

Upgrading the wastewater treatment plants for public amenity?

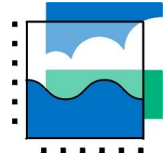
A dilemma of local and global environment

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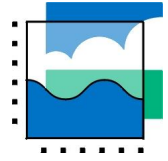
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Background

- Environmental issues concerning wastewater treatment are numerous.
- Legislation is continuously refining the requirements for the level of removal of various pollutants in treated water.
- *Stricter? then better?*



Example-China

- existing wastewater system
 - - secondary treatment for COD removal
 - - hygienic and drainage
 - - no sewer
- **new** *discharge standard of pollutants for municipal wastewater treatment plant(2003, 2006)*

Part of the **discharge standard** and input wastewater quality

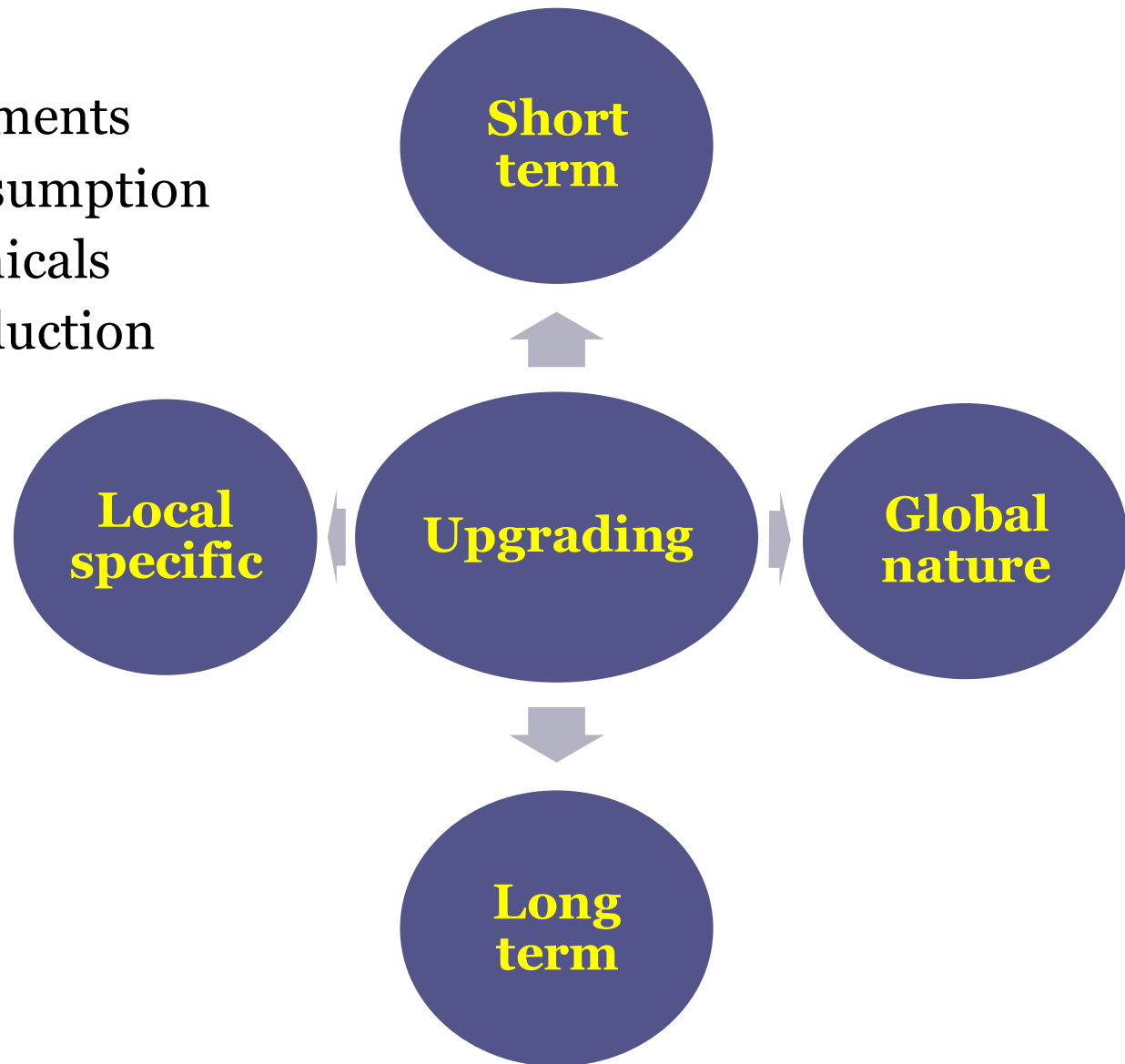
- reused or
- **receiving water-body has less diluting ability**
- for “**landscape water use**”
- **national and provincial identified watersheds**

Parameter	Class 2	Class 1B	Class 1A	Input wastewater	average
COD	100	60	50	146-293	229.4
BOD ₅	30	20	10	44.7-181	96.3
SST	30	20	10		135
TN	-	20	15	20.3-37.3	28.7
NH ₃ -N	25(30 ^a)	8(15 ^a)	5(8 ^a)	16.3-33.8	23.5
TP	3	1	0.5	2.4-4.9	3.4

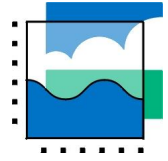
^a Figures in brackets are the standards when water temperature is lower than 12°C.

Upgrading of WWTP for **public amenity** from **aesthetics** point of view?

- high investments
- energy consumption
- use of chemicals
- sludge production

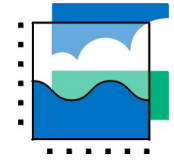


Goal and Scope Definition

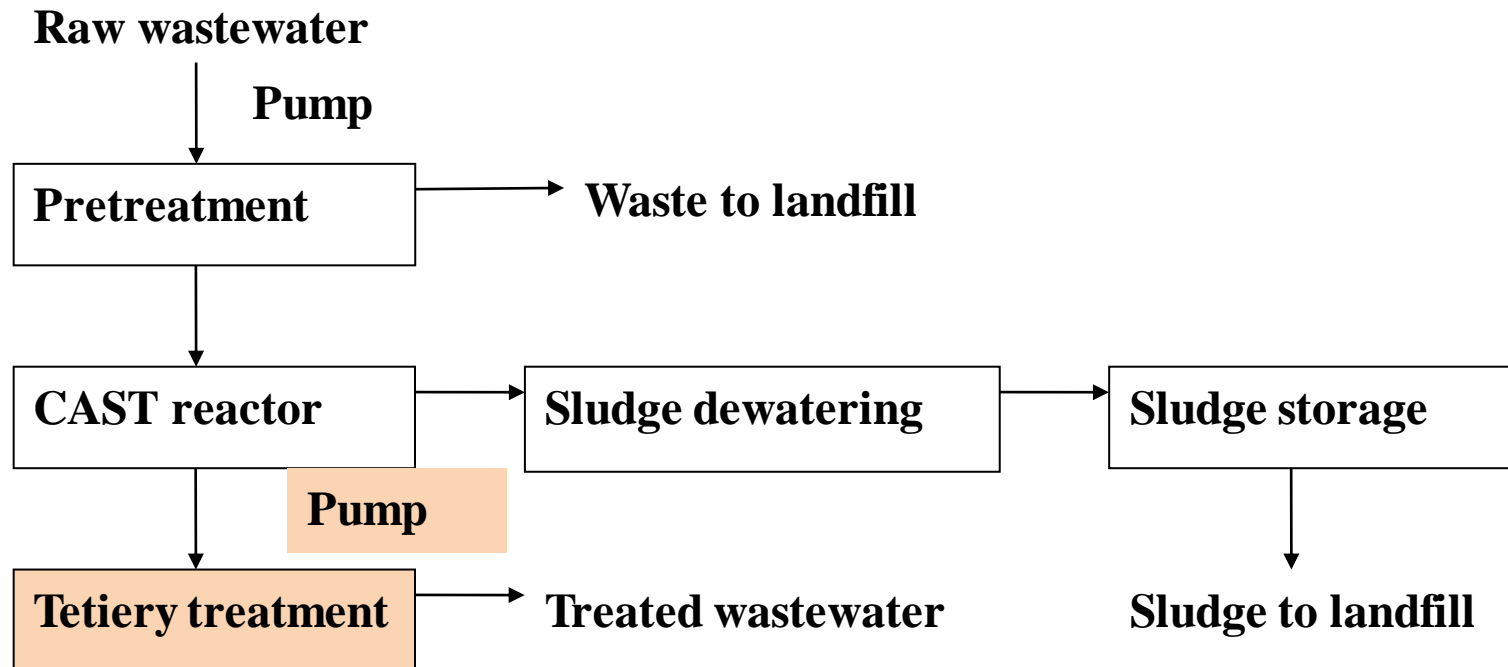


- Objective
 - estimate the potential environmental impacts associated with wastewater treatment processes that meet different classes in discharge standard.
 - optimizing treatment extent
 - compromising on the less aggressive possibility for environment.
- LCA methodology
 - CML2000 method

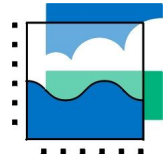
System under study



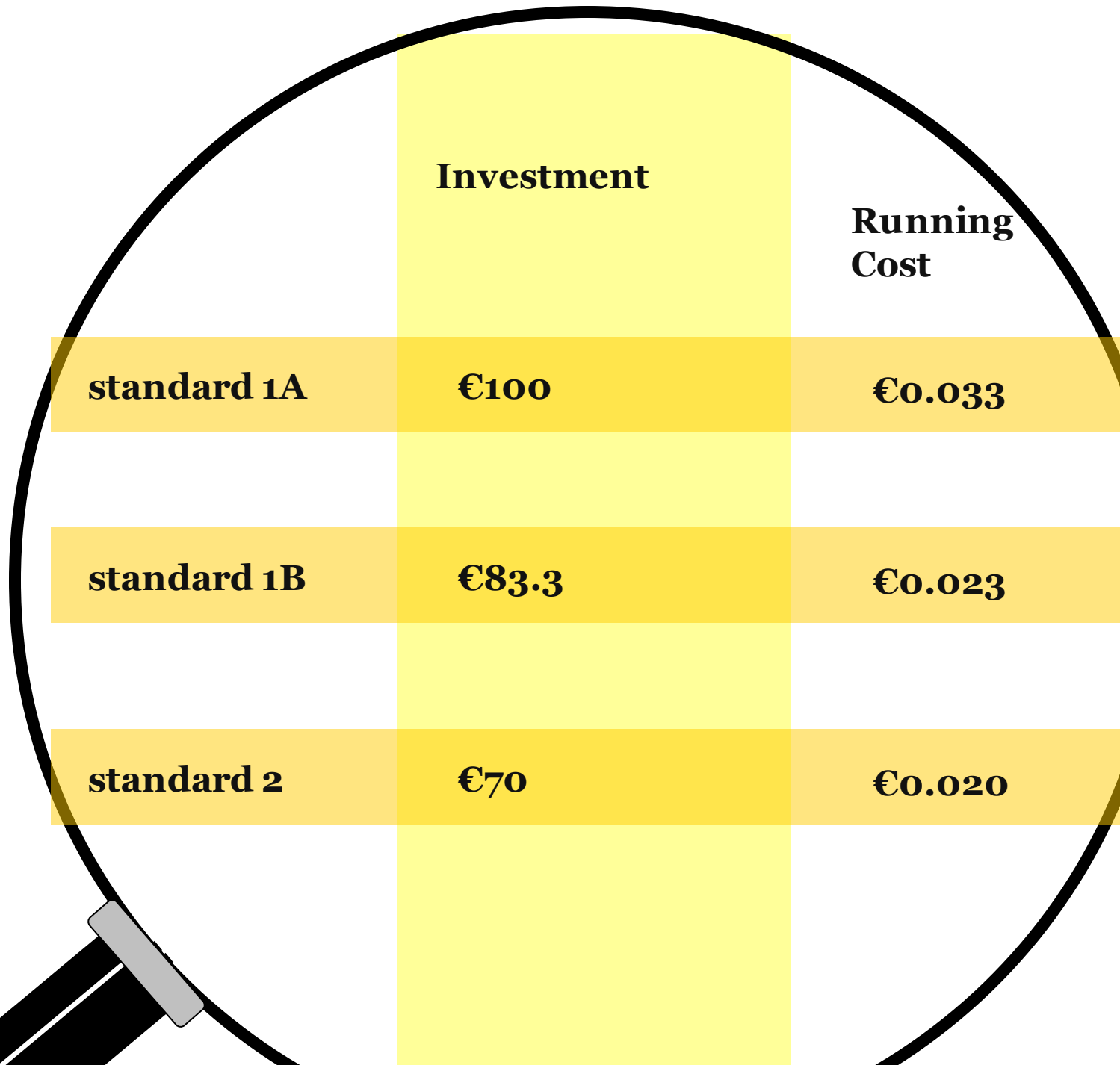
- Location
 - in a cool area, Heilongjiang Province, China
- Function Unit
 - 35000 PCE (per-capita equivalent) wastewater treated



Scenarios

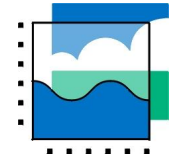


- **scenario 1B:**
 - the existing system
 - effluent meet standard 1B
- **scenario 1A:**
 - introduce a tertiary stage (coagulation + sedimentation + filtration) for upgrading
 - effluent meet standard 1A.
- **scenario 2:**
 - a high-load CAS to meet lower standard, class 2.
- **System boundaries**
 - the focus in the WWTP operation.

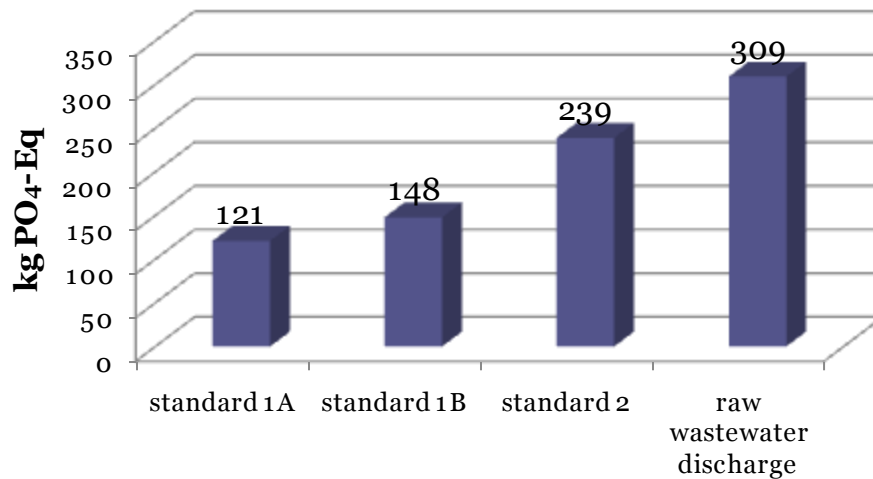


*per PCE

characterisation result

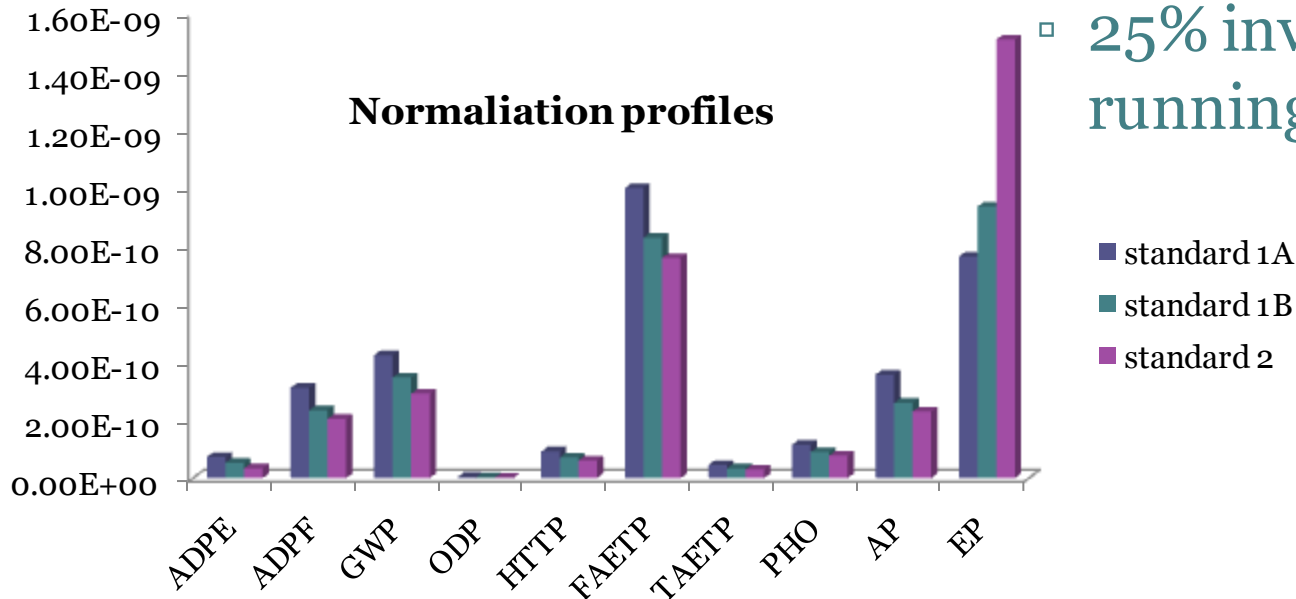


EP

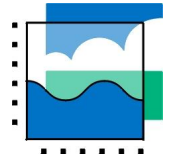


- Upgrading WWTP from Standard 1B to 1A reduce
 - 18% of eutrophication potential.
- At the expense of increasing
 - 21%-37% of other impacts.
 - 25% investment and 43% running cost.

Normaliation profiles

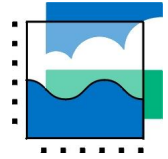


Discussion - Stricter or Not?



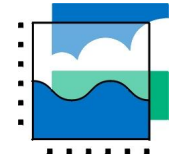
- eutrophication potential \neq eutrophication state
 - carrying capacity, self-purification of receiving waterbody
 - algae bloom, climate
- If the treated water is not reused but for **public amenity**, *is weighing the balance necessary?*

Improvement possibilities 1



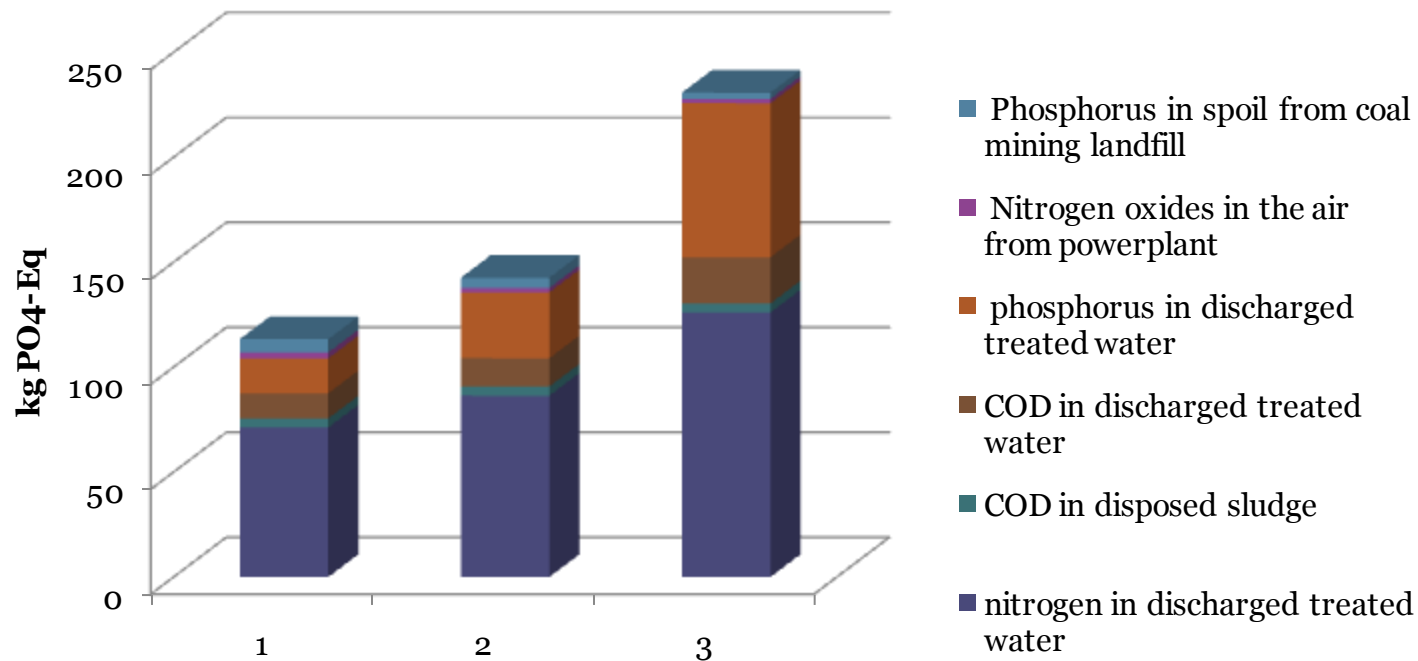
- Upstream? Tributary?
- Across provincial boundary problem
- Water shed
- from Standard 2 to 1B
 - reduce 38% of EP.
 - increase 10%-35% of other impacts.
 - 19% investment and 15% running cost.

Improvement possibilities 2

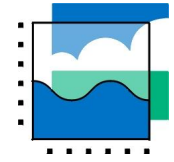


- Which to control: **Nitrogen** or Phosphorus?
- P: more chemicals and sludge.

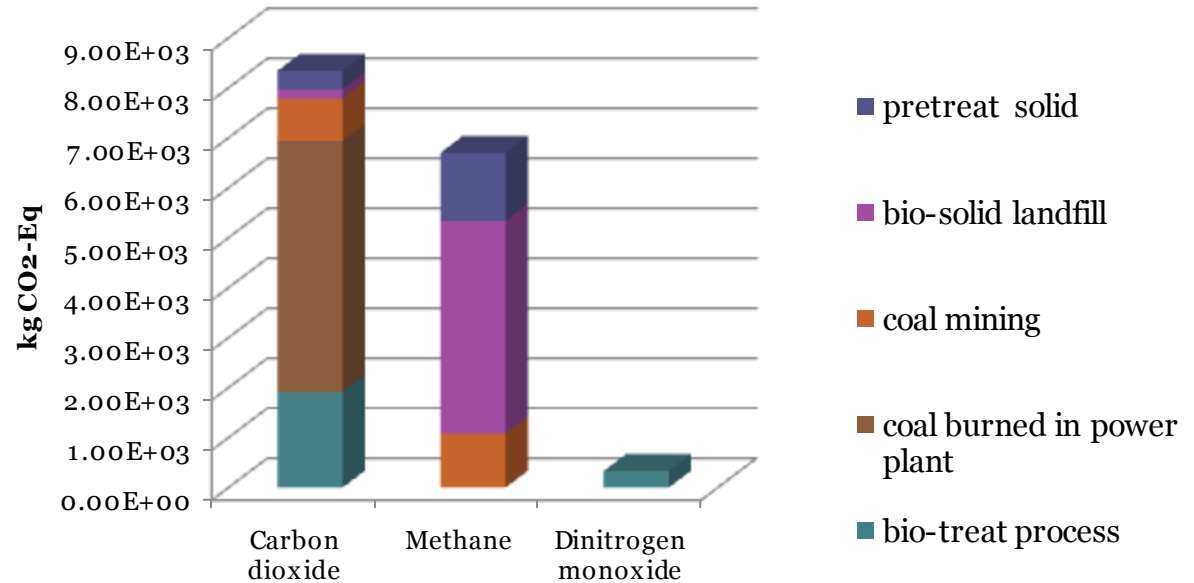
contribution analysis of the main substance involved in eutrophication



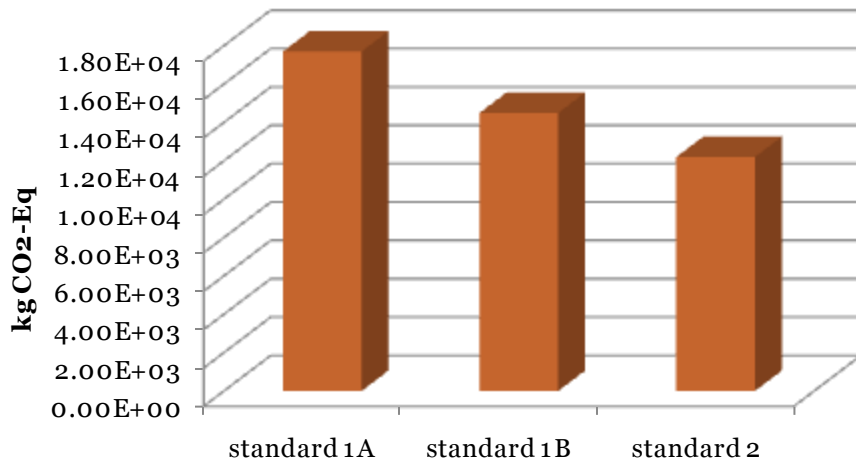
Improvement possibilities 3



contribution analysis of the main substance involved in GWP



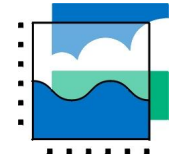
GWP



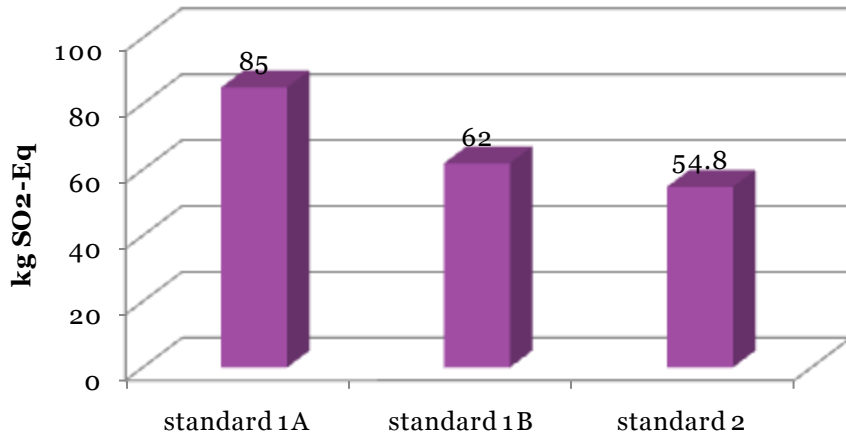
- Chain management
- Sludge disposal properly?

Improvement possibilities 4

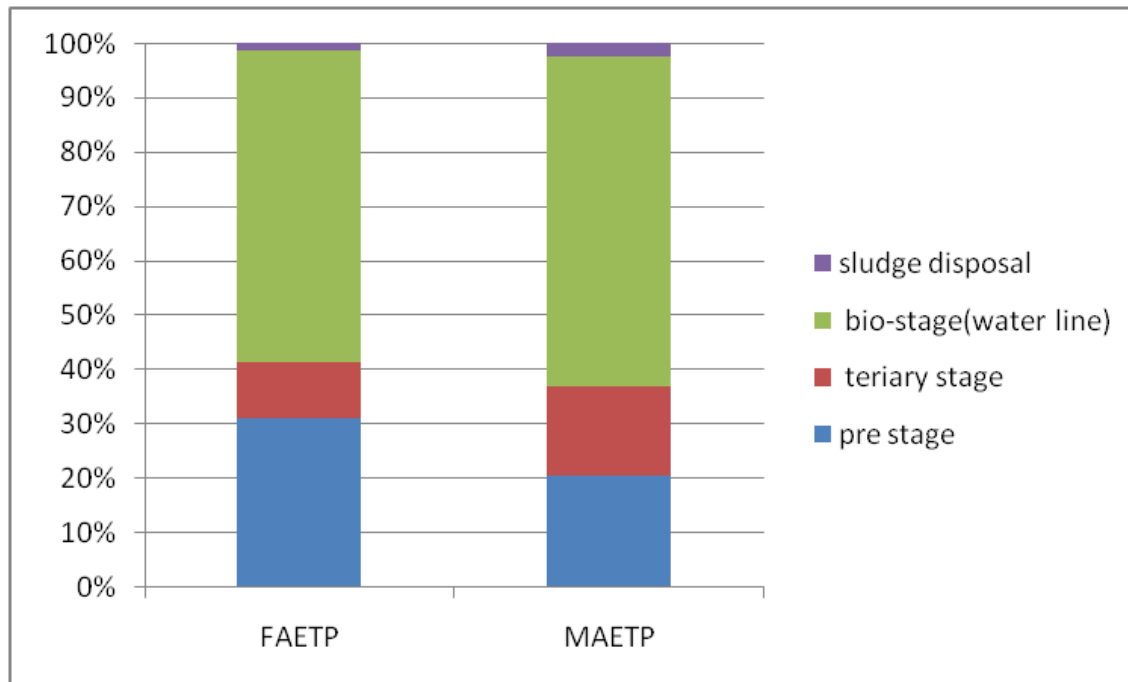
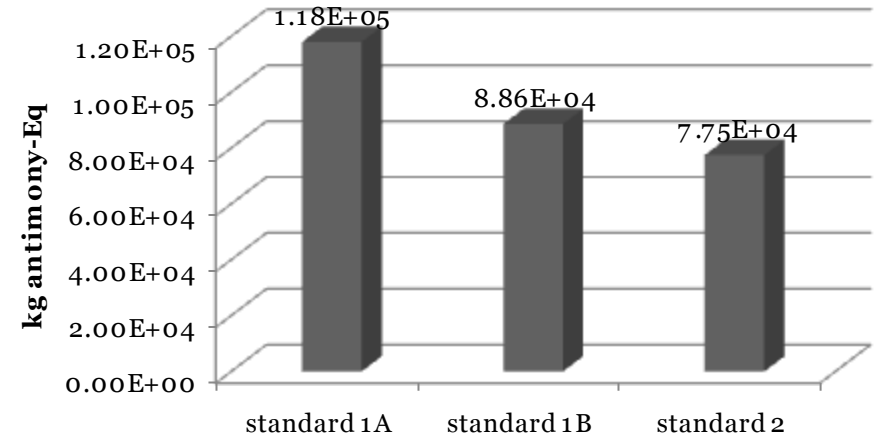
Energy saving?



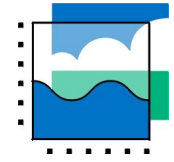
AP



ADPF

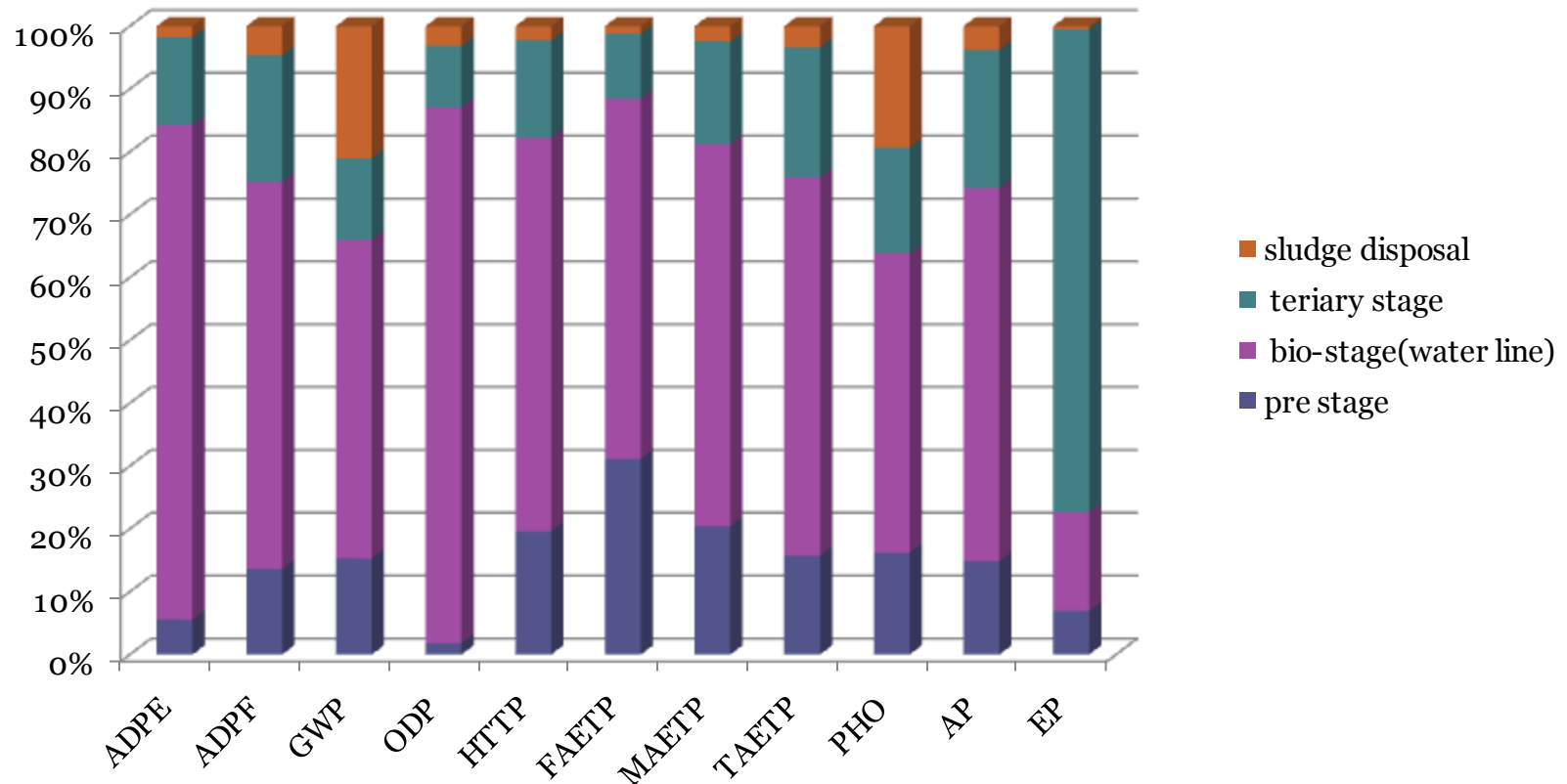


Improvement possibilities 5

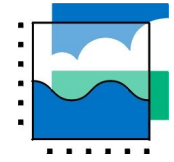


- Is the tertiary stage replacable?

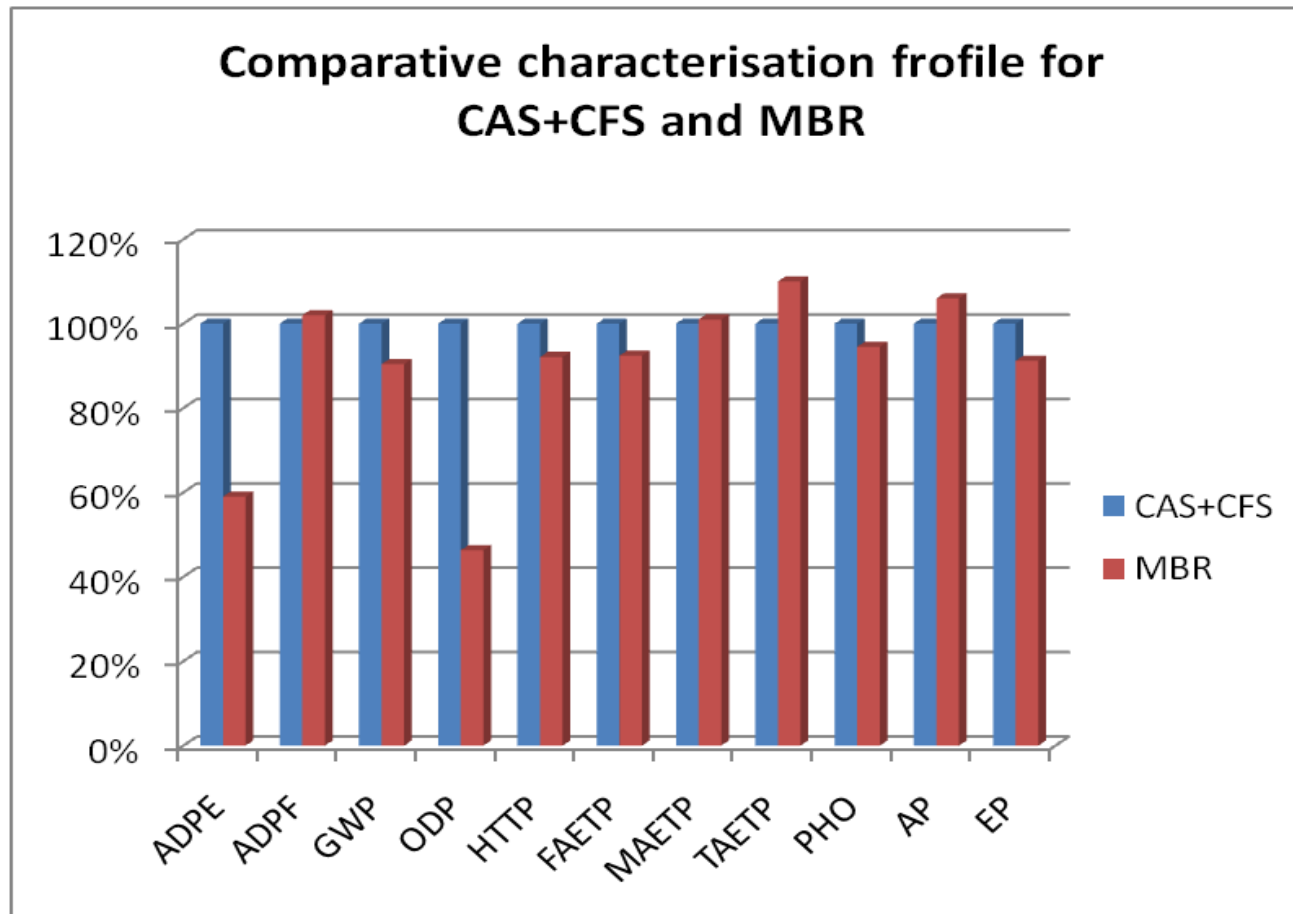
Characterisation profile for CAS+CSF Fuction Unit



MBR could be an option



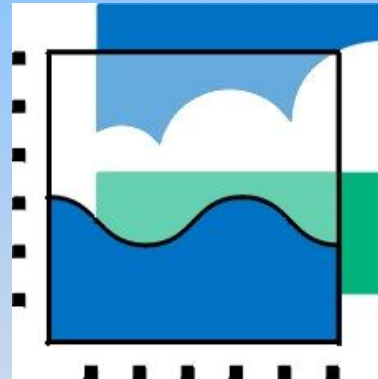
- Please refer to my poster
- *Assessing the environmental impact of options for wastewater reuse*



Thank you!



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Technology, China***



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