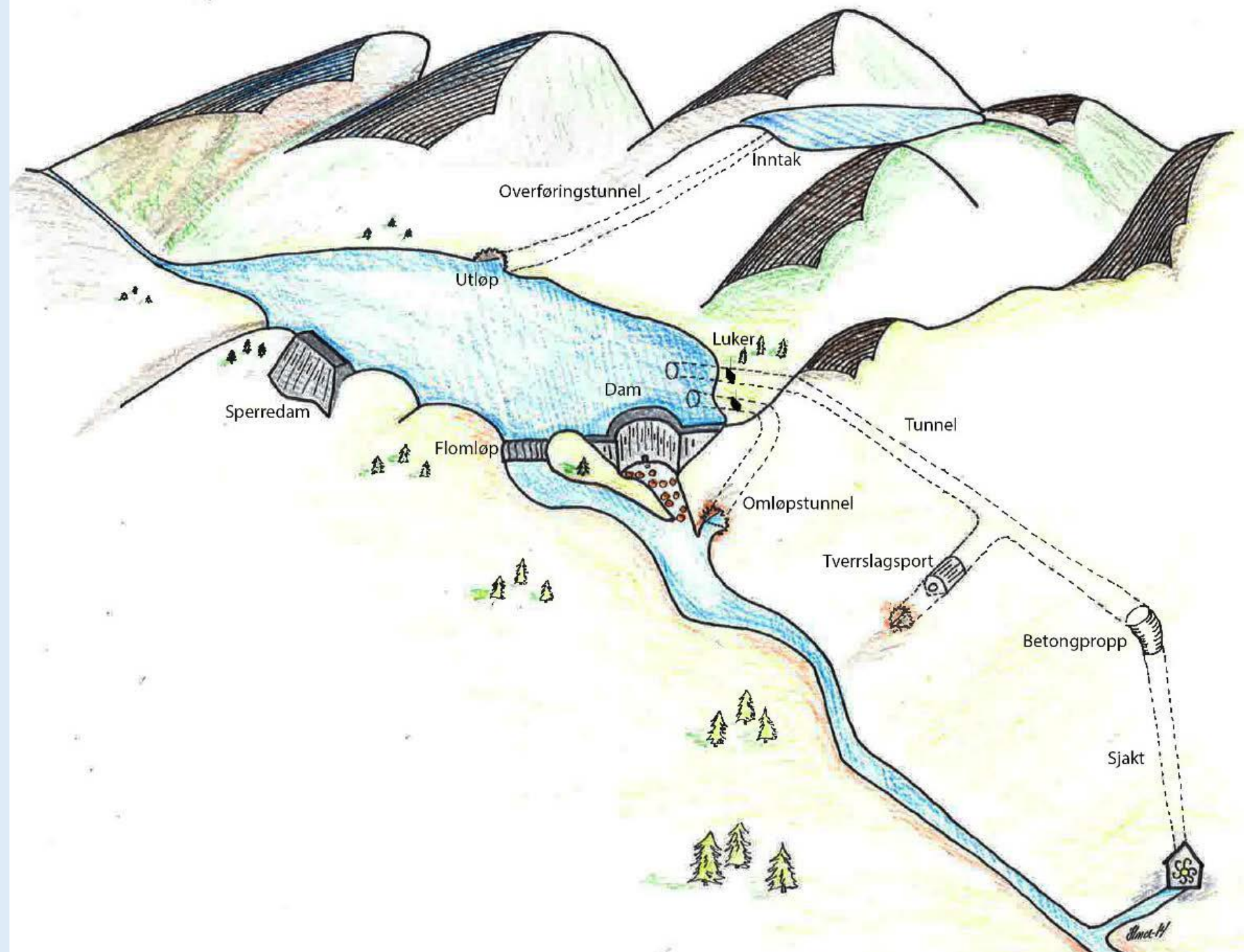
***IRRIGATION***

***WHERE DO WE NEED INSPECTIONS?***

Safety regulations:  
applies to all..

# Water Retaining Structures

and appurtenant  
structures  
(dams, tunnels,  
gates, adits, plugs,  
pipes, etc.)



Comments to PREVIOUS slide.

***BECAUSE OF SAFETY CONCERNS***

***SAFETY***

***DURABILITY***

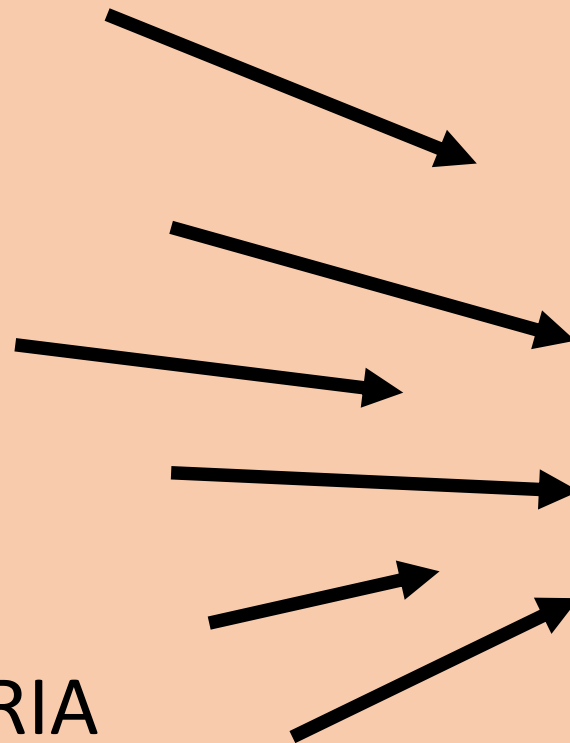
***ECONOMY***

***QUALITY AND RELIABILITY FOR ---WATER-ENERGY-IRRIGATION***

- ***WHERE DO WE NEED INSPECTIONS? ALL PARTS OF A –WRS***
- ***PUBLIC SAFETY IS THE MOST IMPORTANT***

# 10 KEY COMPONENTS OF INTEREST

1. SAFETY
2. RESPONSIBILITY
3. MANAGEMENT
4. HYDROLOGY
5. TOPOGRAPHY
6. DEMOGRAPHY
7. TECHNICAL ISSUES
8. CLASSIFICATION
9. CLASSIFICATION CRITERIA
10. DOCUMENTATION



**INSPECTIONS**



**PREVENT  
ACCIDENTS**

# Comments to PREVIOUS slide.

***WHERE DO WE NEED INSPECTIONS? ALL PARTS OF A –WRS***

***ALL ASPECTS OF HYDROPOWER PLANTS, DAMS PIPES, CANALS, TUNNELS...***

***INSPECTIONS IS A MEANS TO CONTROL UNWANTED EVENTS FROM HAPPENING***

***«ACCIDENTS» CAN MEAN SAFETY FOR PUBLIC, PERSONNEL, PROPERTY, INFRASTRUCTURE, IMPORTANT FUNCTIONS, (ENERGY- WATER- IRRIGATION- ENVIRONMENT..).....***

***AUTHORITIES MAIN OBJECTIVE IS SAFETY FOR THE PUBLIC AND ENVIRONMENT.  
THIS MEANS THAT INSPECTIONS MUST COVER ALL THINKABLE AREAS.***

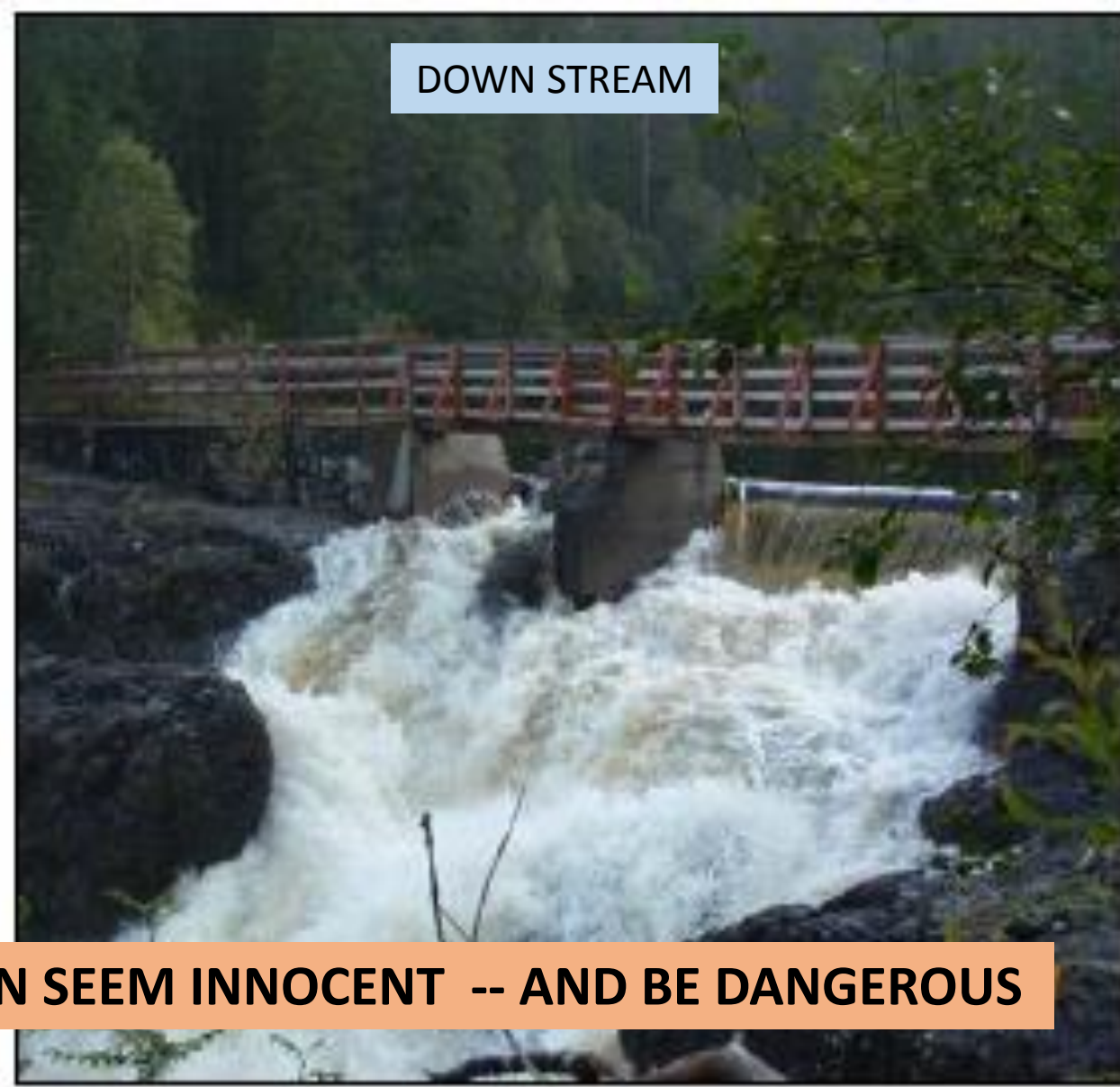
***FOR THE OWNER, THE ECONOMY IS ALSO IMPORTANT***

***ECONOMY IS NOT IMPORTANT FOR THE AUTHORITIES***

UP STREAM



DOWN STREAM



**SAFETY CONCIIOUSNESS: SMALL DAMS -- CAN SEEM INNOCENT -- AND BE DANGEROUS**

SAFETY PRECAUTIONS WRT PUBLIC INTERESTS. PUBLIC MOVEMENT AROUND THE STRUCTURE, BY FOOT OR BOAT CANOES, OR IN ICE.

(Foto: Dag Bache, NVE)



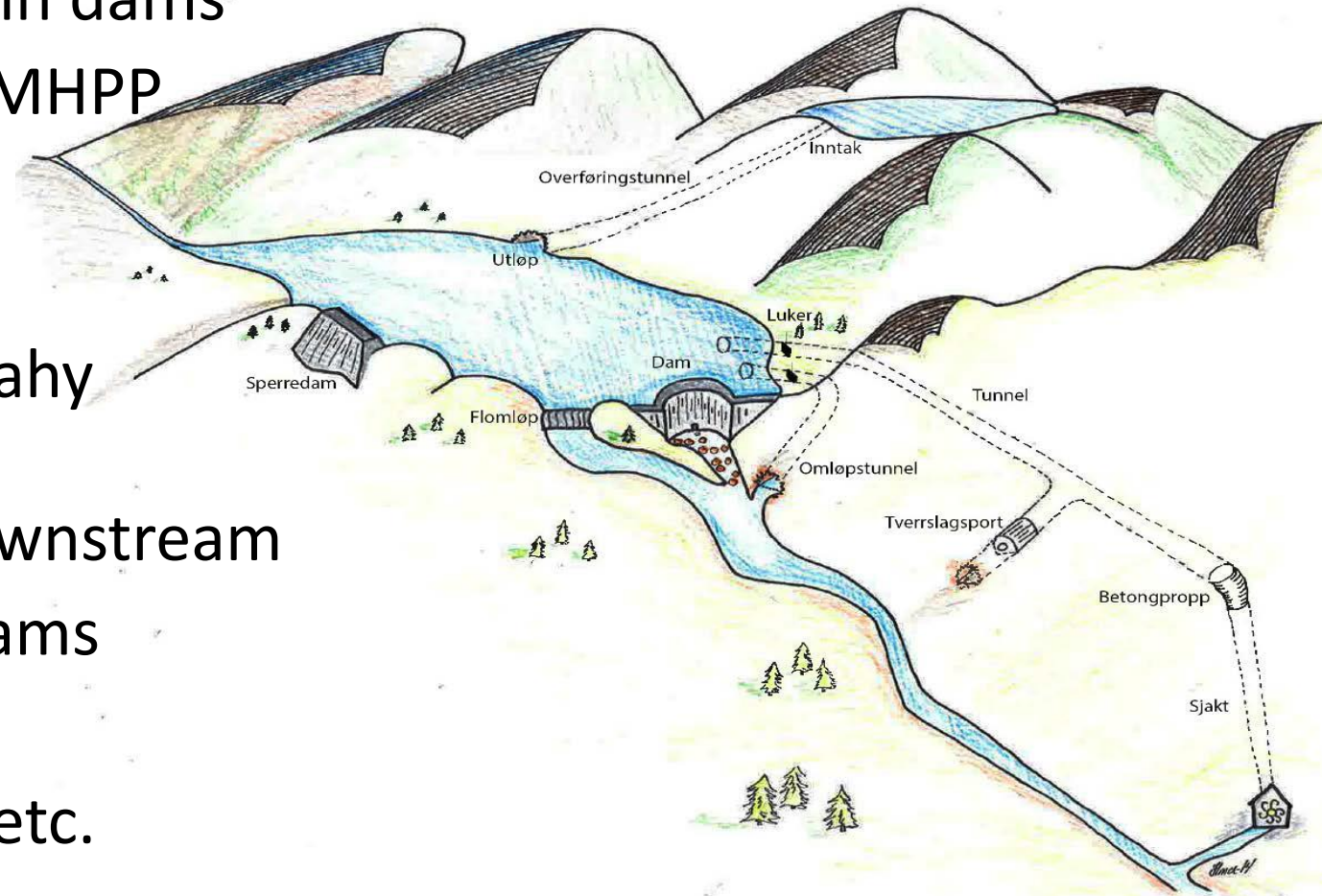
# OWNERS RESPONSIBILITY TO SAFEGUARD THE PUBLIC



WHAT IS BELOW THE ICE?? INTAKES, OUTLETS, TUNNELS?? NATURAL STREAM PATTERNS CAUSING WEAK ICE??

# Danger points on or near WRT

- Submerged tunnels, intakes and outlets
- Tunnel inlets and outlets at surface level
- Gates and other release structures in dams
- Intake dams for HPP's in rivers or SMHPP
- Dams, in particular with overflow
- Tresholds/ river pondages
- Changes in WL; underwater topograhy (deep / not deep changes)
- Sudden regulated water- surges downstream
- Footpaths or roads crossing over dams
- Erosion of intake lake shores.
- Earth slides and dangerous waves, etc.



# Dams in urban areas. Crossing footpaths, bathing and swimming, fishing, playing, etc



**URBAN AREAS – MANY PEOPLE – RECREATIONAL AREAS. PARKS.  
OLD DAMS, WATER MILLS, TRANSPORT ON WATERWAYS, ICE PRODUCTION. --NOW  
PLAYGROUNDS!!**

**OWNER MUST BE AWARE THAT: POEPL E HAVE GENERALLY LITTLE KNOWLEDGE OF DANGERS  
ASSOCIATED WITH WRT.**



Figur 3-1: Ved bynære dammer er det ofte mye ferdsel. Damkrona her er avstengt og det er lagt ut lense foran overløpet. Ved denne dammen er det en populær bade plass like oppstrøms.

(Foto: Roar Sivertsgård, NVE)

## FOOTPATHS -- OFTEN ACCROSS WRT



Figur 3-2: Turistforeningen har her rød-merket en tursti som leder over sperredammen.  
Foto: Rune Engesæter, NVE)



**FARE!  
DANGER!**

### Isbreen i bevegelse.

Dette fører bla. til sprokker som kan bli flere meter brede og 30-40 meter dype. Sprakkene er ofte dekket av snø, krass som går ut i vannet lager stor flodbølge.

Gå aldri på breen.

Gå ikke nær, og aldri inn under breen.

### Glaciers are in motion.

With the following consequences:

Crevasses, several metres wide and 30-40 metres deep, may be present. The crevasses are often covered with snow. Avalanches may occur on steep slopes. Floods may occur on outlet streams.

- never go onto a glacier.

- -Keep well away from steep glaciers and NEVER venture in under any glacier.

### Die Gletscher sind in Bewegung.

Das kann u.a. zur Bildung von Spalten führen, die mehrere Meter breit und 30-40 Meter tief werden können. Die Spalten sind oft mit Schnee bedeckt. Die Bewegungen können auch Lawinen und Überschwemmungen auslösen.

- Wandern Sie niemals einen Gletscher hinauf.

- Bewegen Sie sich nicht in der Nähe steiler Gletscher und niemals unter einem Gletscher.

### Les glaciers sont en mouvement.

Ceci provoque l'apparition de crevasses qui peuvent atteindre une largeur de plusieurs mètres et une profondeur de 30-40 mètres. Les crevasses sont souvent couvertes de neige. Les déplacements de blocs de glace peuvent aussi provoquer des avalanches et des inondations.

N'escaladez jamais le glacier.

- Ne vous approchez pas de glaciers escarpés, et ne vous avancez jamais sous le glacier.

### JÄÄTIKKÖ LIIKKUU.

Tämän seurauksena syntyy monta metriä leveitä ja 30-40 m. syviä raitoja. Ne ovat usein lunta peittämiä. Jäisyöry aiheuttaa jääkkojärvenissä hyökyaallon.

- -ÄLÄ MENE KOSKAAN JÄÄTIKON PÄALLE!

ÄLÄ MENE JÄÄTIKÖN LÄHEILE, EIKÄ KOSKAAN SEN ALLE!





**SLIPPERY ROCK AND TUNNEL INLETS. SAFETY WALL ABOVE**

# Example: Arranged landing and advice to the public on safe conduct



Figur 3-3: Anvist sted for ilandsetting av kano er et godt eksempel på tilrettelegging for sikker ferdsel.  
(Foto: Rolf Knutsen, Arendals Fossekompagni)



Figur 3-4: Populær bade- og rekreasjonsplass i et regulert vassdrag.

Foto: Ole Morten Egeland, Agder Energi Vannkraft)

**BATHING PLACES, RECREATION. CAR PARKING AND SIGNBOARDS. OPENING OF GATES AT UPSTREAM DAMS, and OPERATION OF POWER PLANTS**

Figur 3-6: Isfiskere tar en høy risiko ved å oppholde seg langs iskanten der åpent vann oppstår som følge av utslipp fra vannkraftverk. Disse steder kan det være utfordrende å sikre.

Foto: Bent Kristian Hasle, Aqua Guardian)

**UNSAFE ICE. ESPECIALLY CLOSE TO WATER INTAKES AND OUTLETS. Snow cover, etc.**



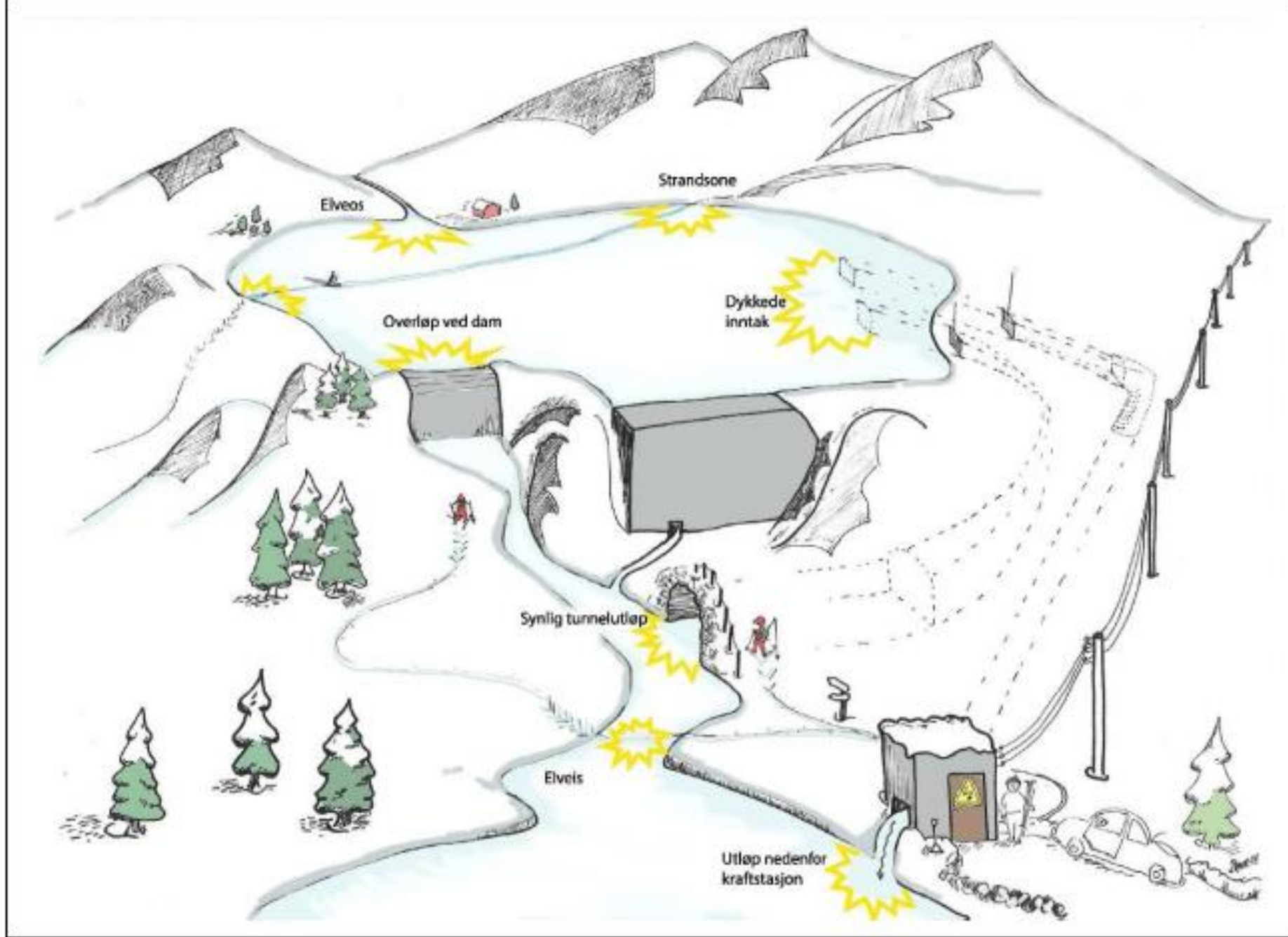
**Popular bathing place, - and in flood  
Ice fishery close to the edge**



**POWER  
COMPANIES**  
may publicise

**MAPS OF  
DANGER  
SPOTS,**

**UNSAFE ICE,  
ETC.**



Figur 3-7: Typiske farlige steder i regulerte vassdrag om vinteren er markert med gult.  
(Illustrasjon: Hanne Marthe Østvold, NVE)



Figur 3-8: Oppsprukket is i strandsonen kan utgjøre en fare for skiløpere. (Foto: Saudefaldene)



**Dangers: Accidental driving,  
snow-scooters, cars.**

**NO SAFETY PRECAUTIONS FOR  
ROAD ACROSS DAM  
(later corrected with guard rails)**

Figur 4-1. Riksveien går over dammen, og damkrona er derfor sikret med autovern  
(Foto: Karen Marie Straume, NVE)

**SAFETY PRECAUTIONS FOR  
ROAD ACROSS DAM  
Guard rails**



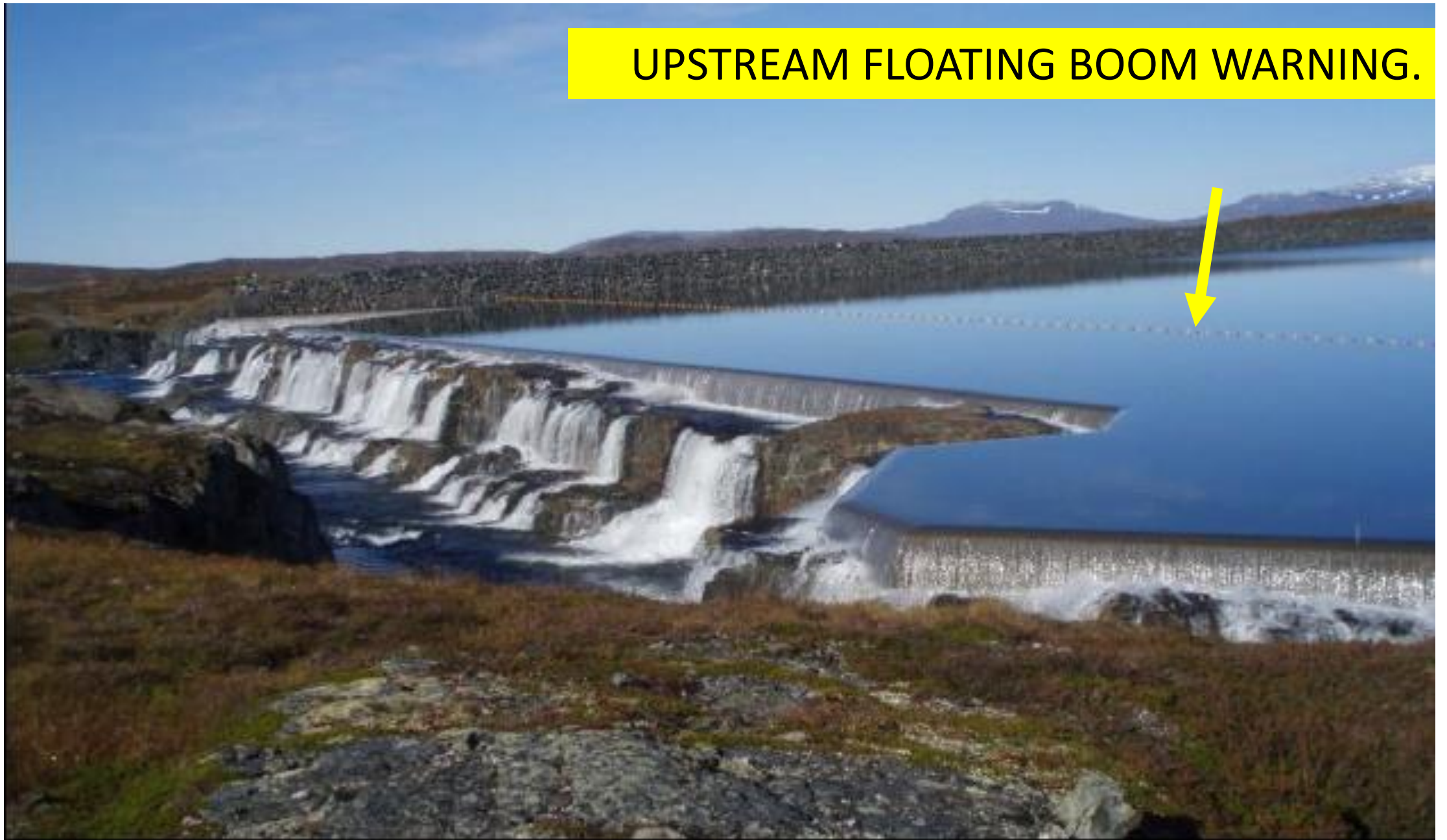
Figur 4-2: Fyllingsdam uten stabbestein, kantstein eller steinvanger. Motorisert ferdsel av uvedkommende over denne dammen er ikke ønskelig. Dammen er utbedret etter at bildet ble tatt.  
(Foto: Børge Hanssen, Statkraft)

**PUBLIC MOVEMENTS ACCROSS DAM IS PREVENTED. SIGNPOST.  
UPSTREAM FLOATING SAFETY WIRE.**



**Figur 4-3: Det er åpenbart ikke ønskelig med ferdsel over denne smale overløpsterskelen. Atkomsten er derfor sperret av i tillegg til varsling med skilt. (Foto: Kjell Molkersrød, NVE)**

## UPSTREAM FLOATING BOOM WARNING.



Figur 4-4: Overløpet kan være vanskelig å få øye på dersom man kommer i båt, på ski eller på skuter vinterstid. På dette magasinet er det lagt ut en varslingslense. (Foto: Toralf Øverås, Statkraft)



Figur 4-8: Fritt overløp og manøvrerbart flomløp under flom. (Foto: Grethe Holm Midtømme, NVE)



Figur 4-10: Åpen kanal uten skilting eller annen sikring. (Foto: Børge Hanssen, Statkraft)



Figur 4-9: Eksempel på lukket flomløp. Her vises samme flomløp tørt og under flom. (Foto: Rune Engesæter, NVE)

# SAFETY PRECAUTIONS??



# DANGEROUS POINTS AND AREAS



Figur 4-21: Nedadrettet virvel til inntak.  
(Foto: Rune Engesæter, NVE)



Figur 4-24: Eksempel på et stort elvekraftverk. Det er sterke strømninger i vannet bak dammen. (Foto: Hafslund)



# DANGEROUS POINTS AND AREAS



***BUMBUNA, SIERRA LEONE. A WB PROJECT AND IFC CONCERN.***

***A MURAL IN THE SOCIAL CLUB BUMBUNA DAM***

# DANGEROUS POINTS AND AREAS



# DANGEROUS POINTS AND AREAS

«MORNING GLORY» SPILLWAY  
SHATS AND TUNNELS

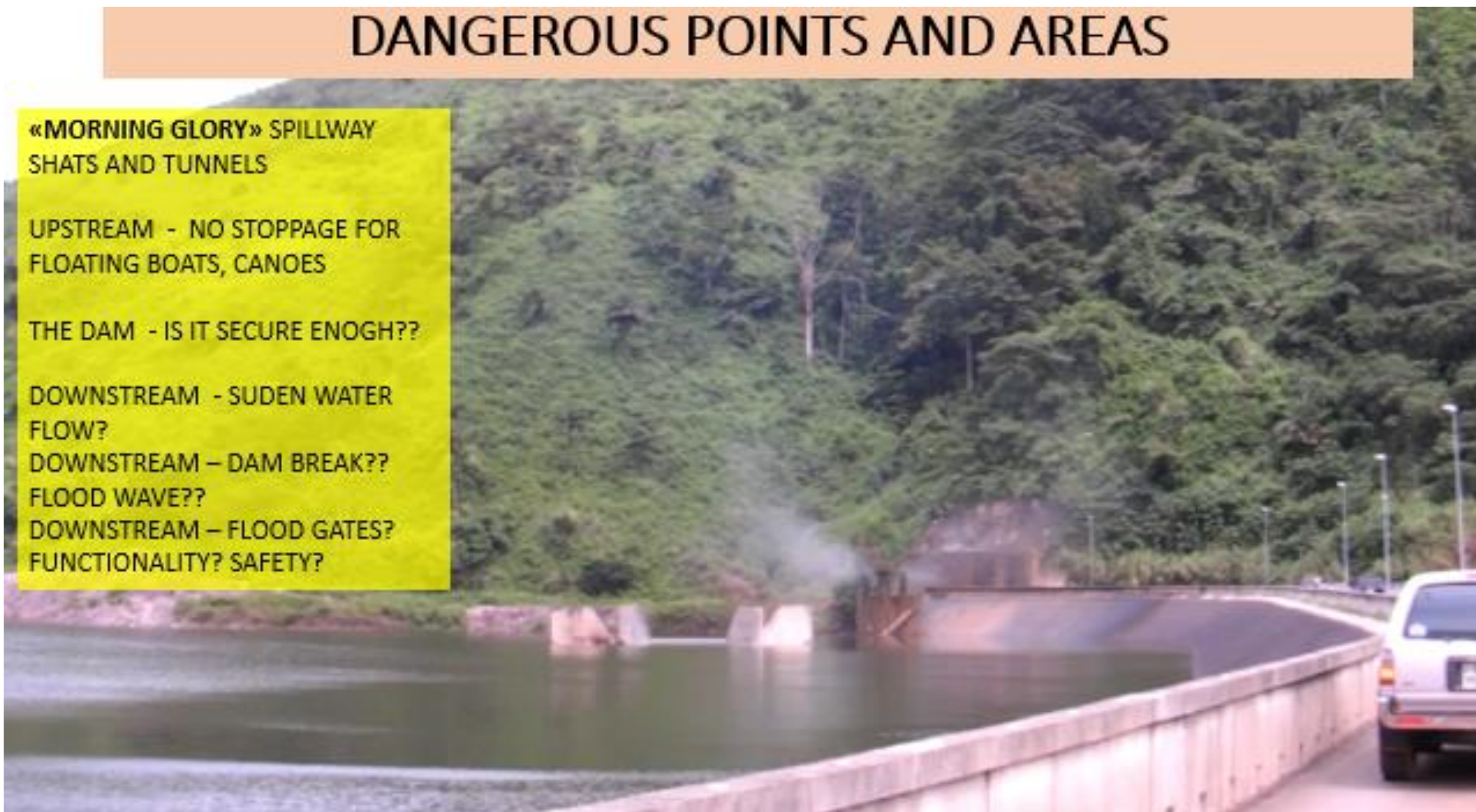
UPSTREAM - NO STOPPAGE FOR  
FLOATING BOATS, CANOES

THE DAM - IS IT SECURE ENOUGH??

DOWNSTREAM - SUDEN WATER  
FLOW?

DOWNSTREAM – DAM BREAK??  
FLOOD WAVE??

DOWNSTREAM – FLOOD GATES?  
FUNCTIONALITY? SAFETY?

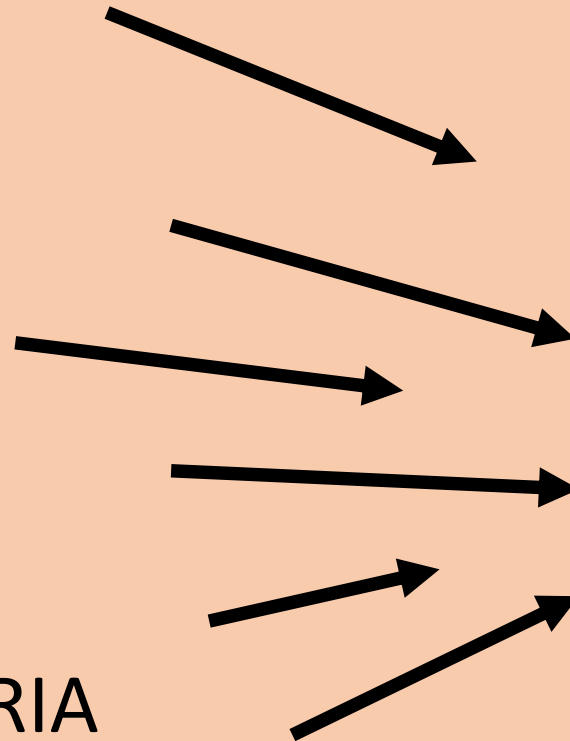


# DANGEROUS POINTS AND AREAS



# BACK TO - KEY COMPONENTS OF INTEREST

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# INSPECTIONS - ORGANIZING SAFETY

TAKE A BREAK

NEXT: Responsible organisation behind dams  
– and SAFE operations