

Objective of Paper:

The Environmental-Economic nexus of a coal mine reclamation.

Paper main question:

What are the most cost-effective and environmentally sound reclamation pathways as the USA phases out coal?

Outcomes:

providing quantitative decision-support for the 109.9 GW of coal retirements planned by 2030.

Previous and current practice for coal mine reclamation

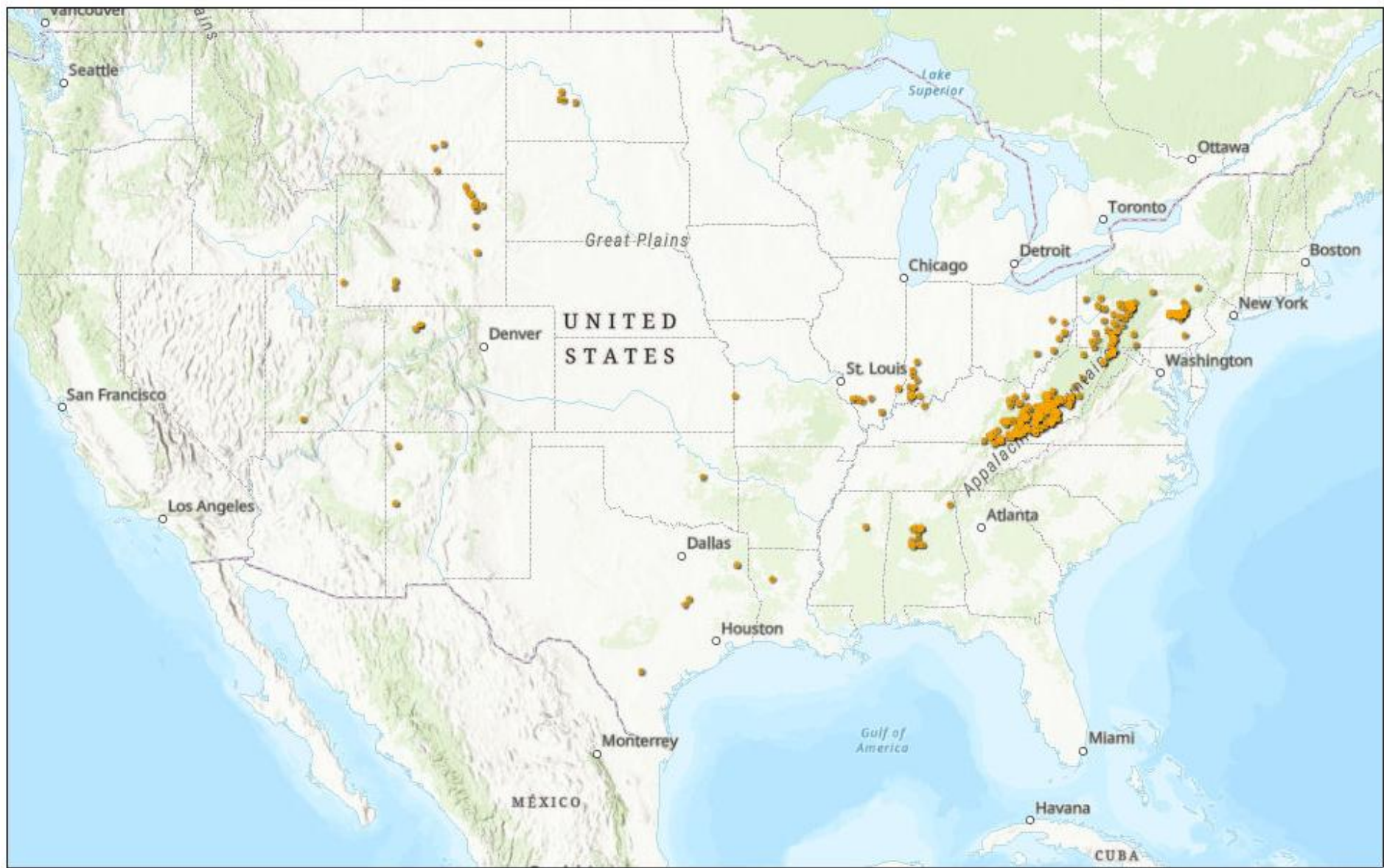
Before SMCRA (1977):

- Not managed reclamation, mostly abandoned.
- underutilized post-mining land use: lakes, forestry, hayland/pasture.

After SMCRA (1977): forestry, hayland/pasture.

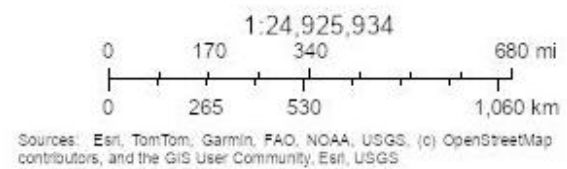
- Forestry, hayland/pasture

SMCRA states that mined land must be returned to its pre-mining land use or a higher and better use.



1/28/2026

World_Hillshade



Hypothetical case in Appalachia region

Physical specification (area, volume, depth of lake): developed database on pit lakes

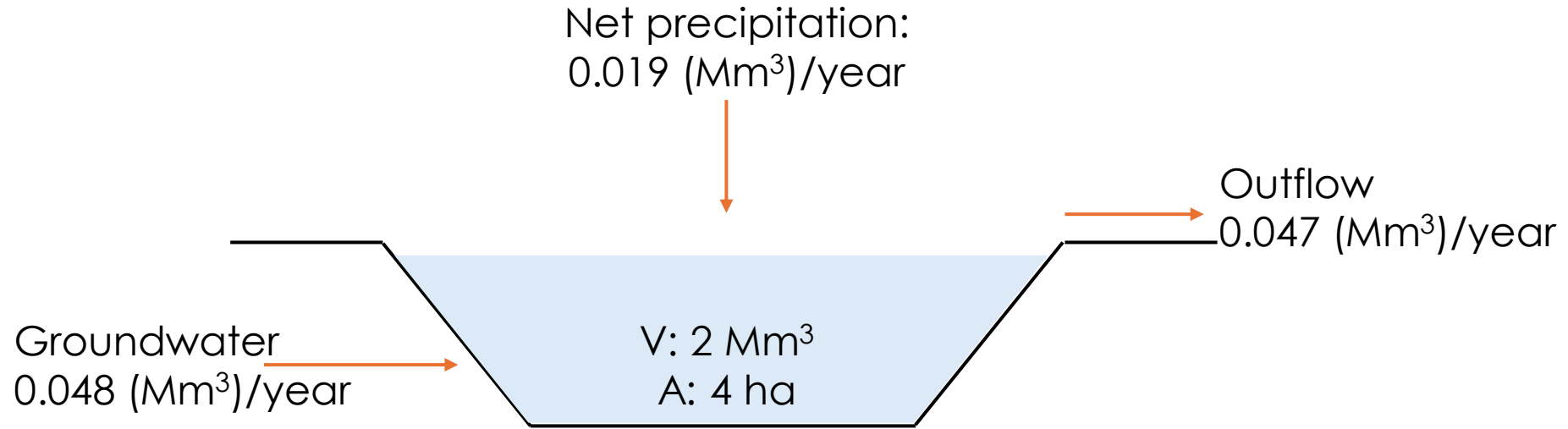
Water balance of the lake: Climate Engine, literature.

Chemical specification of water: USGS database on AMD of coal mines.

Treatment method: developed a database on pit lakes.

End-Use: developed a database on pit lakes.

Hypothetical case in Appalachia region



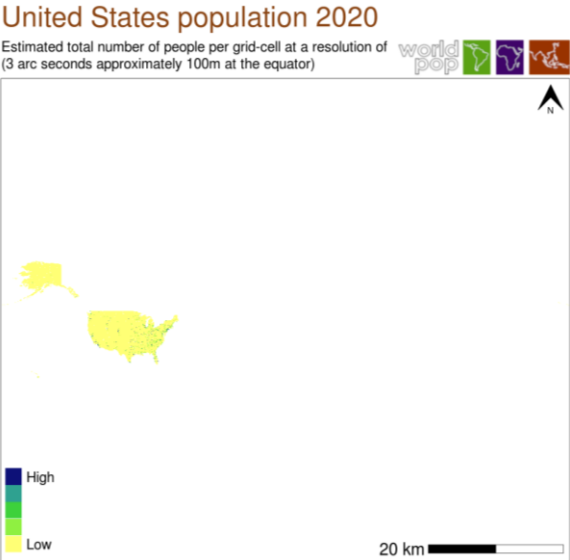
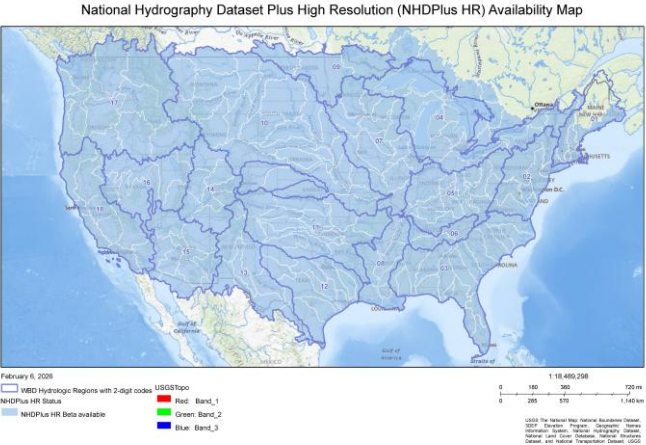
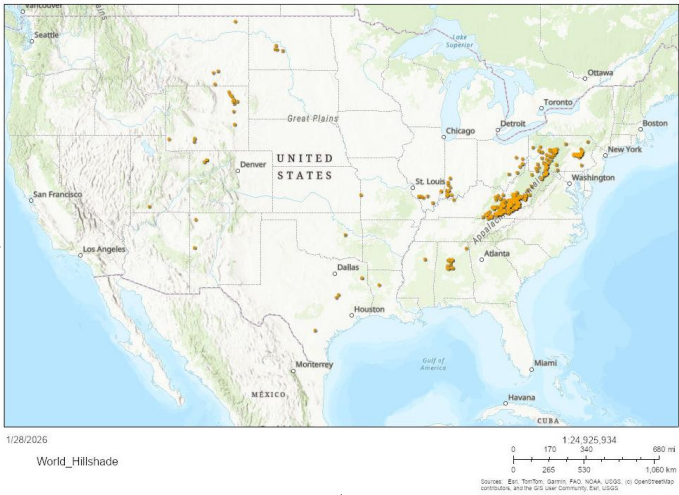
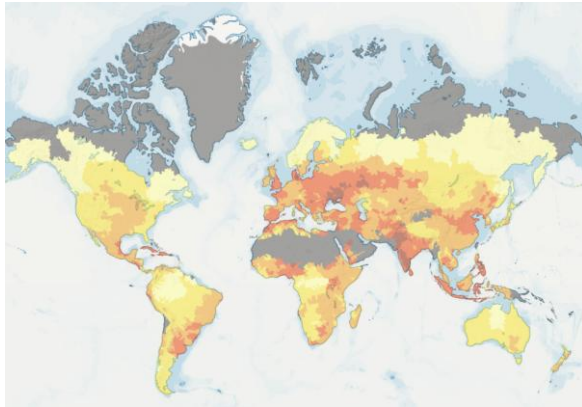
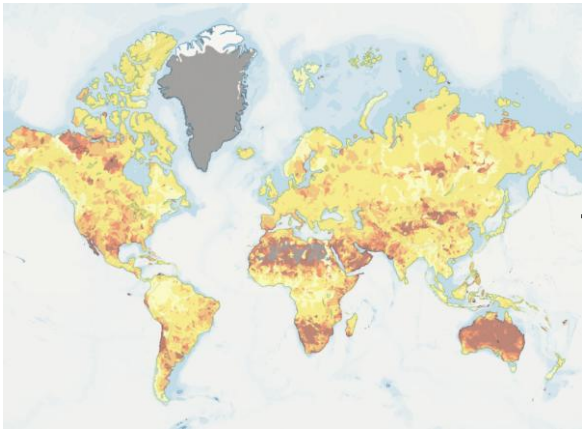
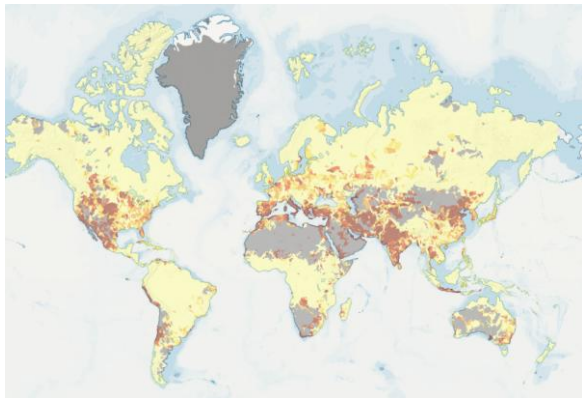
End Use scenarios:

- (1) Non-contact recreational. Treatment: active in-lake neutralization.
- (2) Habitat conservation (wetland). Treatment: passive in-lake neutralization.

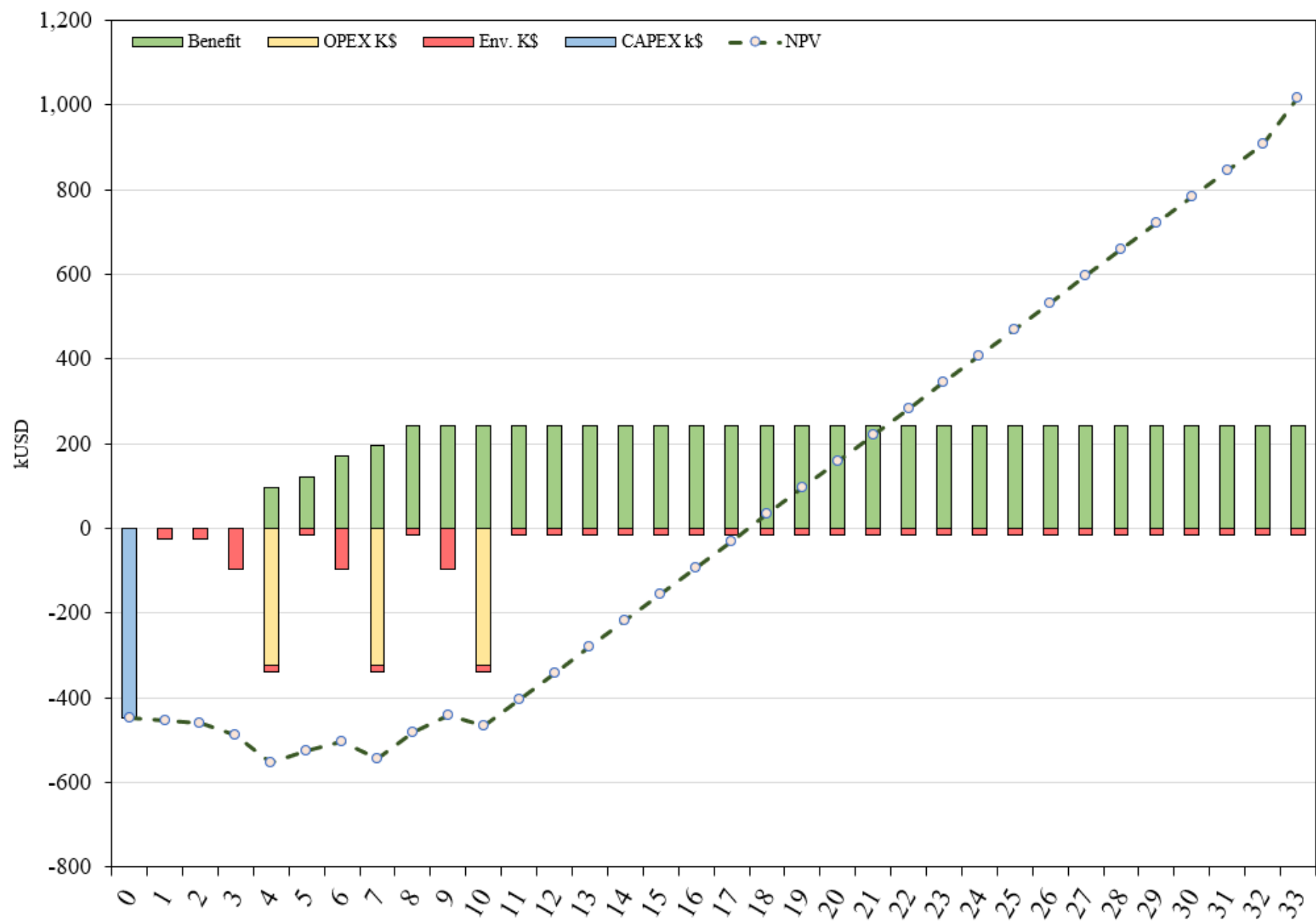
Excess water will be released in nature.

- (3) Non-contact recreational + Agricultural water. Treatment: passive in-lake neutralization.

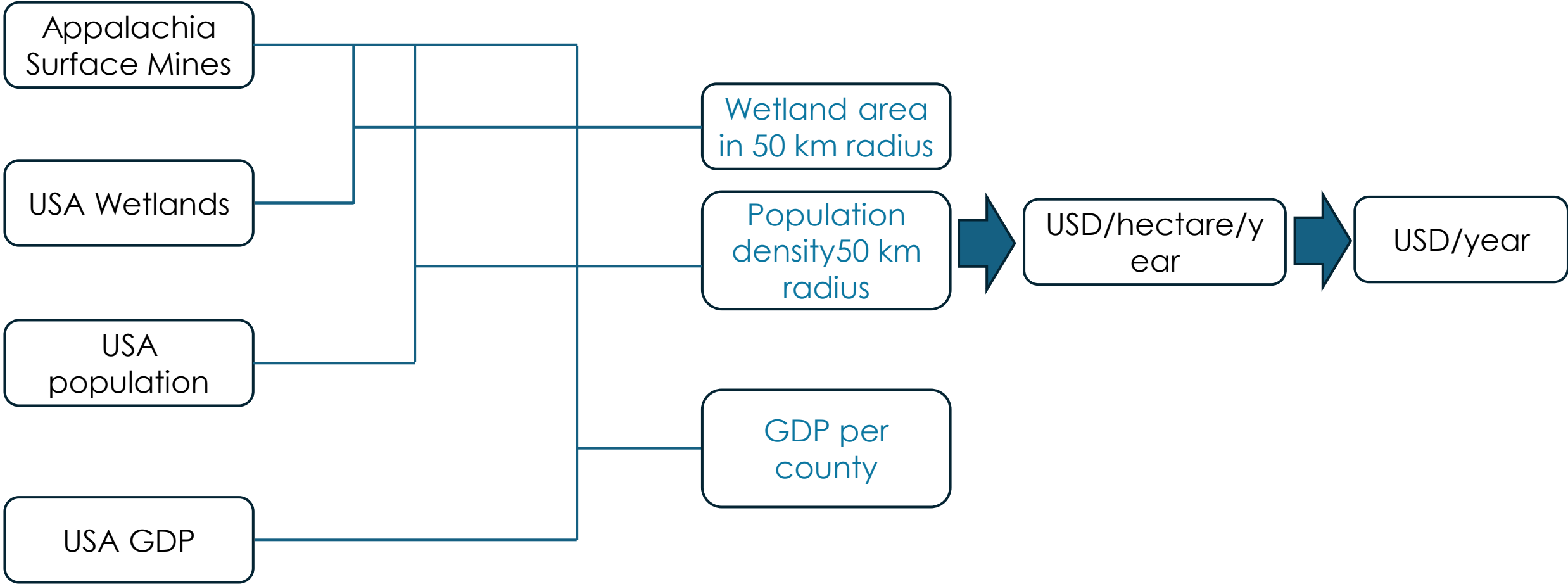
Cost-Benefit Analysis-Benefit, Ecosystem valuation, Scenario1



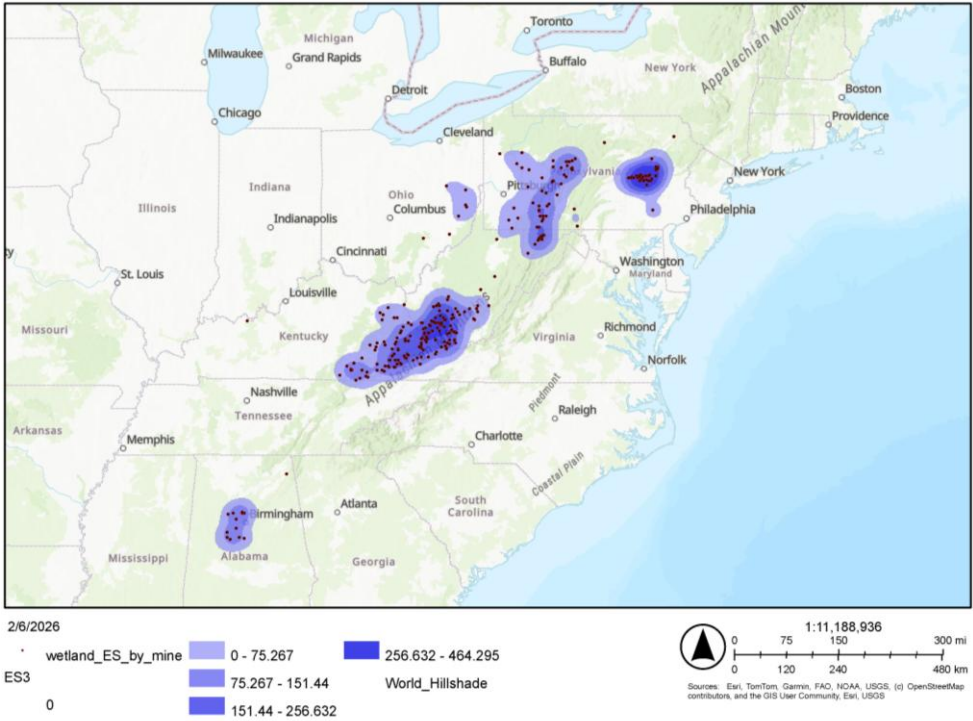
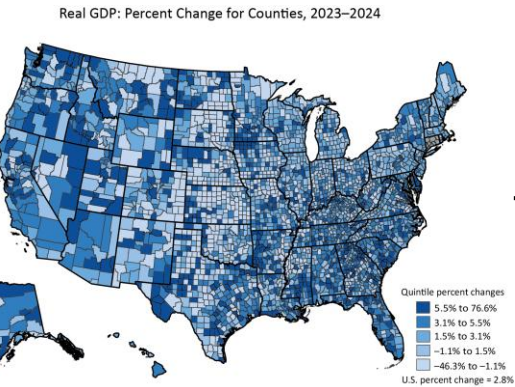
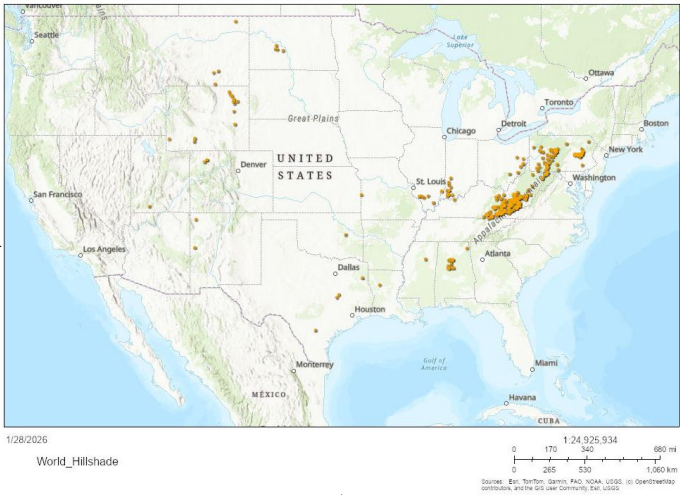
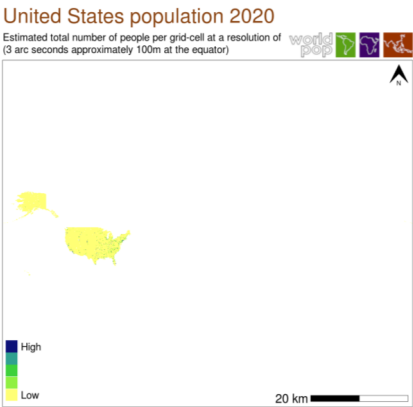
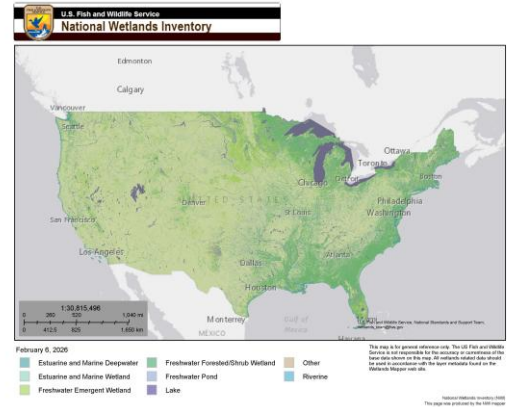
Cost-Benefit Analysis-Cost, Scenario 1



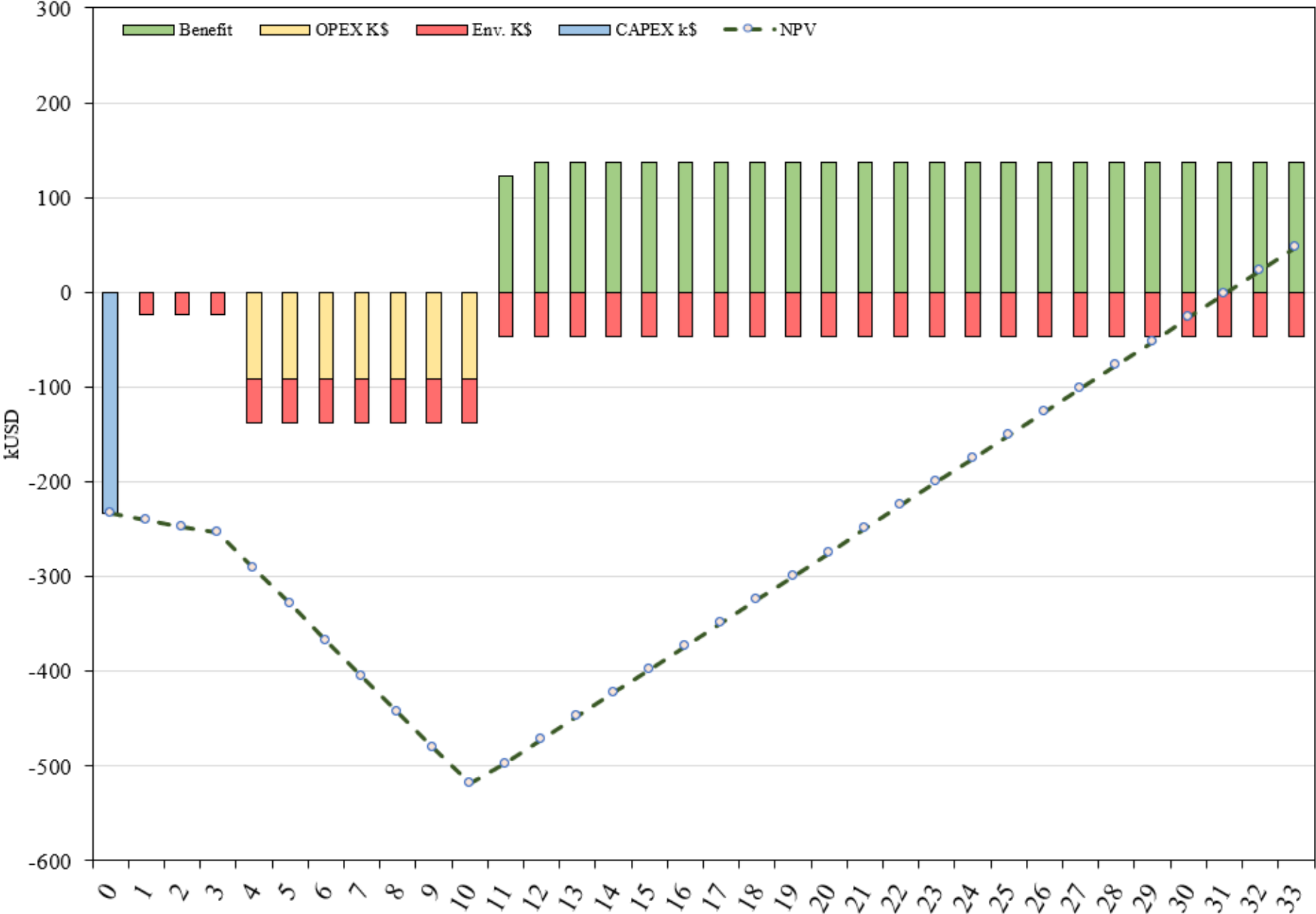
Cost-Benefit Analysis-Benefit, Ecosystem valuation, Scenario2



Cost-Benefit Analysis-Benefit, Ecosystem valuation, Scenario2



Cost-Benefit Analysis-Benefit, Ecosystem valuation, Scenario2



Cost-Benefit Analysis-Benefit, Ecosystem valuation, Scenario3

