Economic and environmental impacts of genetic improvement

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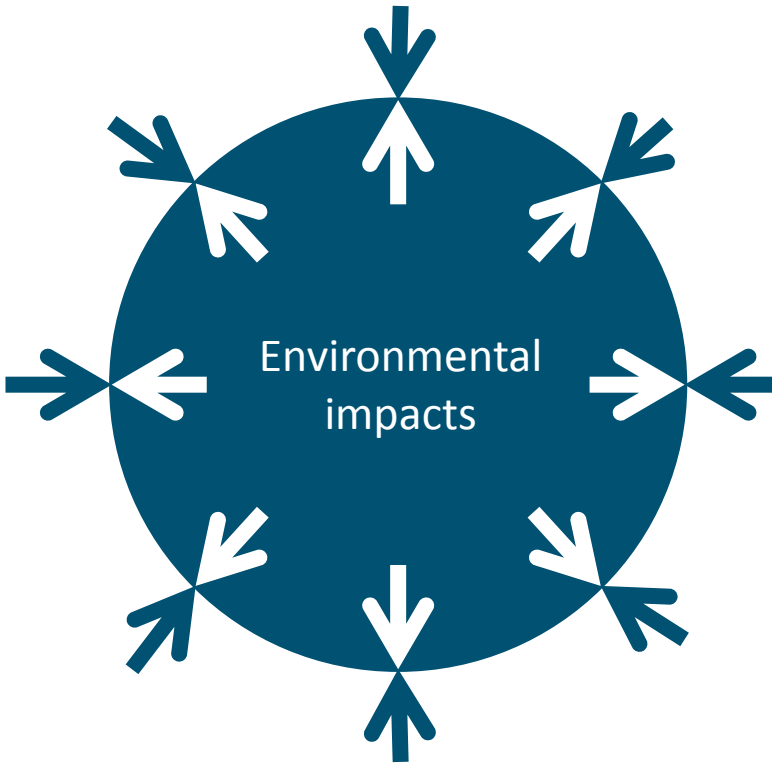
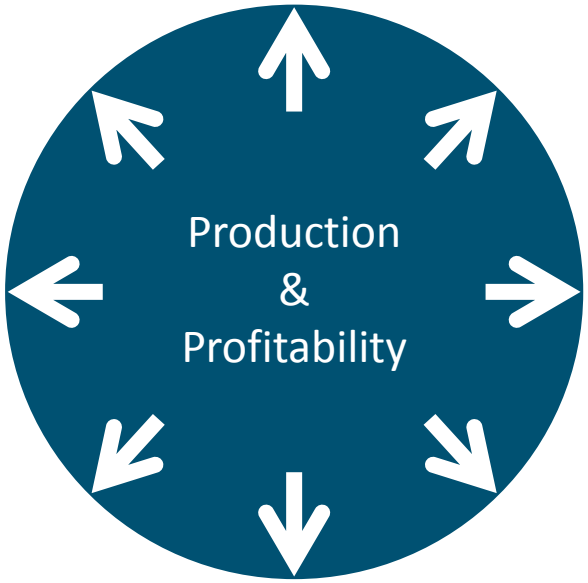
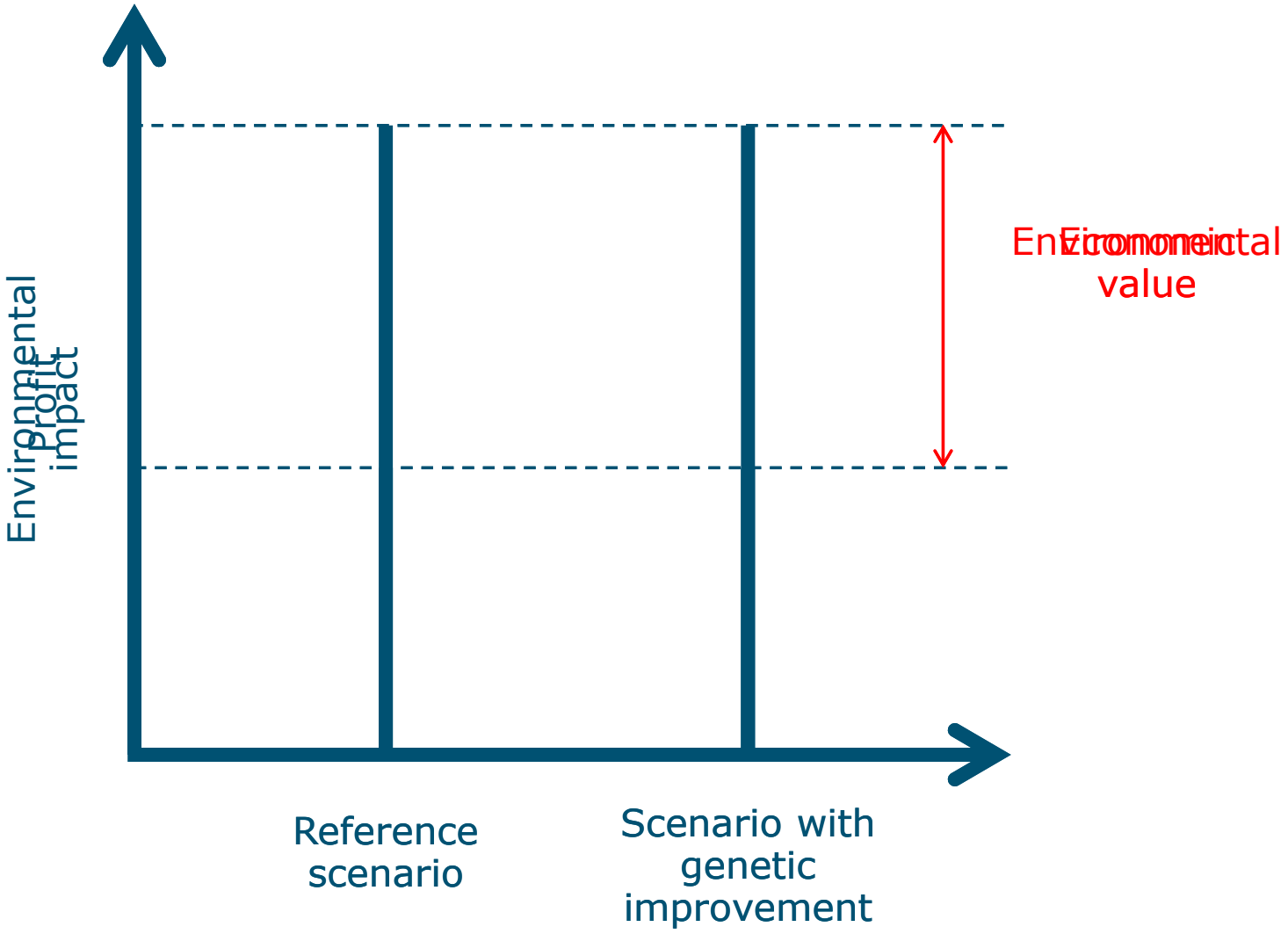
Challenges facing fish farming



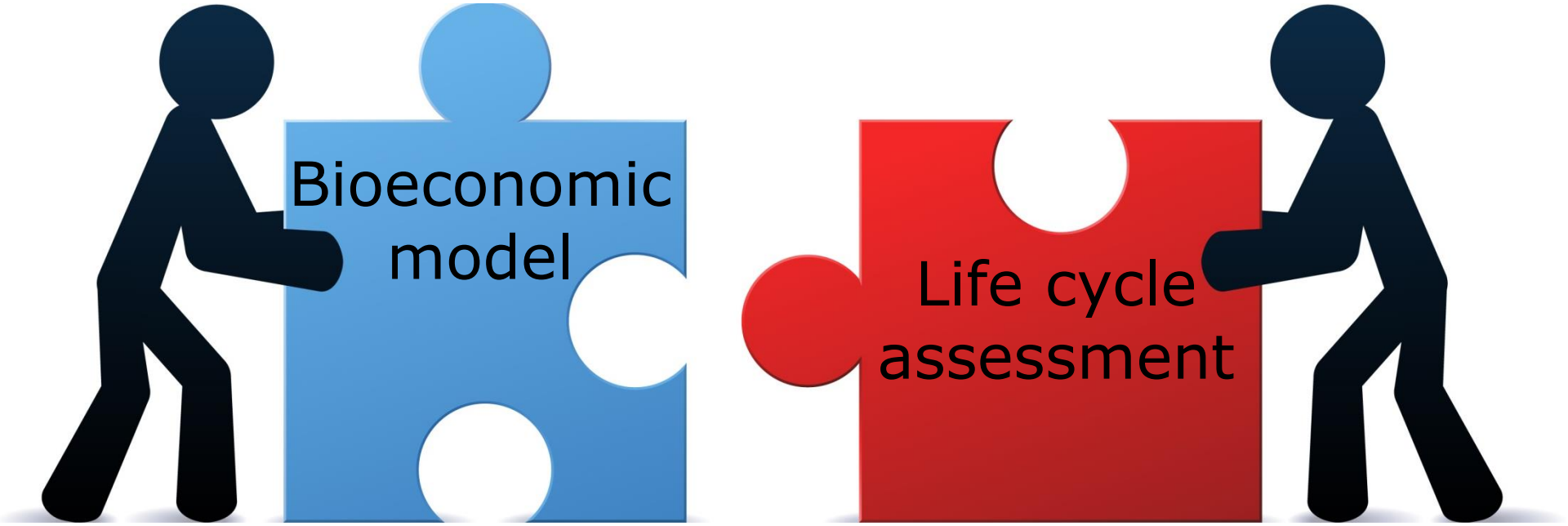


Effect of genetic improvement on profit and environmental impacts?

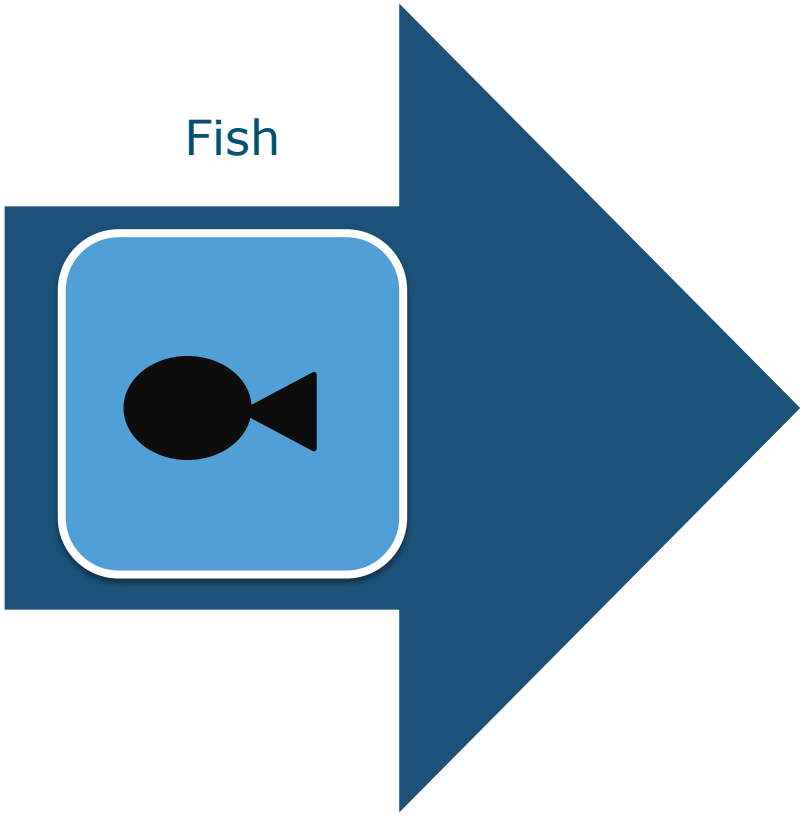
How to estimate economic and environmental impacts?



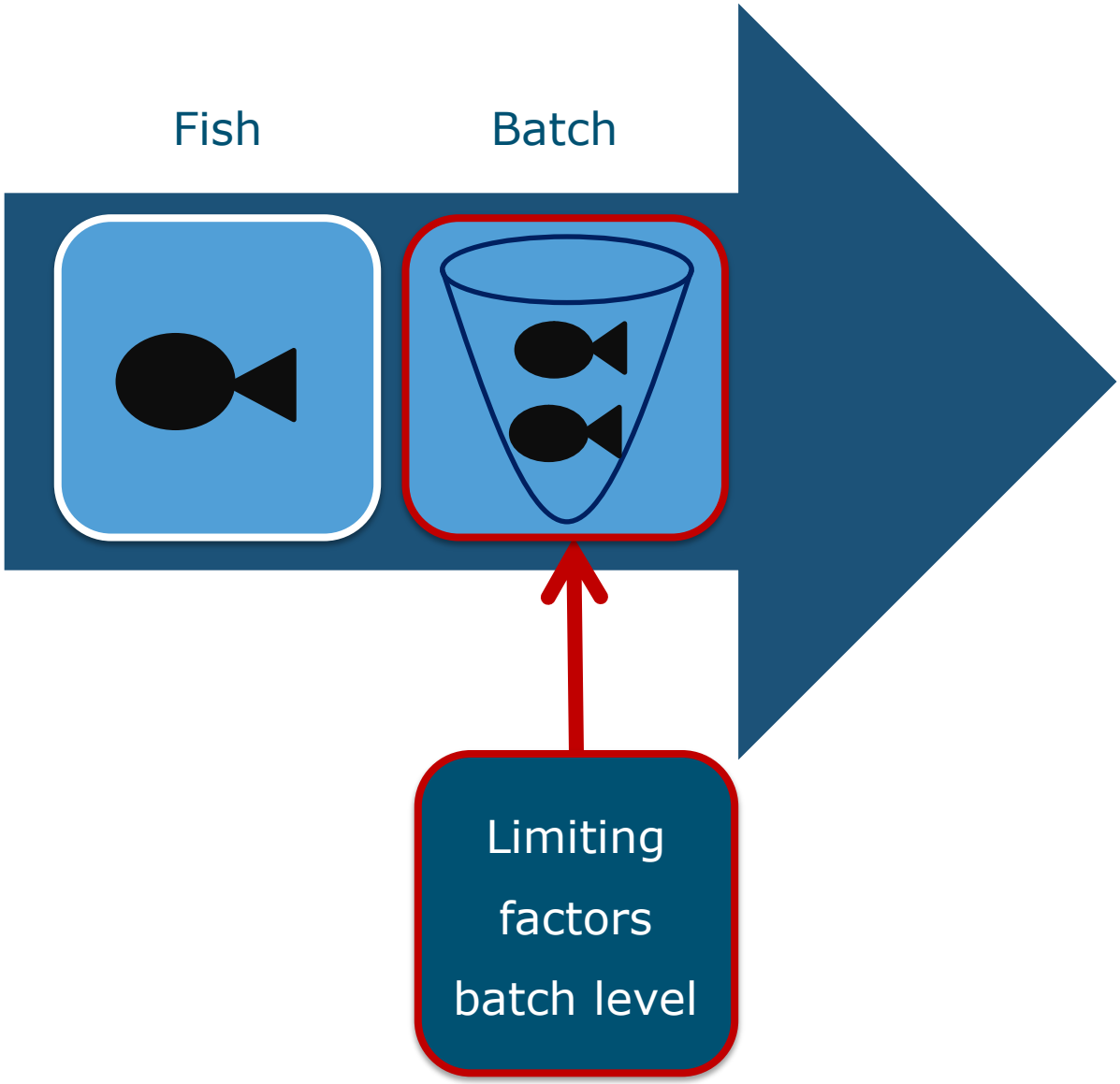
How to estimate economic and environmental values?



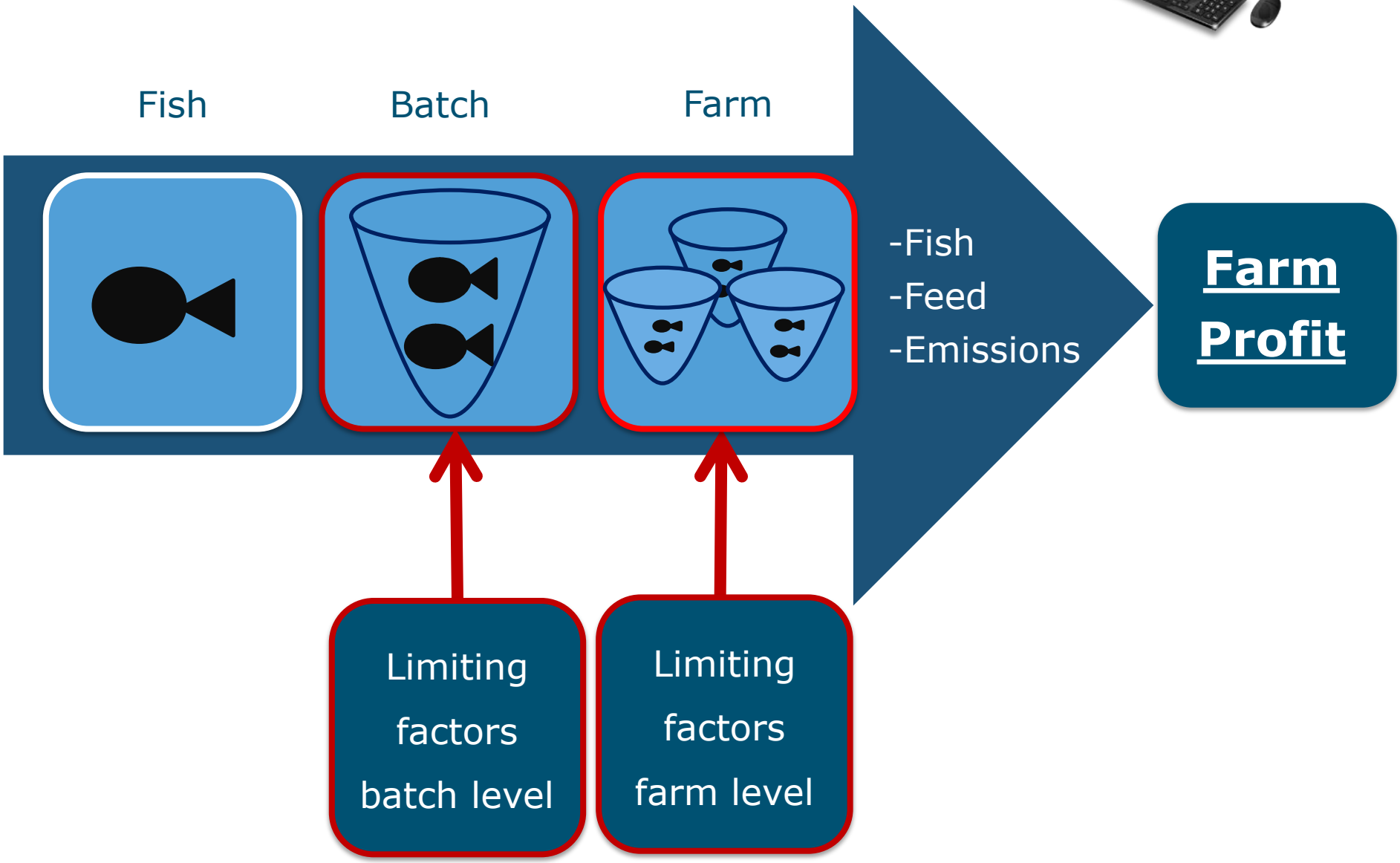
Bioeconomic model

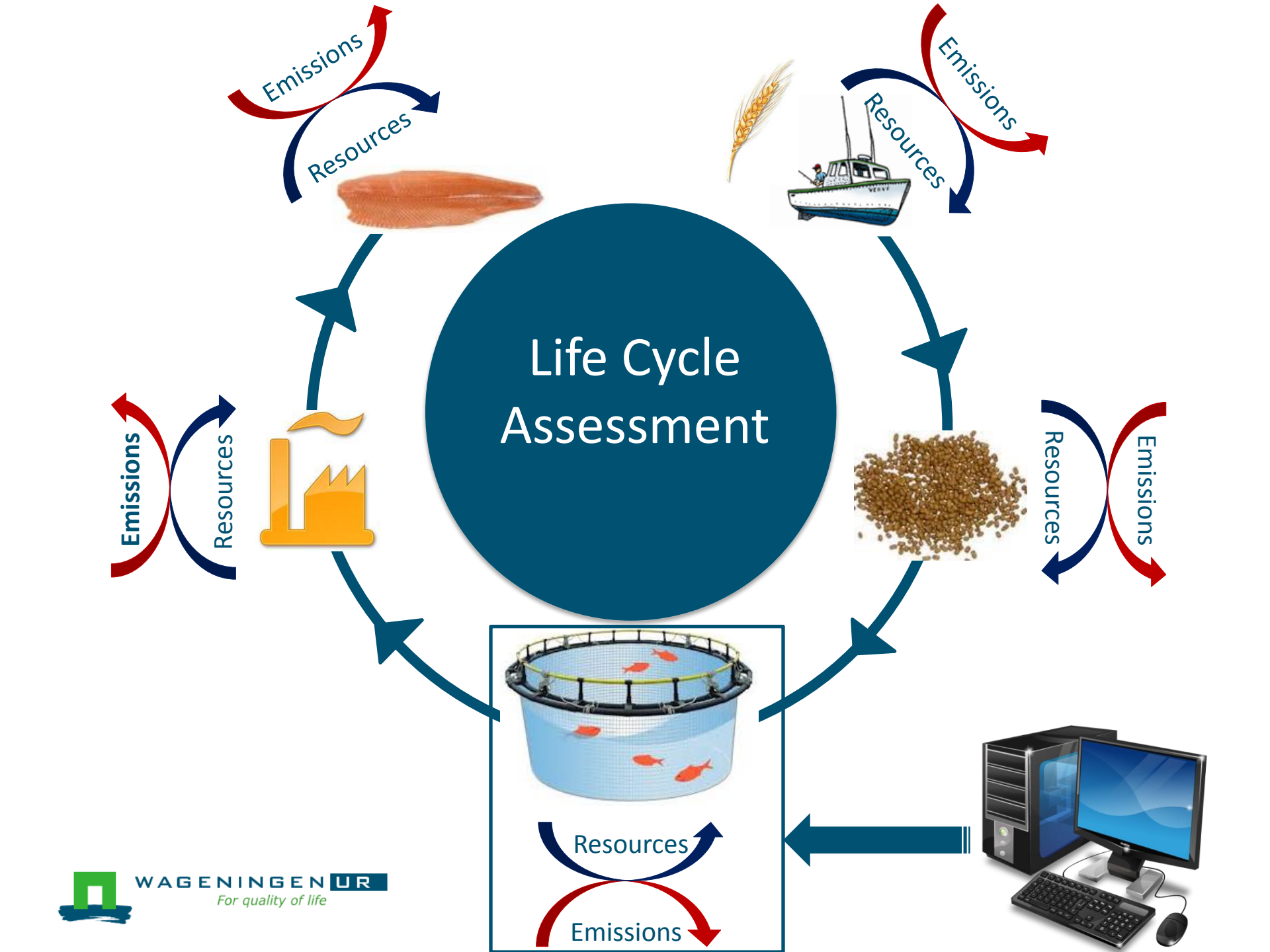


Bioeconomic model



Bioeconomic model




Emissions
Resources
Emissions
Resources
Life Cycle Assessment
Emissions
Resources
Resources
Emissions
Resources
Emissions
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Life Cycle Assessment

- Goal and scope

Cradle to farm gate analysis

Functional unit = 1 t of fish

- Impacts categories

Climate change (CO_2)

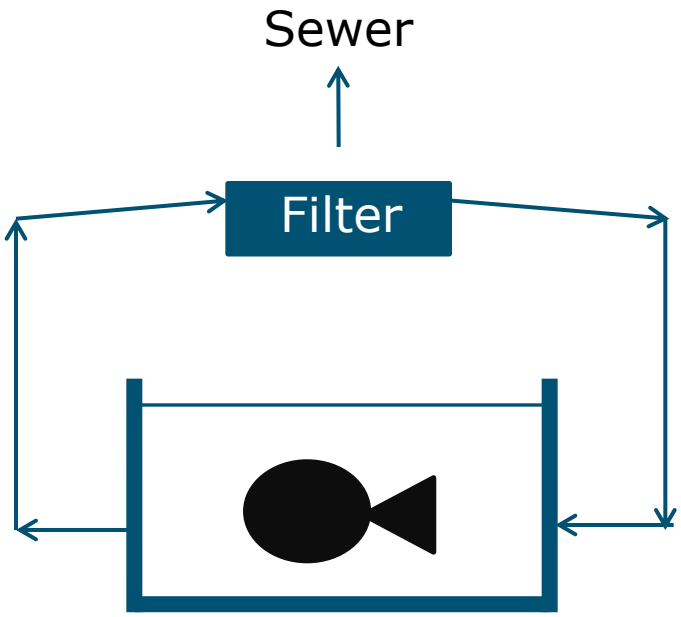
Eutrophication

Acidification

Cumulative energy demand

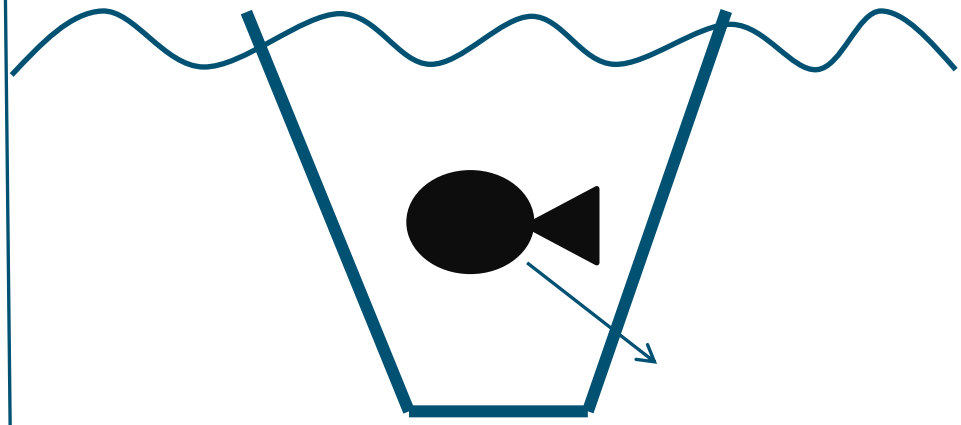
Two systems studied

Recirculating (RAS)



- Rearing density (batch)
- Bio-filter capacity (farm)

Cage



- O_2 availability (batch)
- Quota (farm)

Traits and ΔG

- **Thermal growth coefficient (TGC)**

6.8% per generation

- **Feed conversion ratio (FCR)**

7.8% per generation

(Sae-Lim, Komen et al. 2012)

Results

Higher production

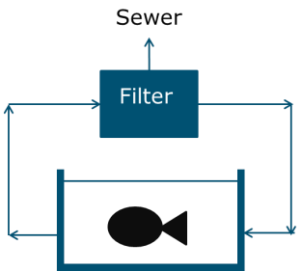
Nb of batch

=> dilutes fixed environmental and economic costs

Higher production efficiency

=> decreases inputs with same production

EV and ENV in RAS



Limiting factor	EV_{growth}	EV_{FCR}
Bio-filter (farm)	0 €/kg	++
Density (batch)	+	+

Limiting factor	ENV_{growth}	ENV_{FCR}
Bio-filter (farm)	0 %	--
Density (batch)	-	-

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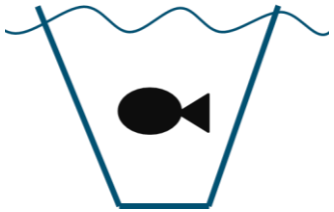
EV and ENV in sea cage



Limiting factor	EV_{growth}	EV_{FCR}
Quota (farm)	0 €/kg	+
O_2 (batch)	0/+	++

Limiting factor	ENV_{growth}	ENV_{FCR}
Quota (farm)	0 %	-
O_2 (batch)	0/-	--

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Conclusion

- Constraints at farm level -> EV_{growth} ENV_{growth}= 0
- Constraints at batch level -> EV_{growth} ENV_{growth} >0
- EV_{FCR} and ENV_{FCR} always very good
- Next step => include EV and ENV in breeding program

Thank you

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