ROYAL HASKONING

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"Best Practices River Restoration Design and Construction, a Dutch consultants view"

- river restoration in NL
- from vision to ground work
- difficulties on the road
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Rivers to be restored in NL

2 major types of rivers :

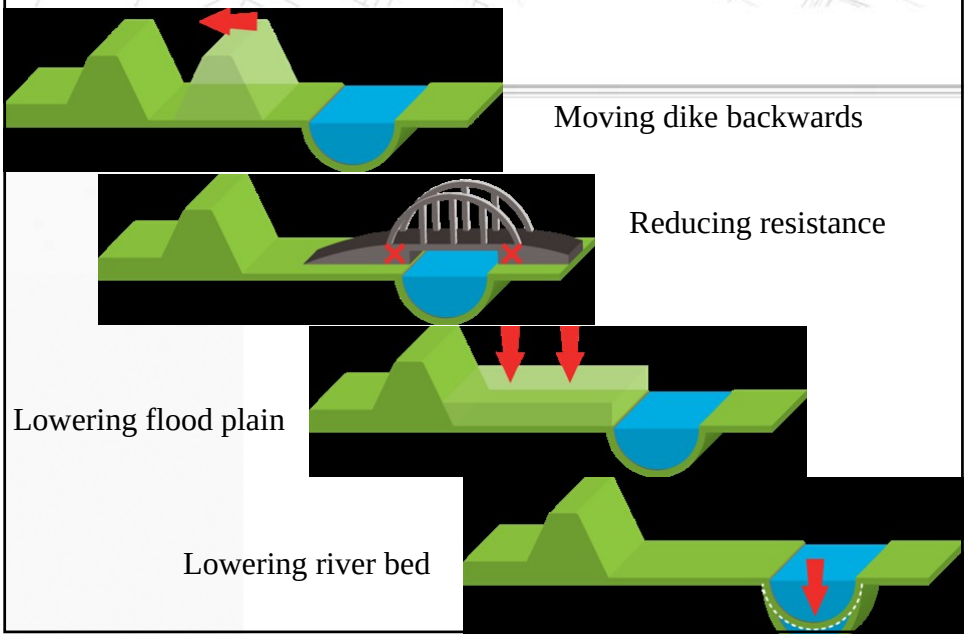
- Large rivers: Rhine, Meuse and branches
  managed by State (Rijkswaterstaat)
- Lowland streams/ brooks
  managed by regional water boards

Large rivers: River Rhine/Waal

- Shipping
- Cooling/ Power Production
- Drinking water supply
- Fresh water supply

Flood risk reduction
- 'Room for the River' program
- 30 projects
- some spare room for nature

Room for the River: typical measures

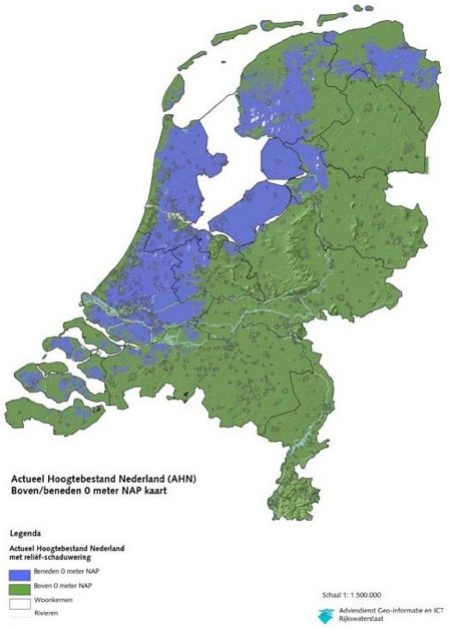


New side channels in flood plains

Restoration of large rivers

- Major driver is flood risk reduction
- 1 client: Min. Infrastructure and Environment
- Due to budget cuts, back to basics ->
  less attention for nature development:.
- River Meuse: only feasible due to financing by gravel producers

lowland streams : south/east of NL



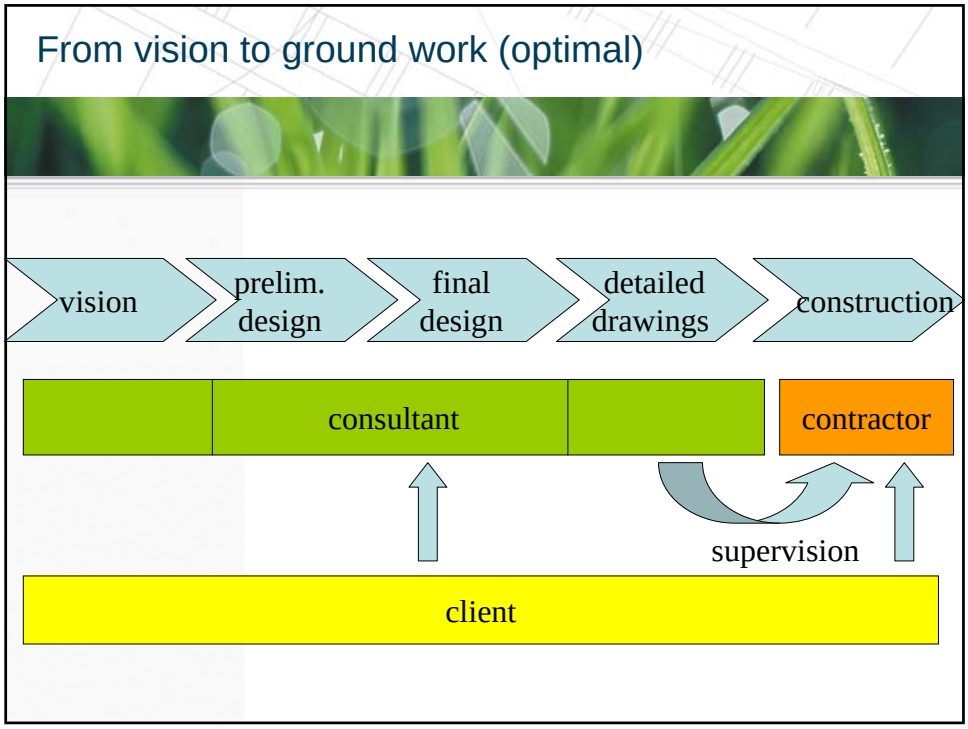
Blue = below SL
Green = above SL

lowland streams in NL

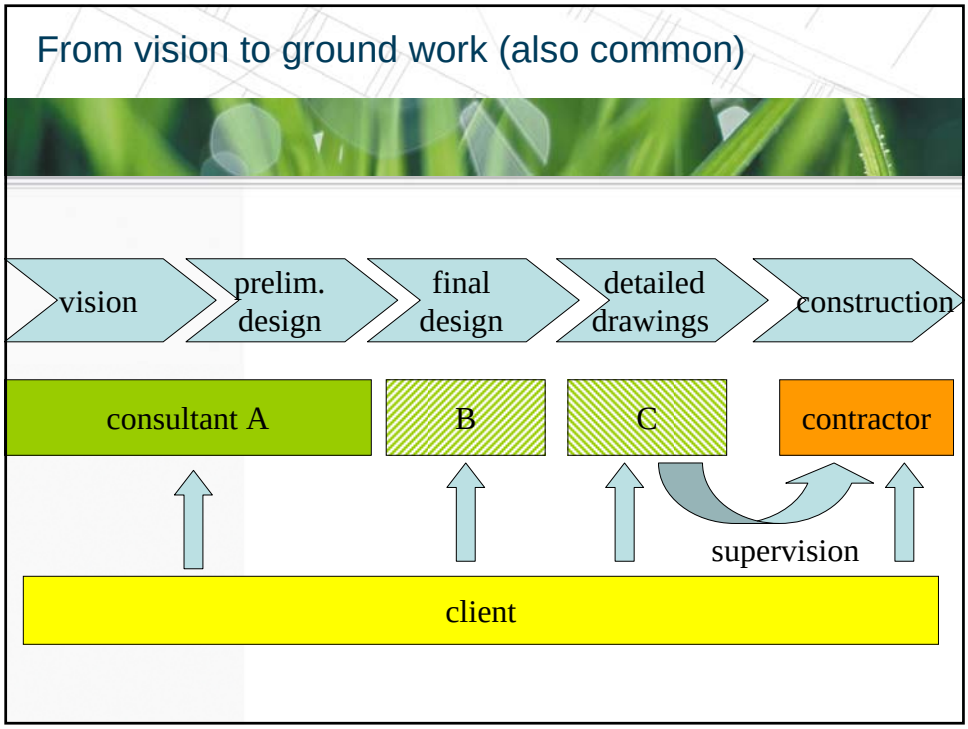
- 95% regulated since ’50-60’s for agriculture purposes
- standard profile
- high peaks, low flows
- massive vegetation growth, maintenance
- many weirs, vis migration barrieres
- restoration projects since early 90’s

lowland streams in NL

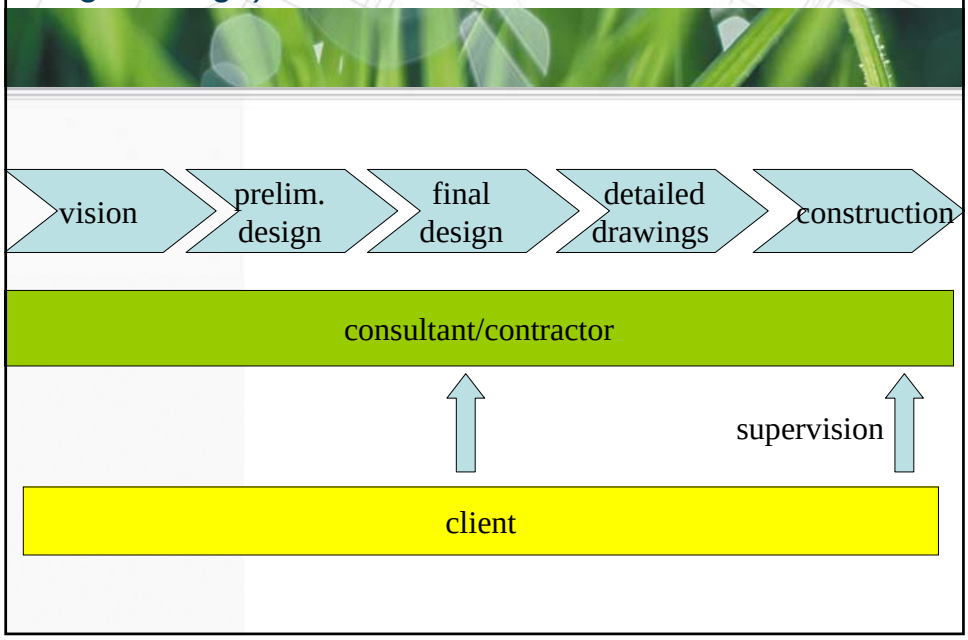
From vision to ground work (optimal)



From vision to ground work (also common)



From vision to ground work (future D&C, systems engineering?)



Challenge: making the contractor understand the vision

- ecologists' vision fades away into technical and concrete solutions during the process
- contractors should have experience in nature construction: selective tendering
- continuous need of dialogue with contractor
- preferably 1 consultant for the process

Example: standard fish passage: series of concrete chambers

Less technical alternative: temporary fish passage

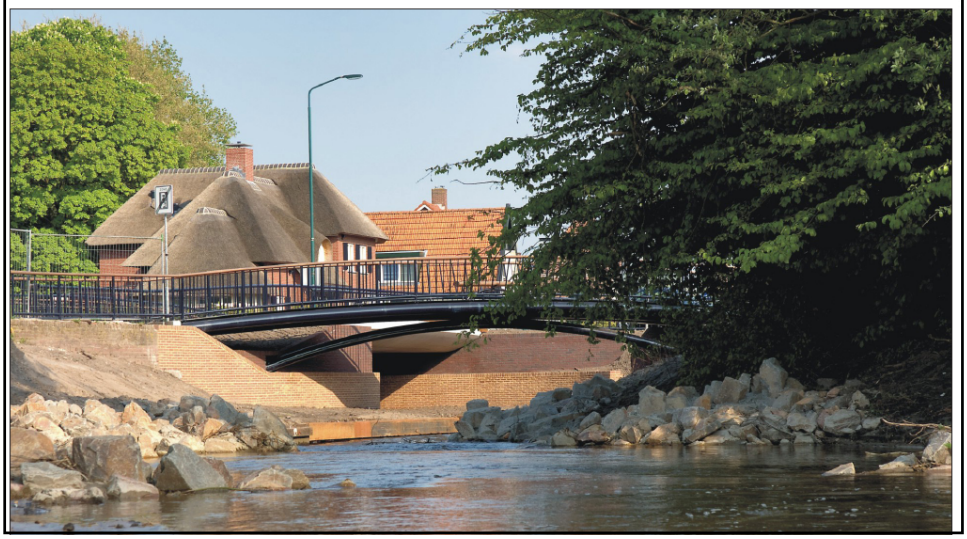
Examples: inundation bypass

Difficulties on the road

- stakeholder commitment: as early as possible
- land acquisition: voluntary basis
- delay by archeology, explosives, contaminated soils, cultural inheritage
- causes delay in financing, risk of loss of subsidy

Stakeholder involvement: showing the case

Safety conditions in urban area determine lay out



River Nemer use of alien materials for construction

Finally: also found in the Netherlands