

Flood Resilience:

Risks, Mitigation and Funding Solutions



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Monday, 16 May 2011

Dams and Flood Mitigation

Norm Himsley

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What are Dams?

Dams are built across streams and flow paths to safely catch, store and release stormwater flows.

They can be built of concrete, rock or soil.

They range in size from large dams such as Warragamba Dam down to small 2-3m high retarding basins (and even smaller onsite detention systems).

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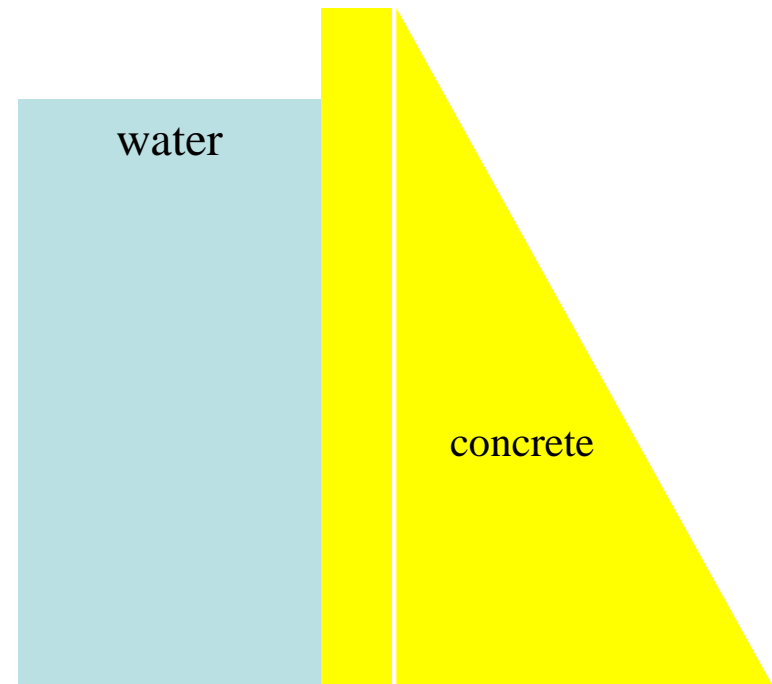
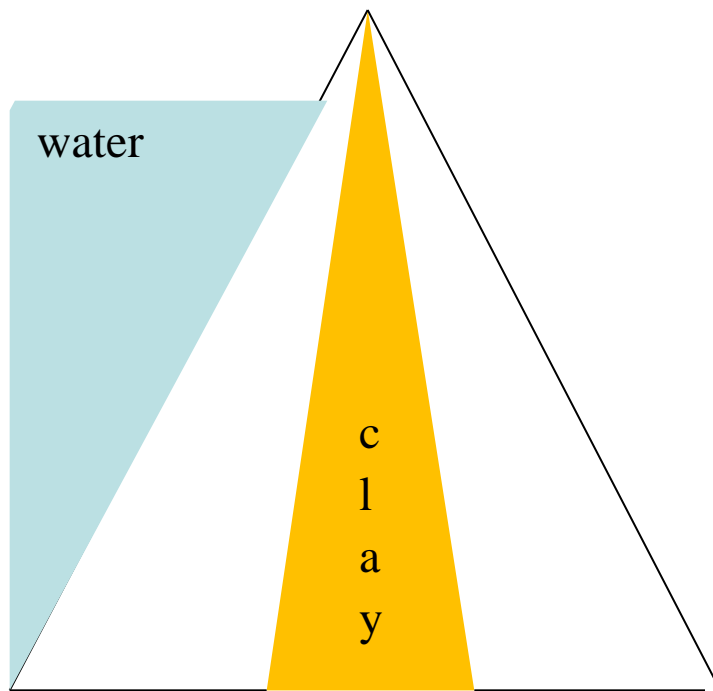
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Dam Cross-sections

- Embankment Dam
- Concrete Gravity Dam



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Warragamba Dam



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Dungowan Dam



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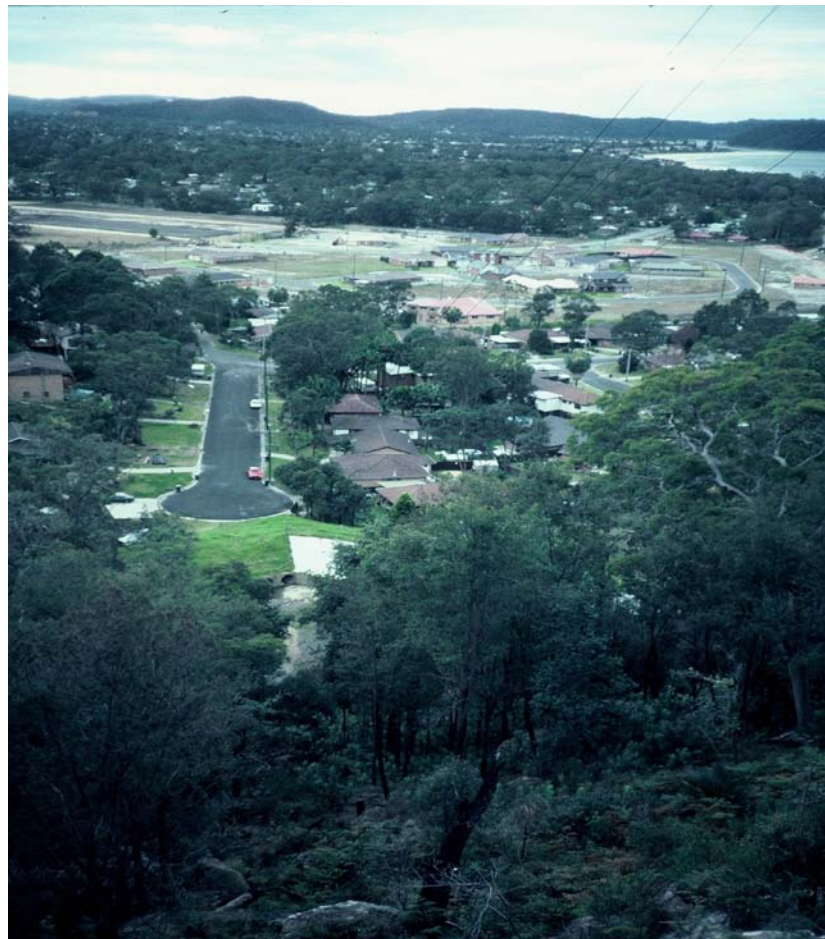


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Palm Tree Grove Retarding Basin, Umina



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Risks from Dams

- Dams face various risks including floods, earthquakes, structural defects, people's actions etc.
- Over last 20 years in USA, one significant dam has failed every week on average
- Dambreaks have similar actions to tsunamis
- People have died due to dambreaks in Tasmania and Queensland

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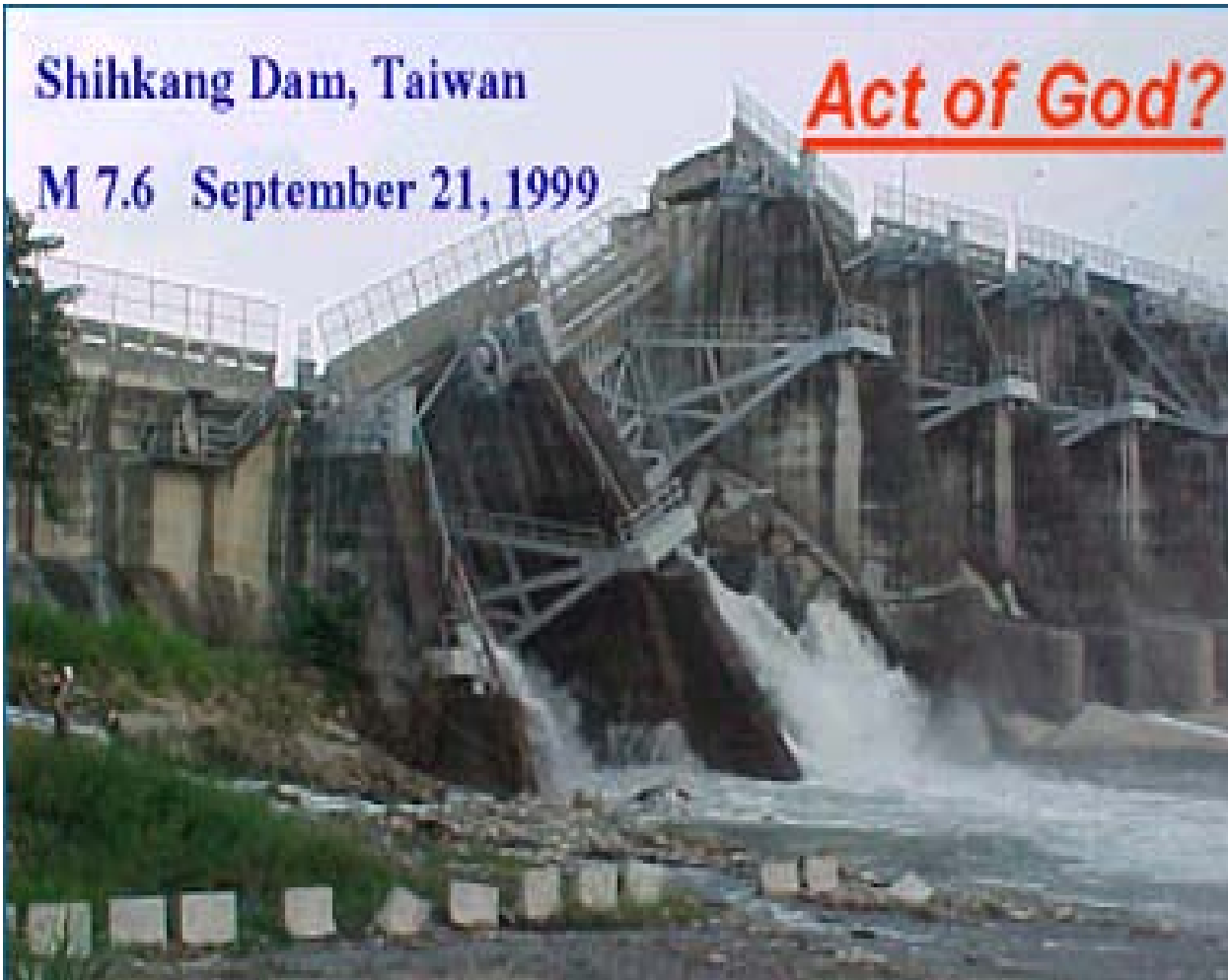
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Risks from Dams (cont)

Shihkang Dam, Taiwan

M 7.6 September 21, 1999

Act of God?



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Malpasset Dam



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Malpasset Dam



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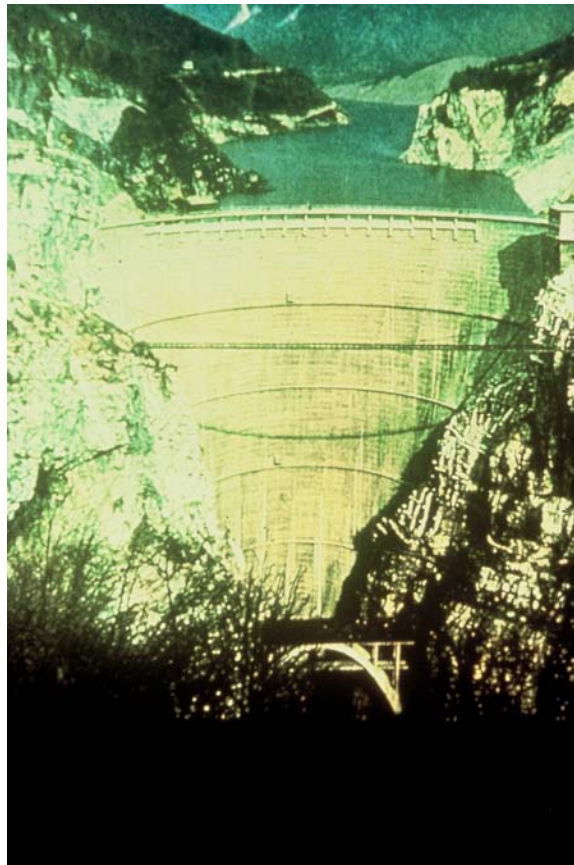


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Vaiont Dam



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Risks from Dams (cont)

- Critical that dams are designed to minimum risks commensurate with their failure consequences
- NSW Dams Safety Committee oversights dams in NSW whose failure consequences would be significant
- Many dams upgraded over the last 20 years in NSW to ensure up to date safety
- NSW was first government in world to adopt risk based approach to dam safety in 2008

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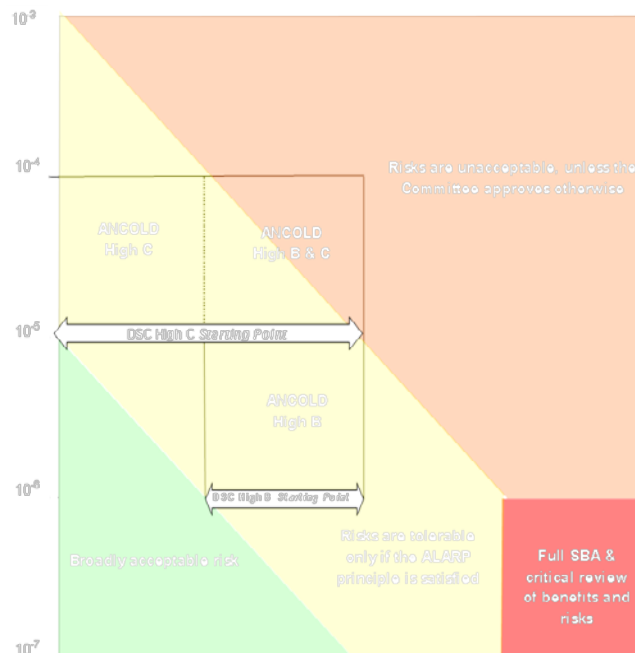


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Risks from Dams (cont)



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Benefits of Dams

- Water Supply (human, stock, fire fighting etc)
- Irrigation
- Environmental controls
- Hydropower
- Recreational (swimming, boating etc)
- BUT-ALL dams provide some degree of flood mitigation

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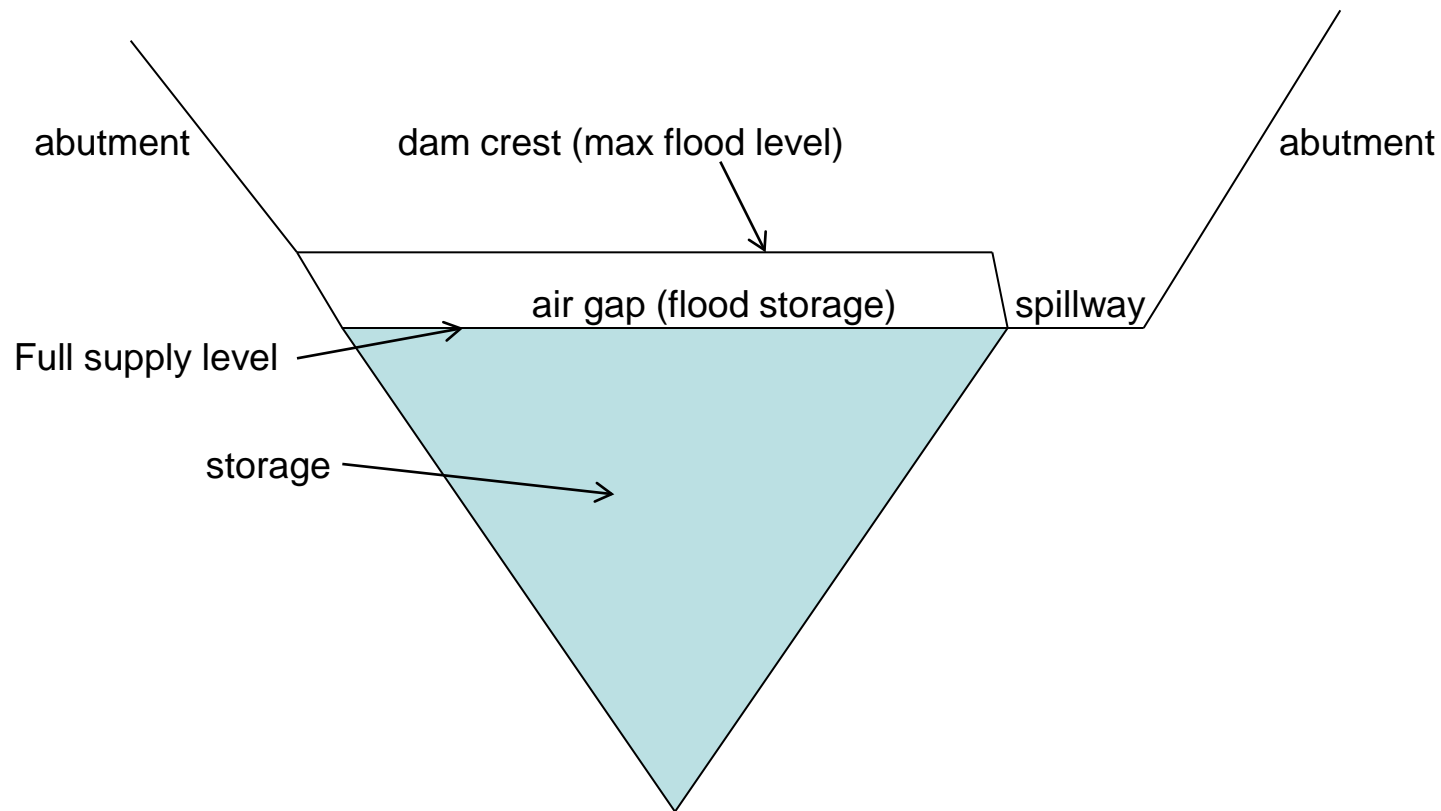


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Valley view across dam



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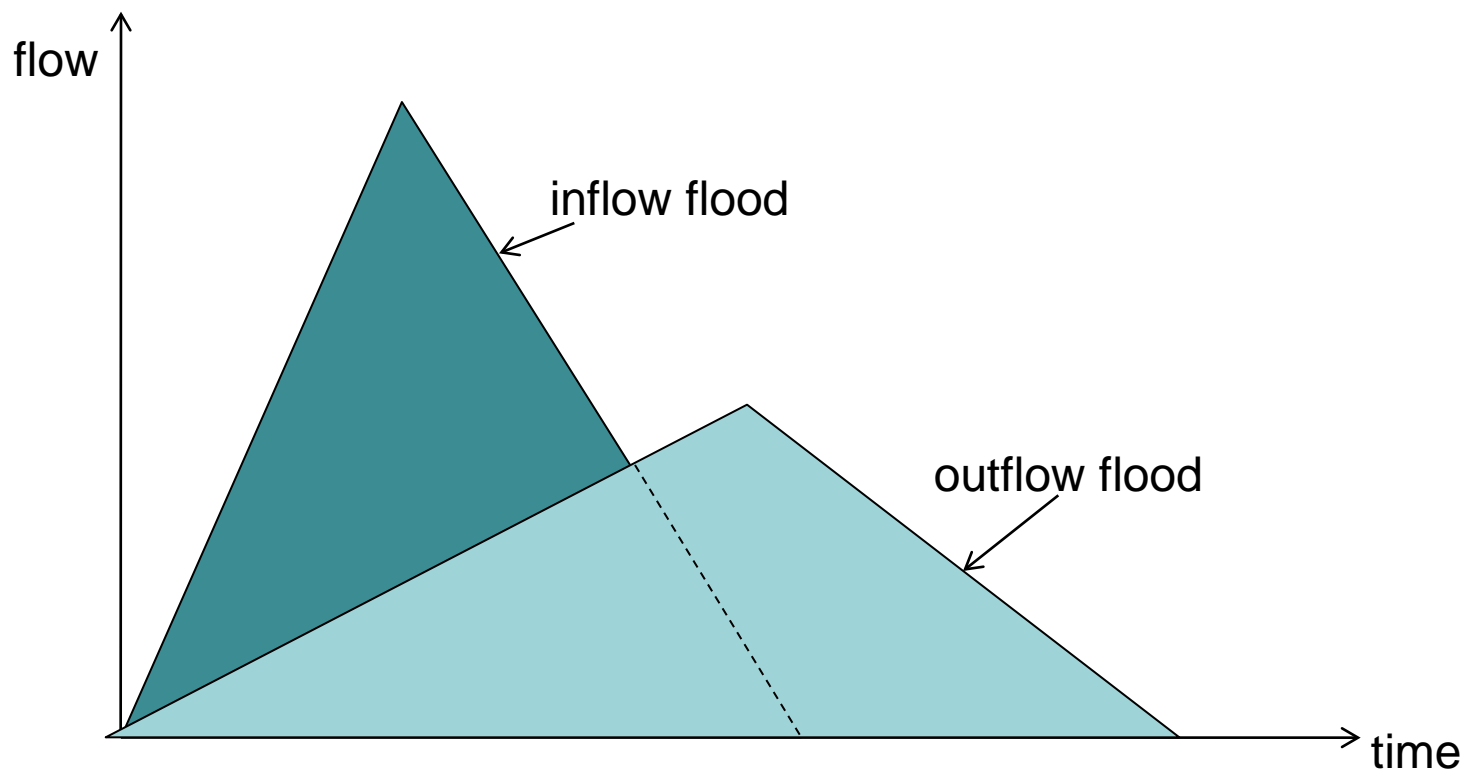
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Typical dam flood mitigating effects

Dams lower flood peaks and slow down floods



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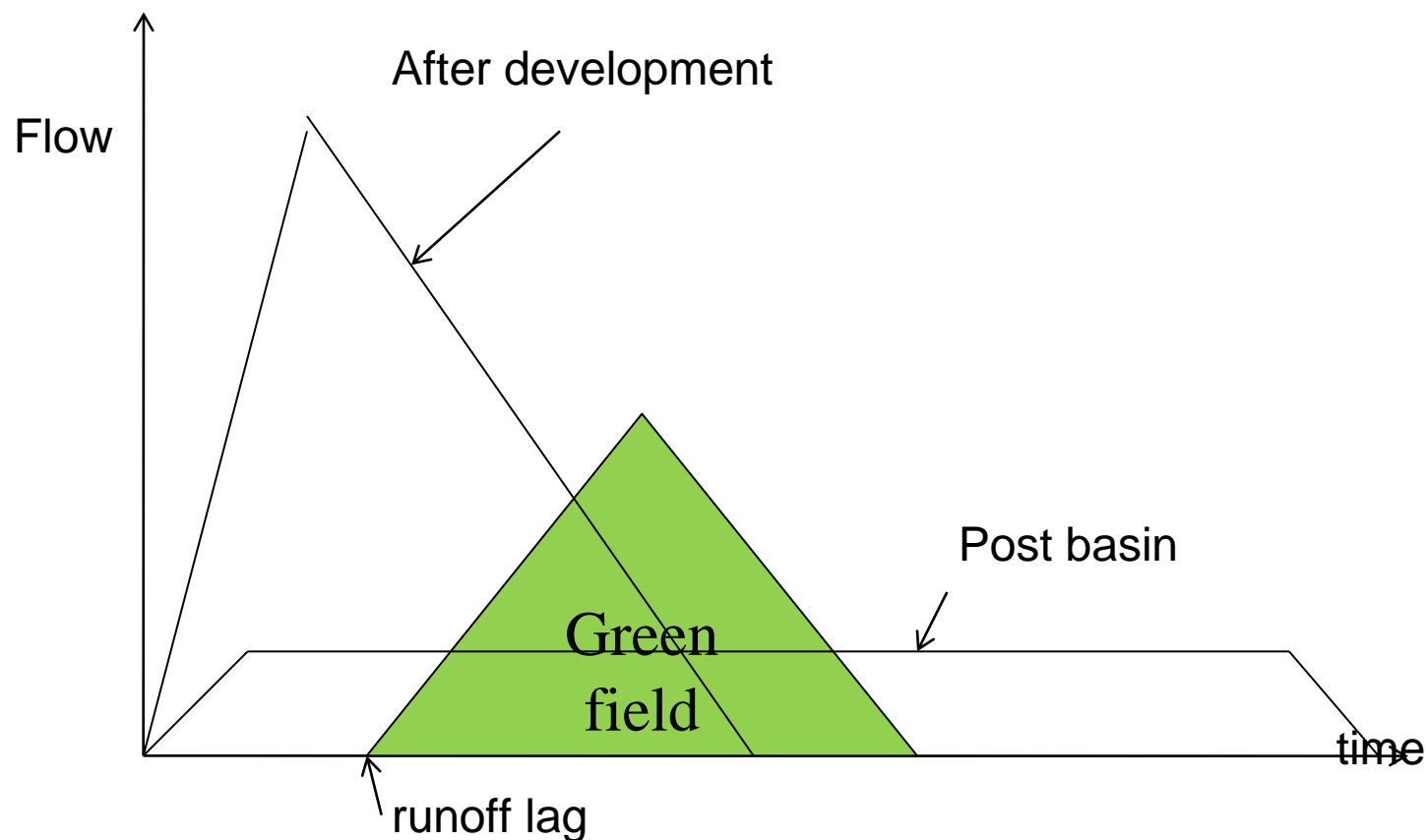


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Typical retarding basin mitigating effects



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Flood Mitigation Example- Wivenhoe Dam



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Brisbane Flood Comparison 1974 v 2011

- 2011 rainfall nearly twice 1974 rainfall and in shorter time
- Significant development (industrial, houses etc) in Brisbane floodplain between 1974 and 2011
- Both these factors should have led to significant higher flood levels in 2011 than in 1974

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Brisbane Flood Comparison 1974 v 2011 (continued)

- However 2011 flood levels were lower than 1974 levels in Brisbane
- The difference was the flood mitigating effects of Wivenhoe Dam, built after 1974 floods, even though designed and operated primarily for water supply and controlling only half the catchment above Brisbane (ie Bremer river is uncontrolled)

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Retarding Basins

- Usually designed to provide local mitigation to frequent flooding (ie up to the 1% AEP flood)
- Hundreds of basins in Sydney, landscaped into the local community (ie in parks, golf courses etc)
- Must be designed to survive (or fail slowly) in extreme floods to minimise risks to downstream people

Operational Flood Mitigation

- Minimise flooding by:
 - pre-releasing from dams
 - operation of dam gates
 - slowing flood in one river so that it comes in behind flood in another river merging downstream (ie get longer flood rather than higher flood)

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Emergency Flood Operations at Dams

- All major dams in NSW have Dam Safety Emergency Plans that:
 - Specify measures to minimise dam failure risk
 - Align with SES Flood Plans
 - Provide detailed downstream flooding information
 - Specify measures to alert and assist SES

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Dams and Flood Mitigation

- Need to consider flood mitigation (including non-structural) at all levels from river catchments down to neighborhood and backyards
- Need to look holistically at dam functions- balance usage vs environmental aspects vs flood mitigation-proper planning, implementation and ongoing management is critical