



# Environmental flows - does it make sense for Mozambique?

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# Overview

1. Environmental flows - legal instruments
2. Incomati: the potential benefits of environmental flows
3. Zambezi: are environmental flows too expensive?
4. Conclusion

# Environmental flows - legal instruments

Política de Água (2007)

*ÁGUA E O AMBIENTE* (Cap. 4):

‘O uso e fornecimento de água para a preservação e manutenção dos ecossistemas deverá ser parte integral da gestão global dos recursos hídricos.

... a gestão dos recursos hídricos inclui a **garantia de caudais ecológicos nos rios e estuários onde armazenamentos ou outros factores alterem o regime de escoamento ...**’

# Environmental flows - legal instruments

## The SADC Protocol on Shared Watercourses (2000)

Introduces the concept of “Environmental use” = water for the preservation and maintenance of ecosystems

### *Protection and preservation of the aquatic environment*

(Art. 4, 2d):

‘State Parties shall ... take all measures ... to protect and preserve the aquatic environment, including estuaries, taking into account generally accepted international rules and standards.’

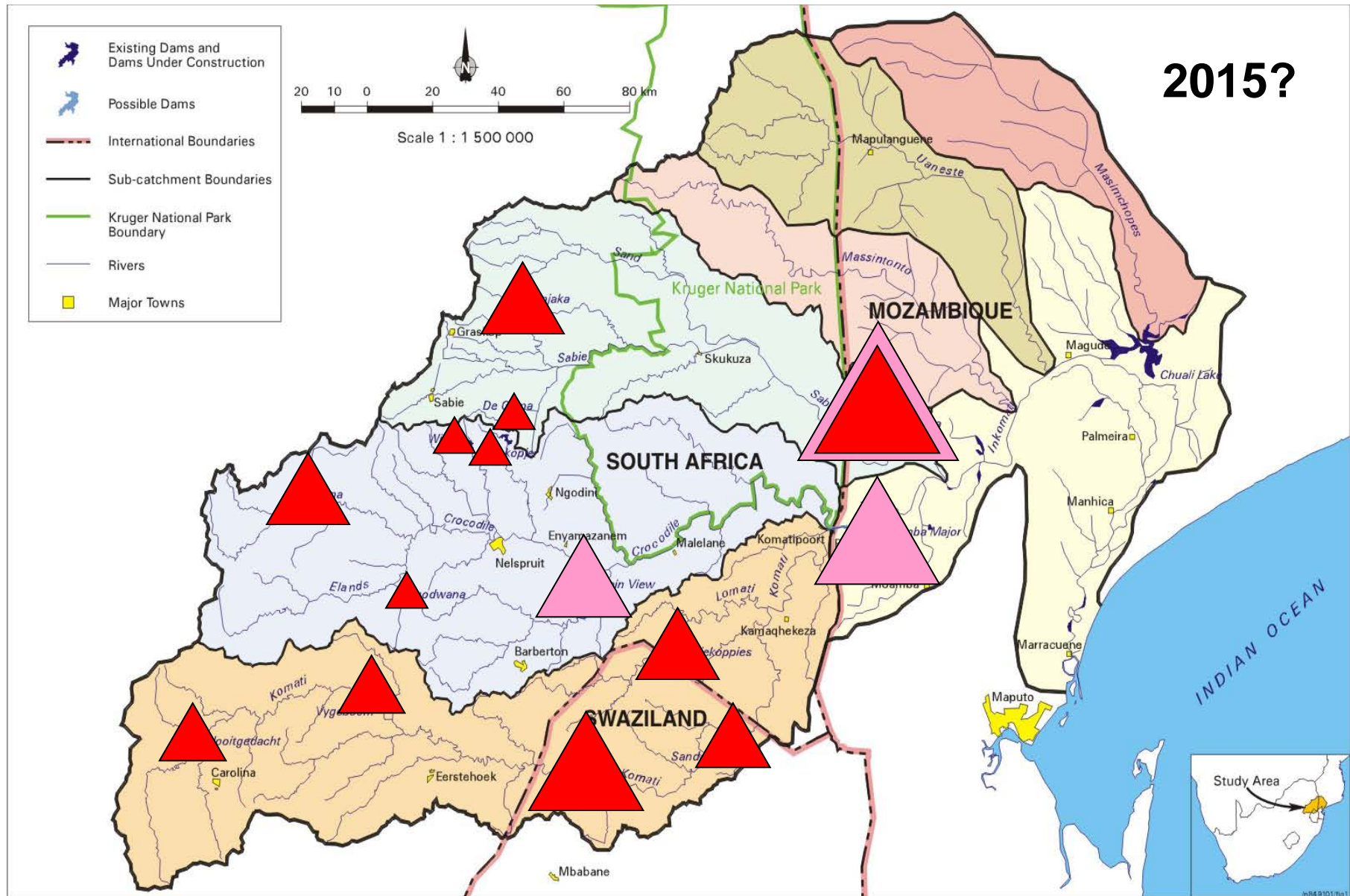
# Incomati

## Interim Inco-Maputo Agreement (2002)

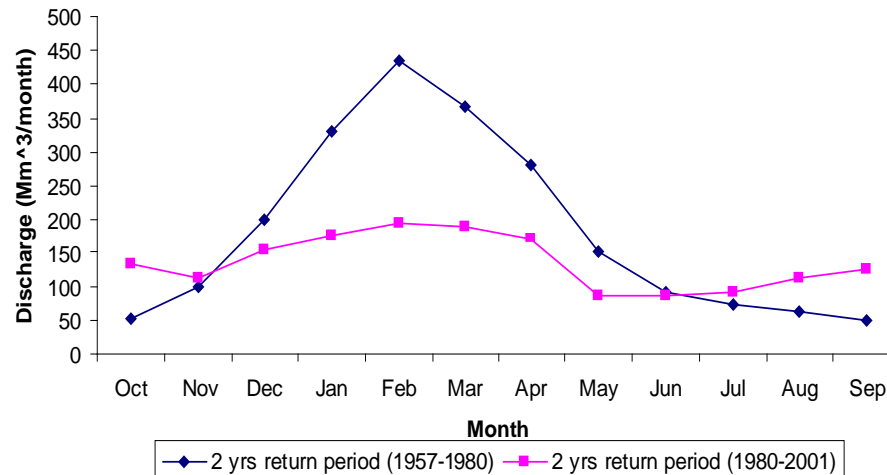
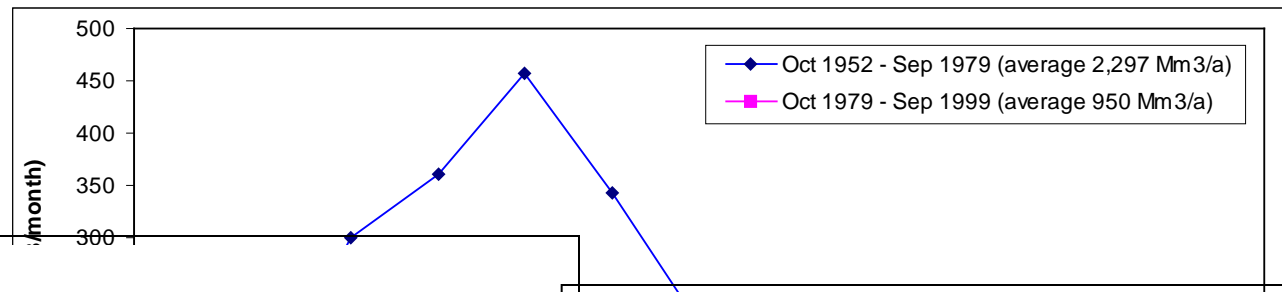
### **Article 6**

#### **Protection of the Environment**

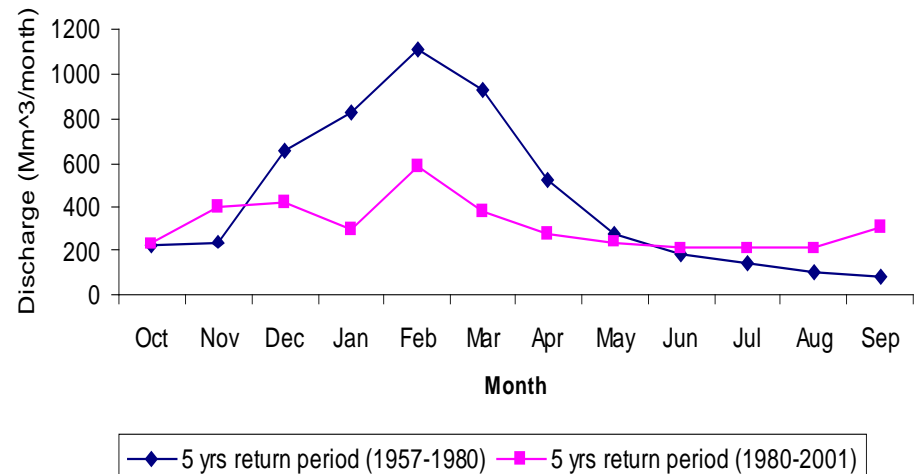
- (1) The Parties shall, individually and, where appropriate, jointly, protect and preserve the aquatic environment of the Incomati and Maputo watercourses, taking into account generally accepted international rules and standards.
- (2) The Parties shall, individually and, where appropriate, jointly, take all measures to protect and preserve the ecosystems of the Incomati and Maputo watercourses.



# Incomati



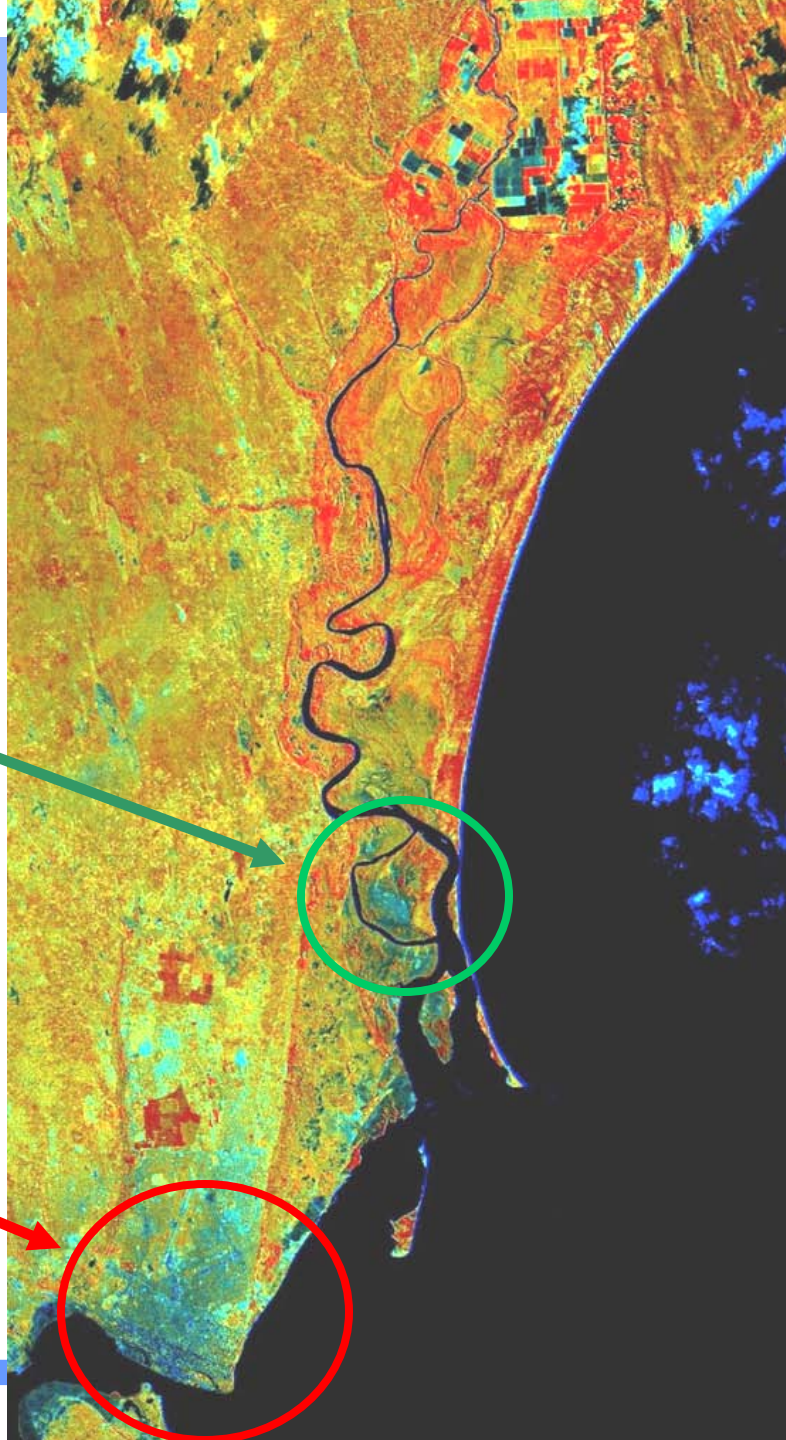
Source: Carmo Vaz & Van der Zaag, 2002

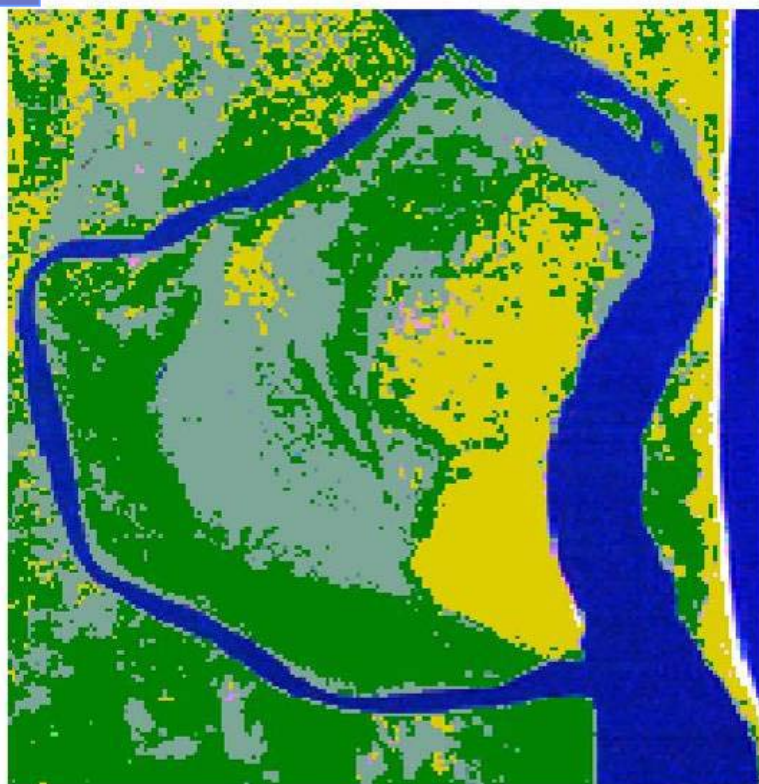


The flow regime has been fundamentally changed

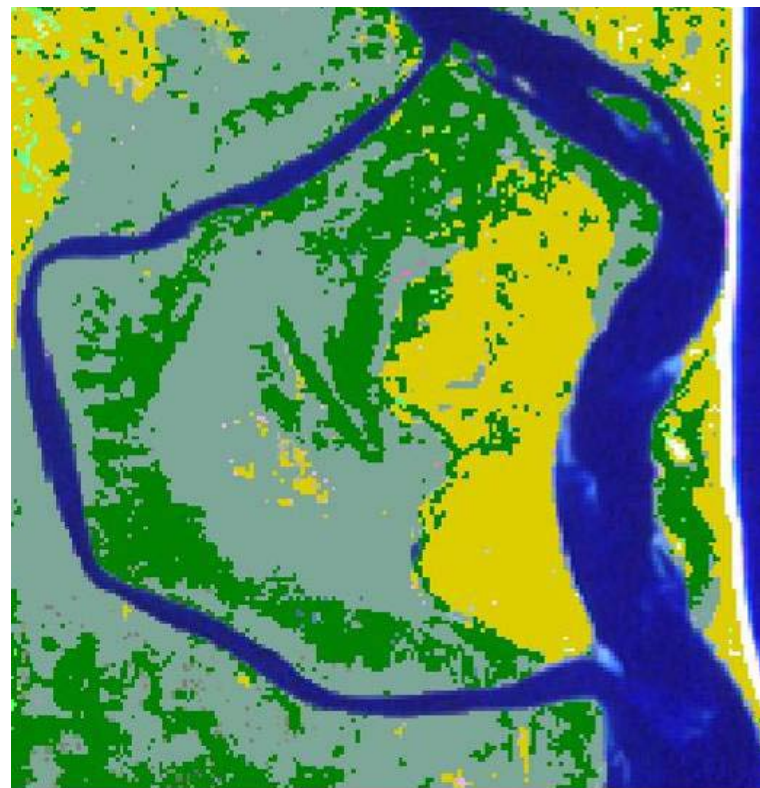
Benguela  
island

Maputo  
city

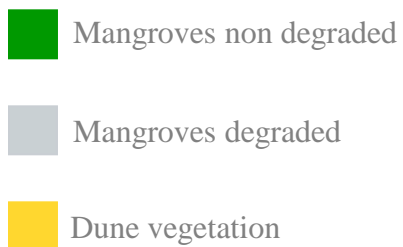




1984



2003



Source: LeMarie et al., 2006

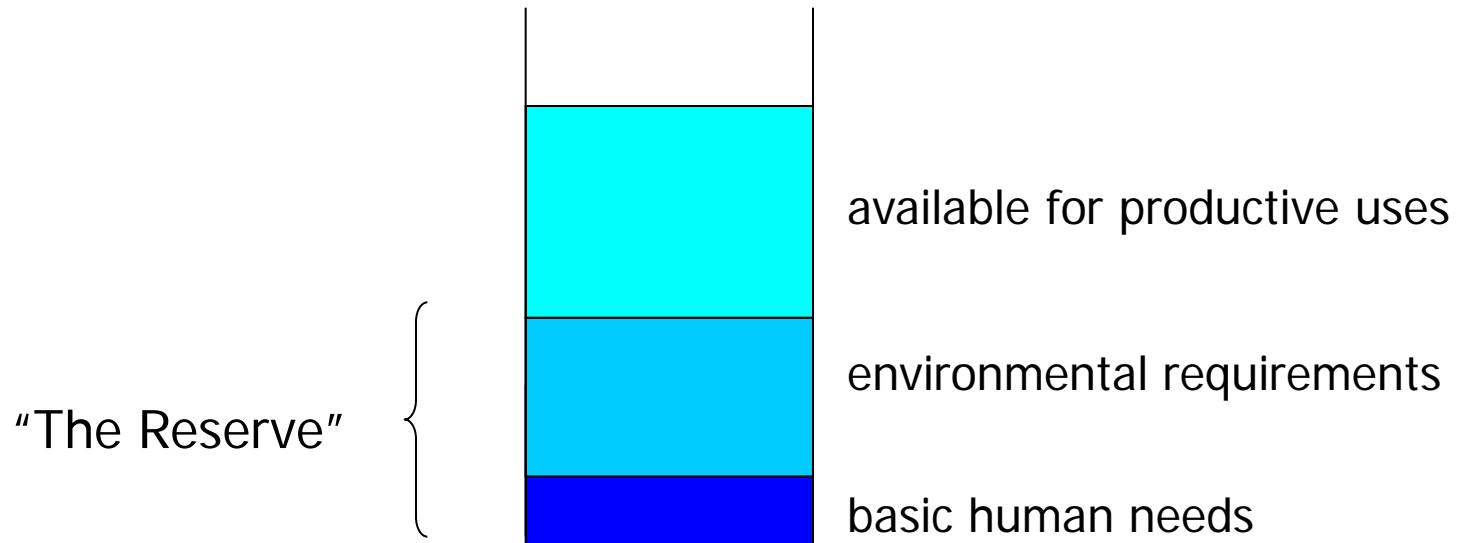


Photoos: Sengo, 2003



# Incomati

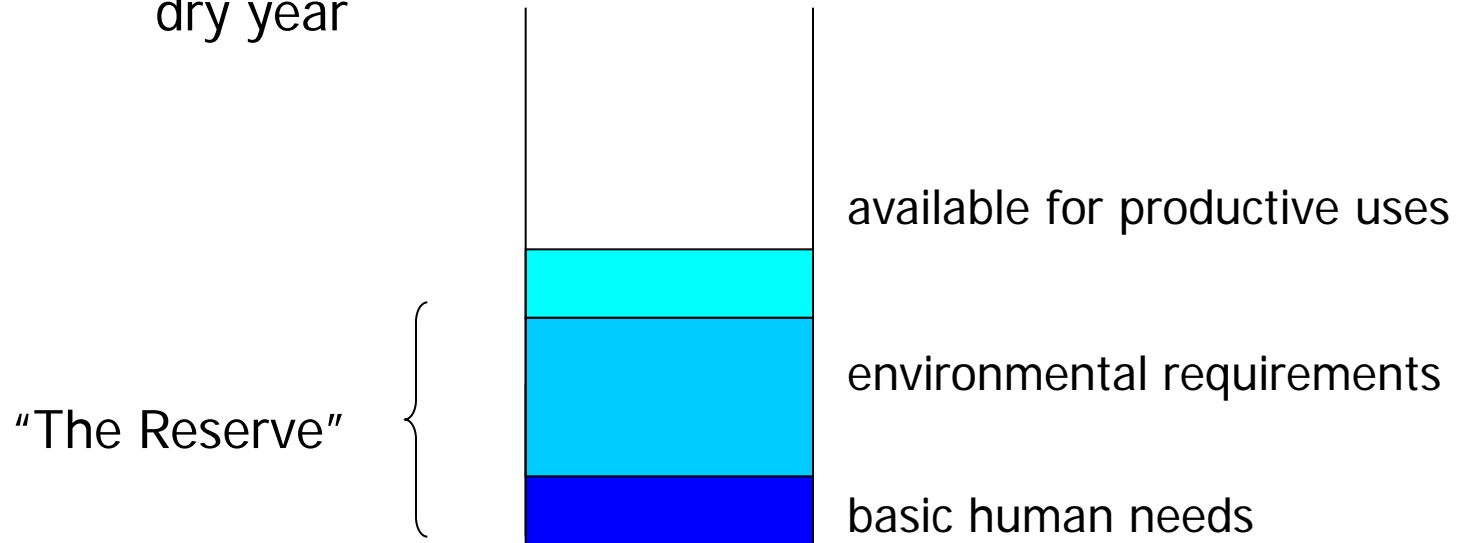
South Africa



# Incomati

South Africa

dry year



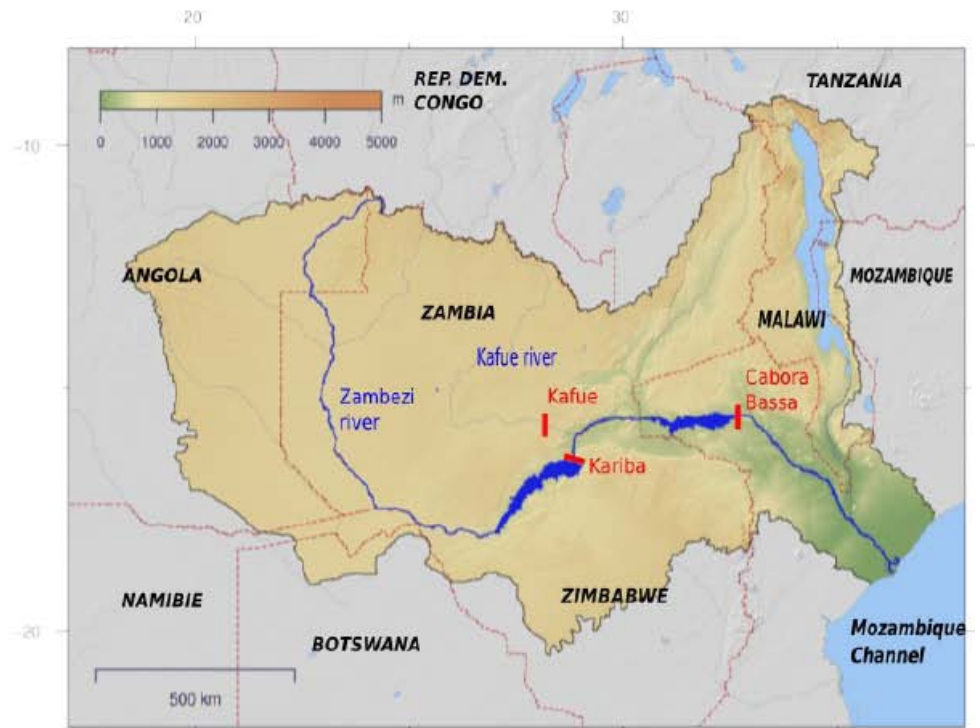
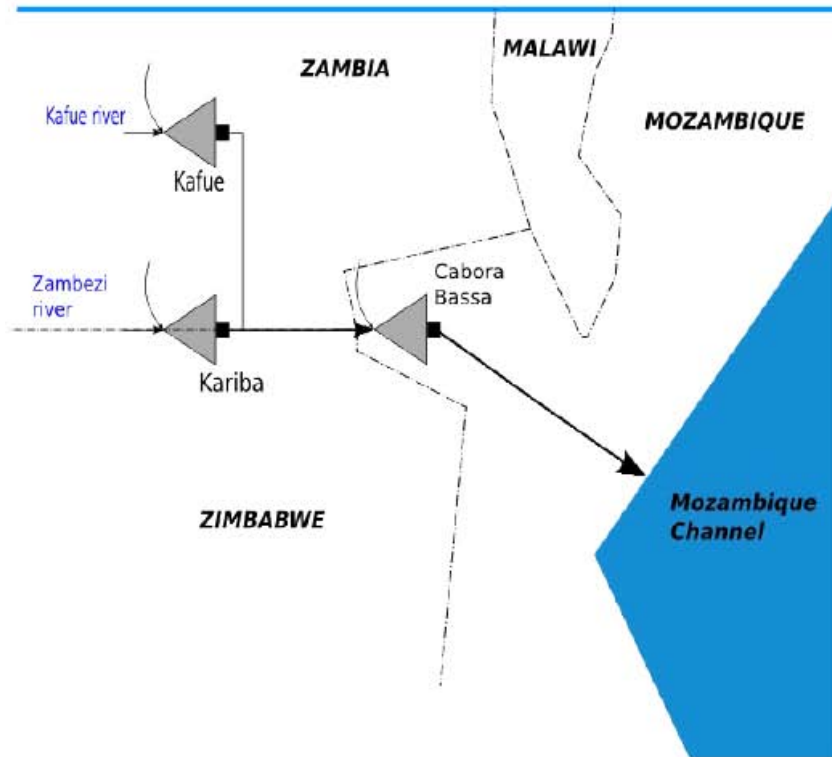
# Incomati

Thus:

Environmental flows are good for the Incomati in  
Mozambique

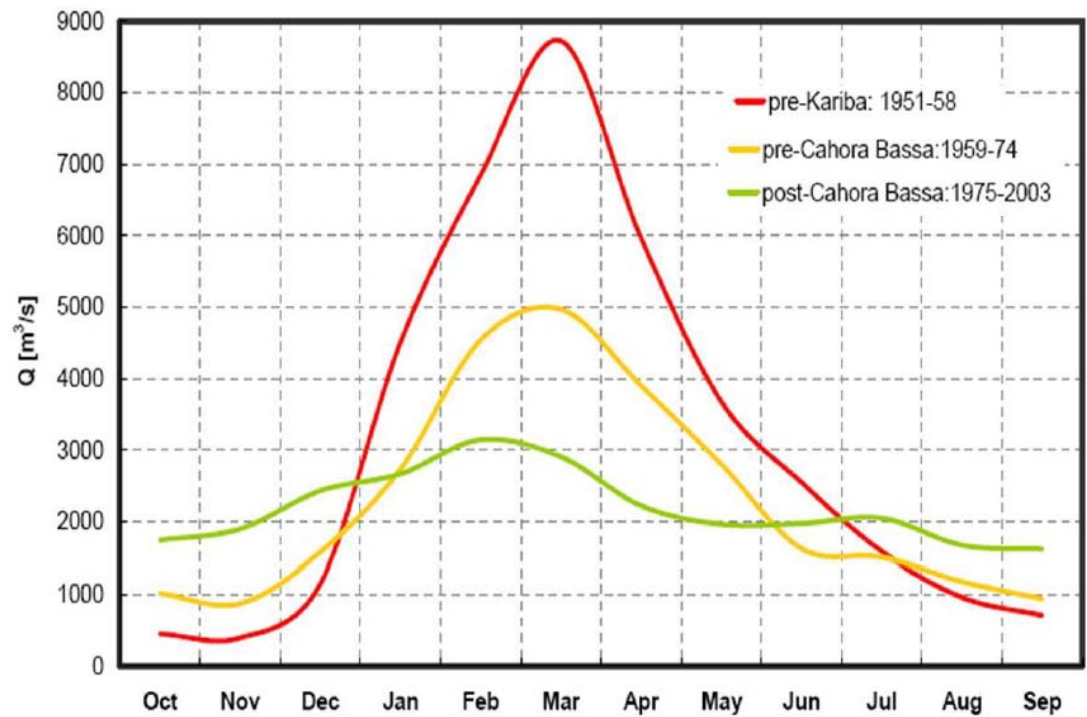
# Zambezi

## Zambezi Basin



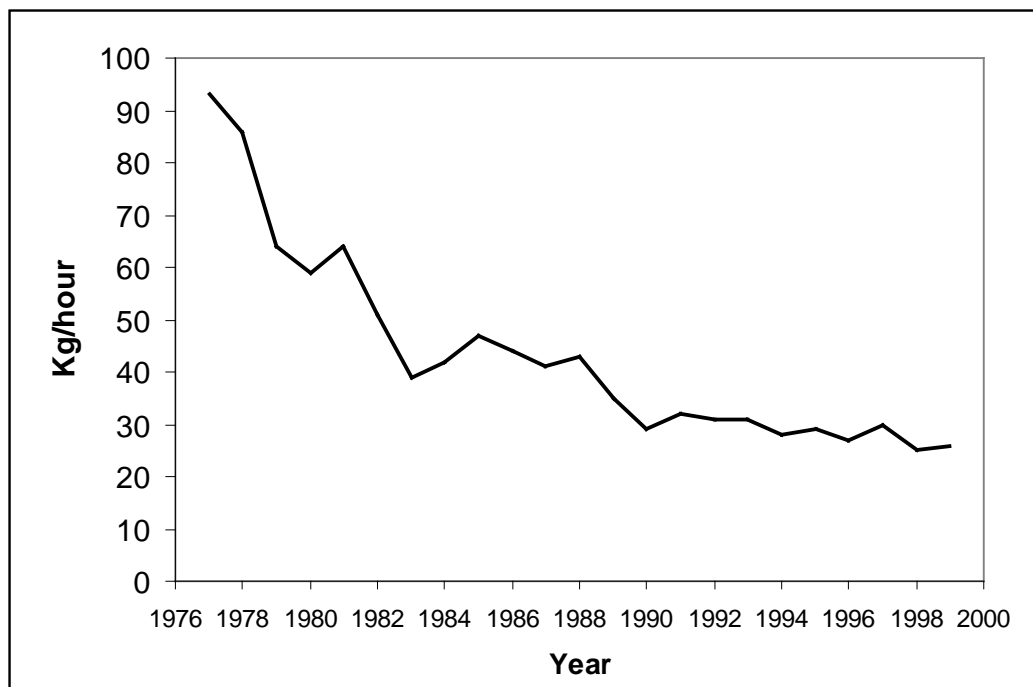
# Zambezi

A significantly  
modified flow regime



Source: Riversadale, 2011

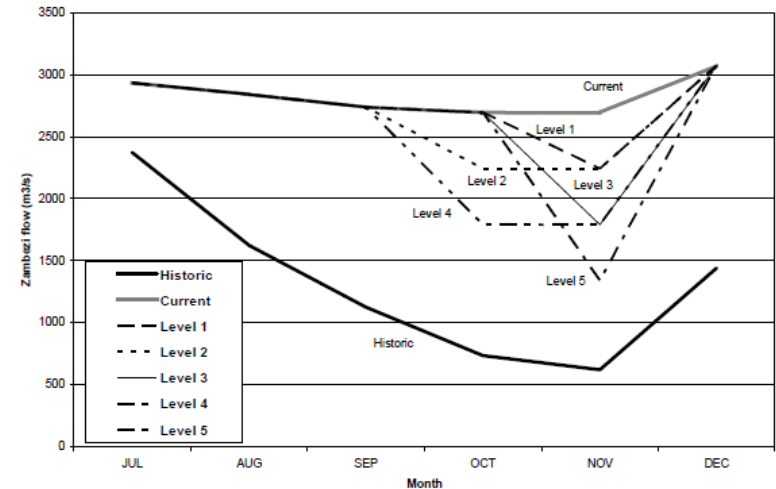
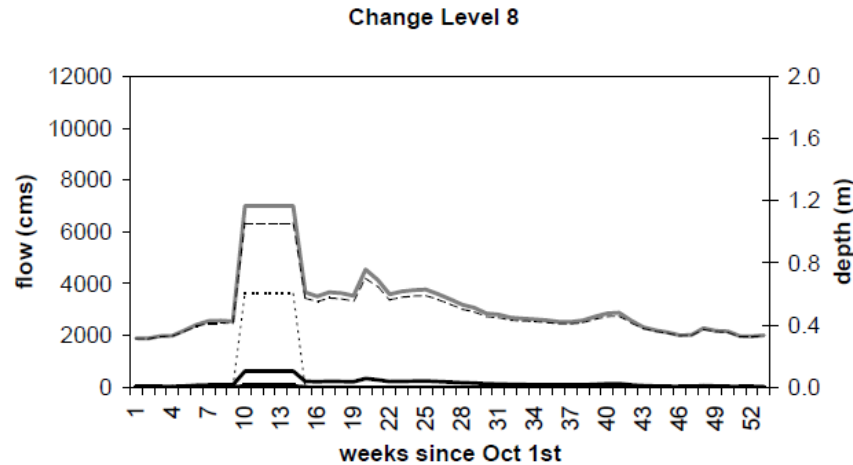
# Zambezi



Evolution of the catch rates of the shrimp in Sofala Bank

Source: Hogueane, n.d.

# Zambezi



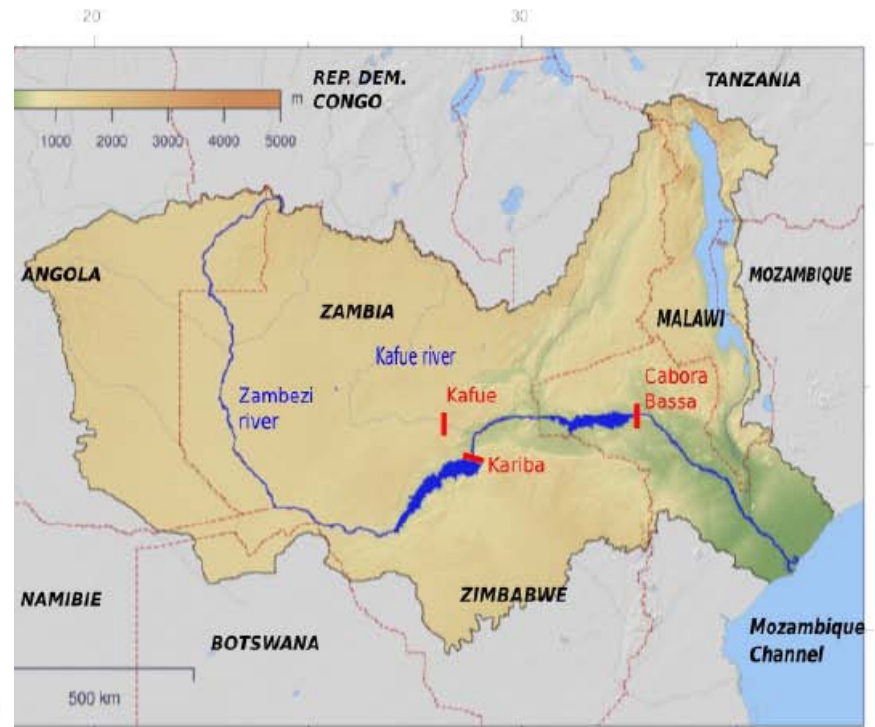
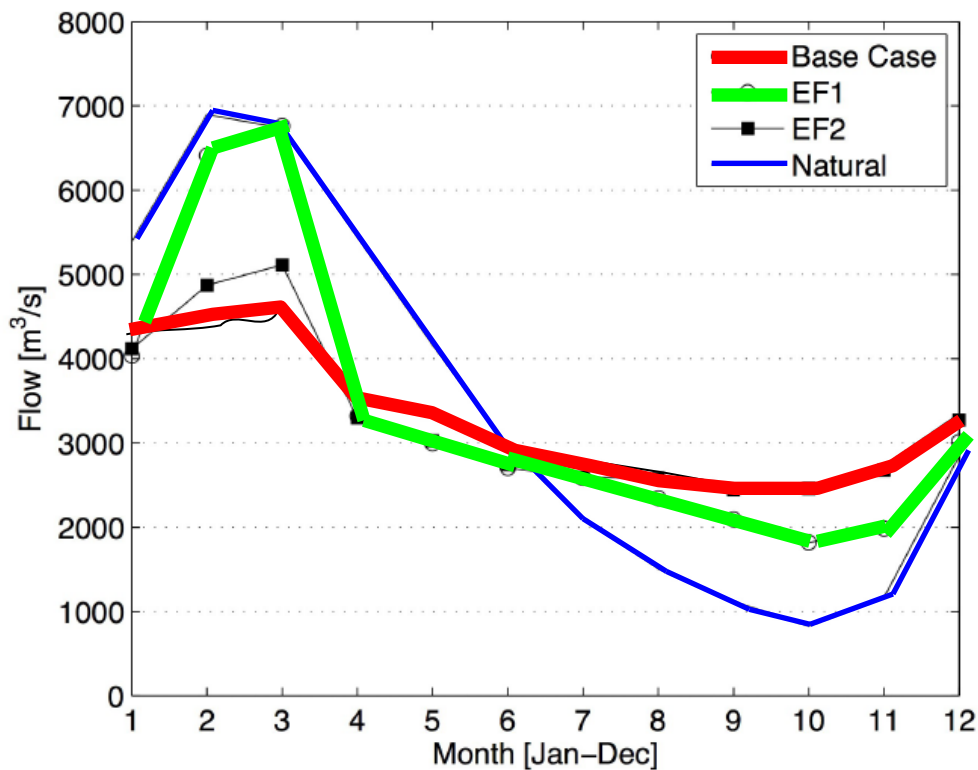
Source: Beilfuss and Brown, 2006

Re-establishing partly the flow regime

- legally mandatory?
- possible?
- benefits?
- costs?

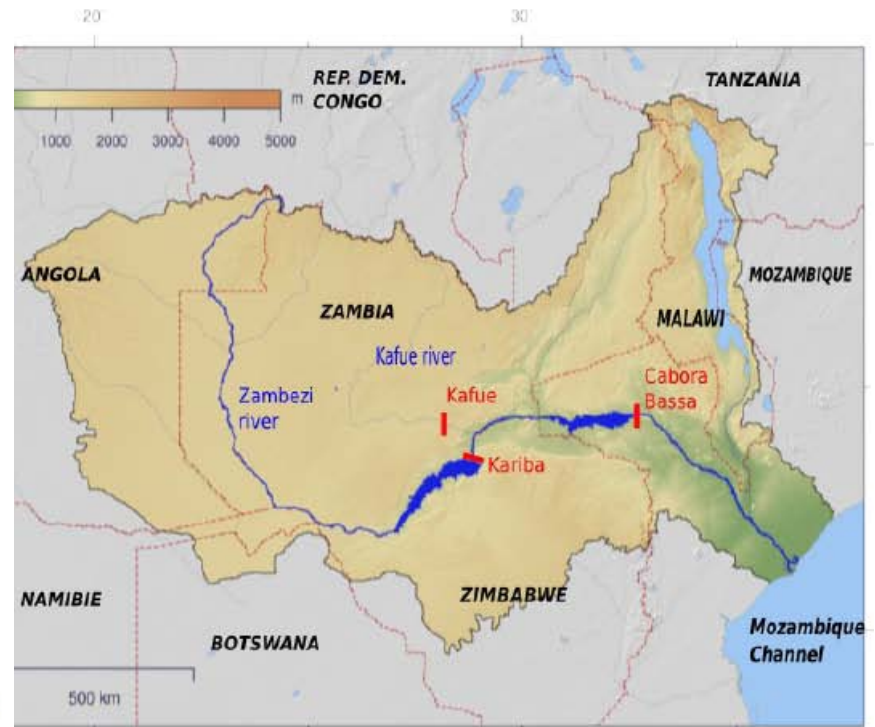
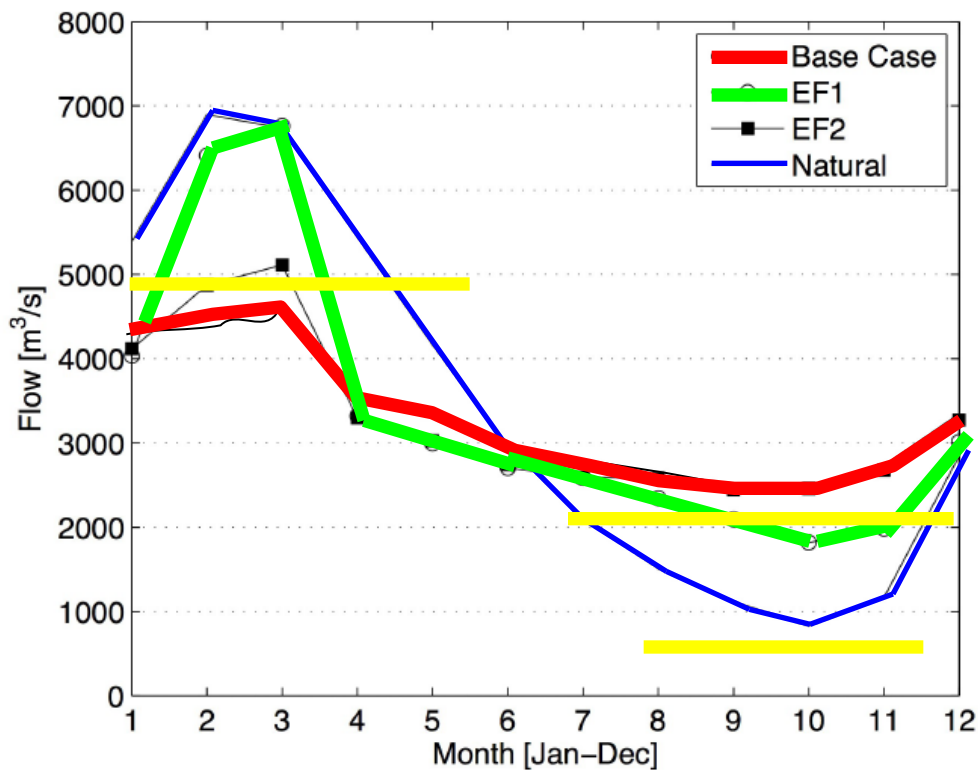
# Zambezi

## Zambezi Basin



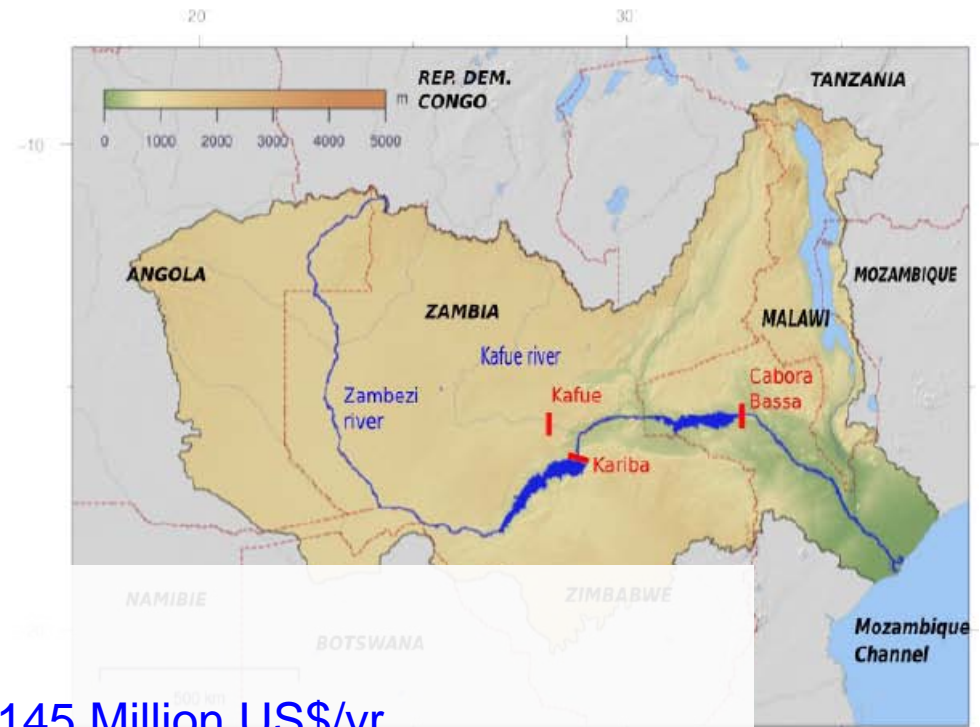
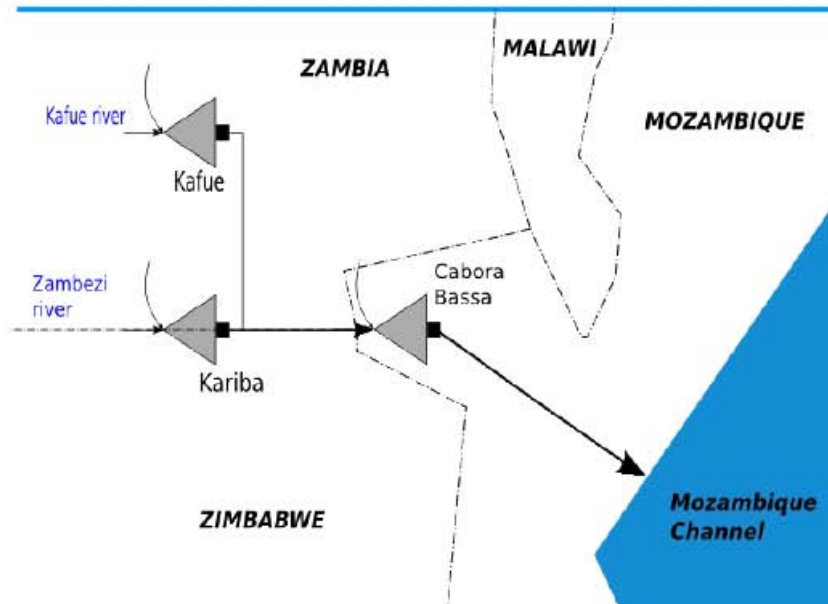
# Zambezi

## Zambezi Basin



# Zambezi

## Zambezi Basin



Electricity produced:

Full development: 30.8 TWh/yr

EF1 scenario: -1.8 TWh/yr  $\approx$  -145 Million US\$/yr

EF2 scenario: -0.4 TWh/yr  $\approx$  -32 Million US\$/yr

Source: Tilmant et al., 2010

# Zambezi

## Environmental flows

- ZamCom does not yet prescribe EFR
- technically possible
- will benefit fisheries, and environment
- economic benefits not known  
(+20% fish production? Hogue, unpub.)
- transboundary synchronisation of the operation of Kariba and HCB will bring additional benefits
- costs: reduced electricity production
- costs: may impair navigation, especially during the (short) low flow season

# Conclusion

1. Environmental flows are good for Mozambique in the Incomati
2. Environmental flows are good for fisheries and the environment in the Zambezi
3. Environmental flows reduce electricity production and may impair navigation during one month per year in the Zambezi
4. Environmental flows in the Zambezi requires changing the operating rules of HCB
5. Who will decide?



Photo: Chris Keely, 10 February 2009

# Thank you!

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