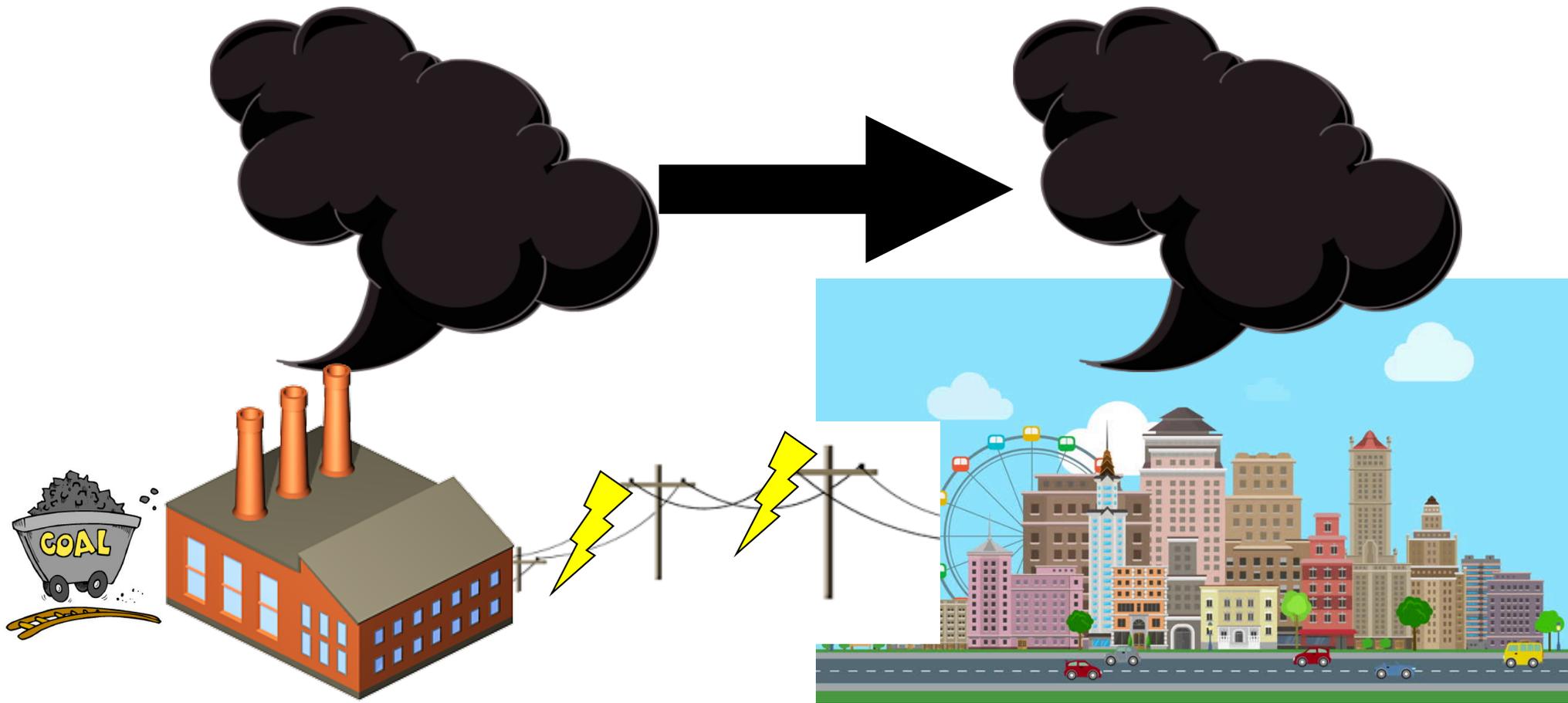


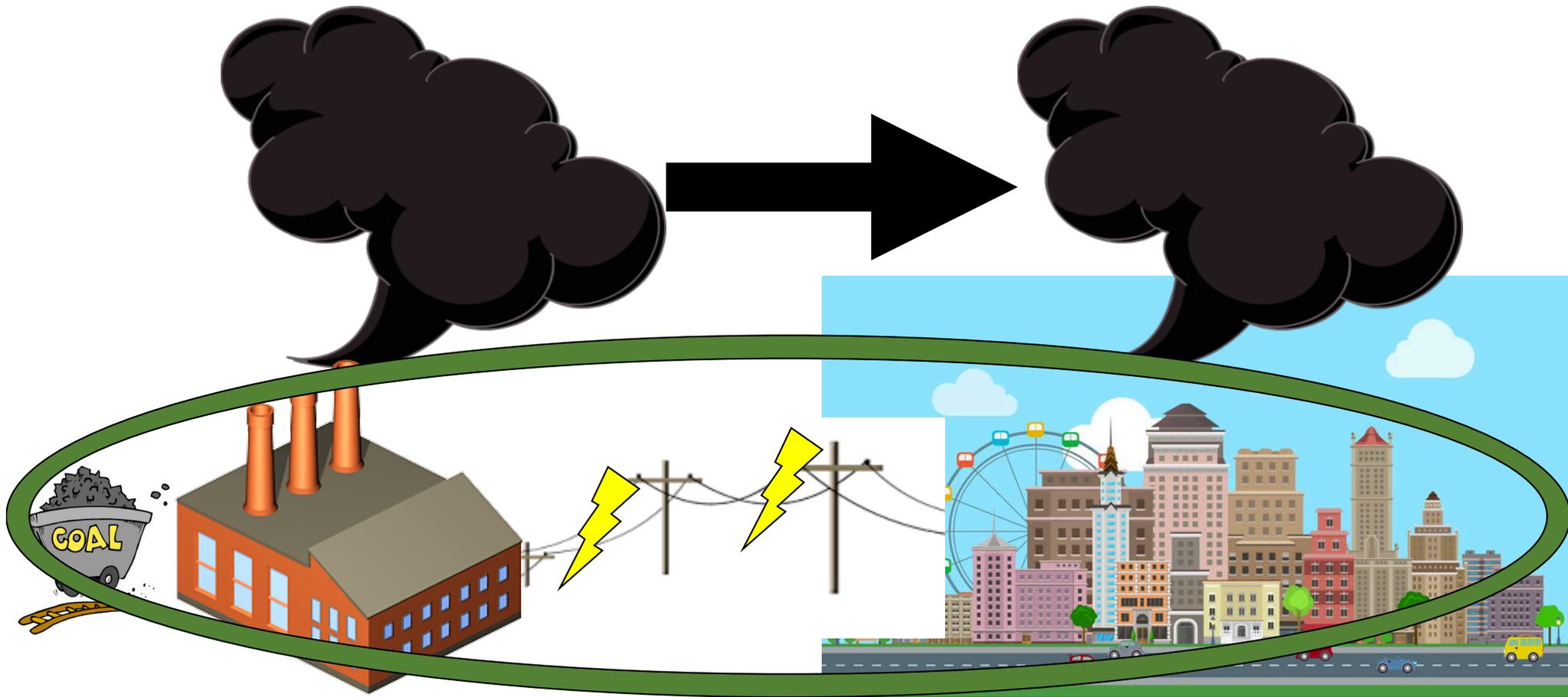
Environmental Economics & Policy

ATS 150

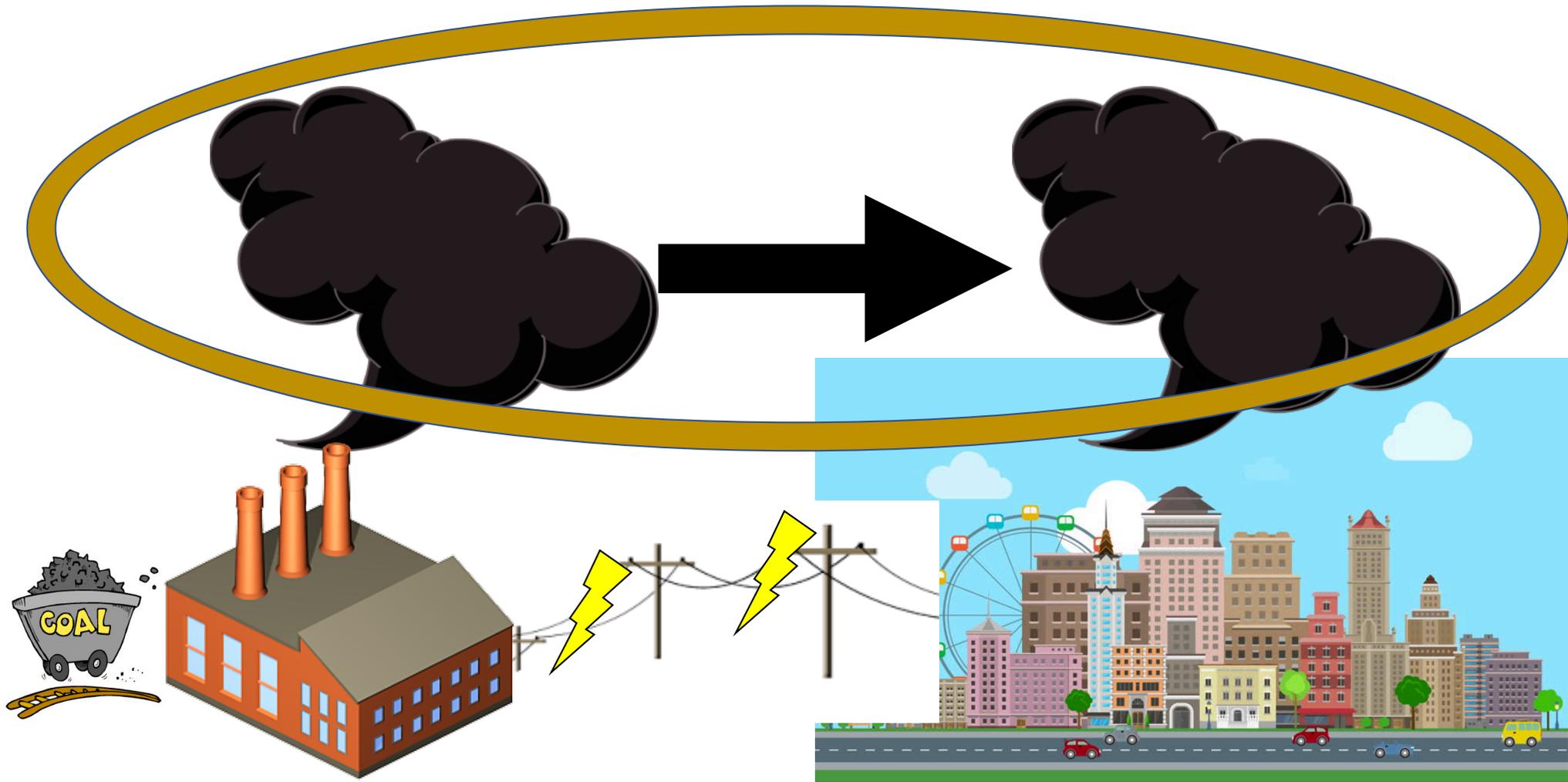
New example: a coal-fired power plant upwind of a town.



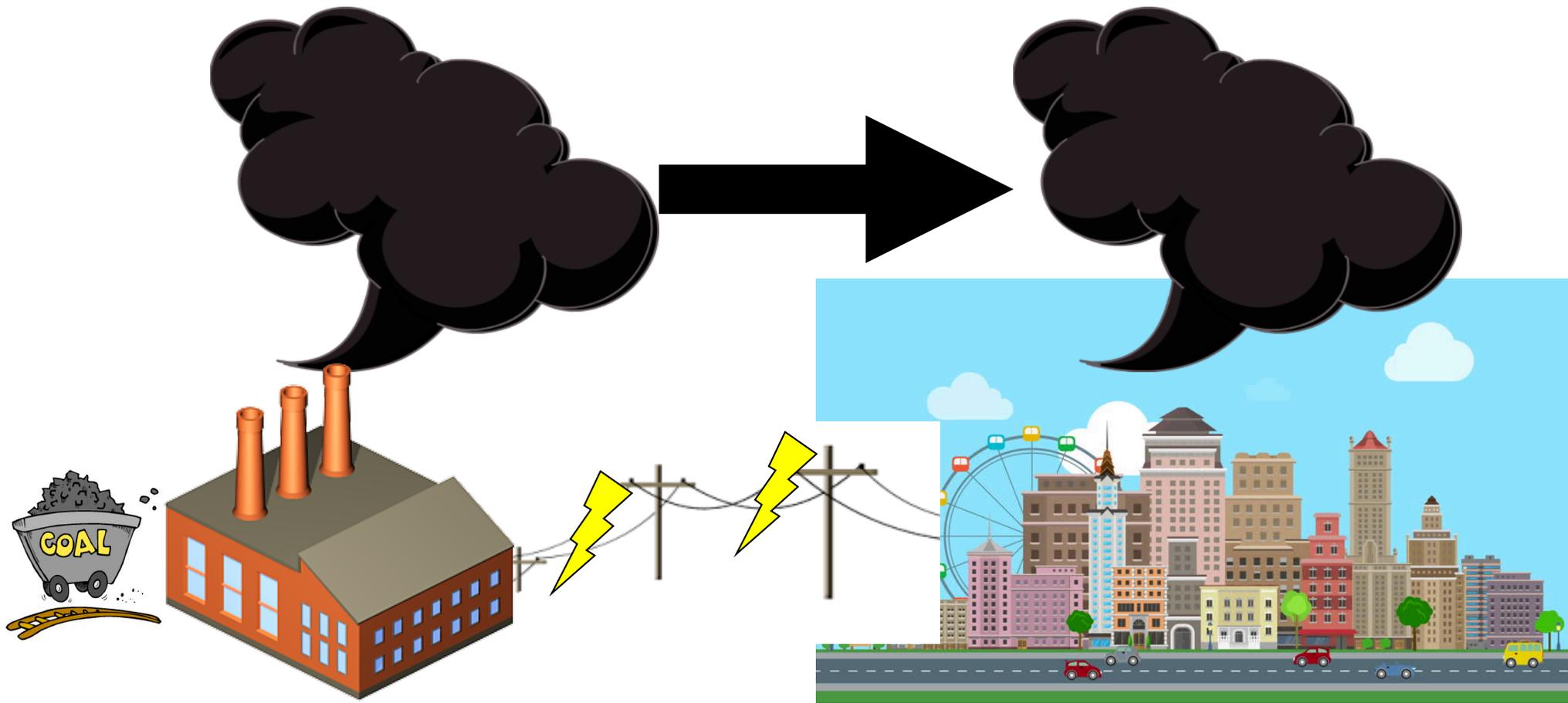
Everything in **this circle** is paid for with money.



The pollution is a **Negative Externality!**



The power plant in this example is offloading some of its costs on to the city - it isn't paying the full price.



Externality: transactions that take place **in the market** cover some but not all of the costs.

Costs – who pays

- Raw materials – power plant
- Operations and maintenance – power plant

Benefits – who gets them

- Power plant revenue – power plant
- Electricity – customers

- **Air pollution – Society at large**

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How should we address this externality?

In a 'Command & Control' regulation, the government makes a rule and enforces it.

- CAFE standards – fuel economy set by car size.
 - Toyota Camry:
 - A 2014 Camry must get at least 32.54 mpg
 - A 2020 Camry must get at least 41.33 mpg
 - A 2025 Camry must get at least 51.72 mpg
 - Ford F-150:
 - A 2014 F-150 must get at least 23.13 mpg
 - A 2020 F-150 must get at least 25.25 mpg
 - A 2025 F-150 must get at least 30.19 mpg

In a 'Command & Control' regulation, the government makes a rule and enforces it.

- Criteria pollutants
 - Ozone, Particulate Matter, Carbon Monoxide, Lead, Nitrogen Dioxide
- Under the Clean Air Act, the EPA:
 - Sets, reviews, and revises standards
 - Determines whether areas meet the standards
 - Works with areas to attain and maintain the standards.

Market-Based solution: internalize the externality and let the market fix the problem.

Costs – who pays

- Raw materials – power plant
- Operations and maintenance – power plant

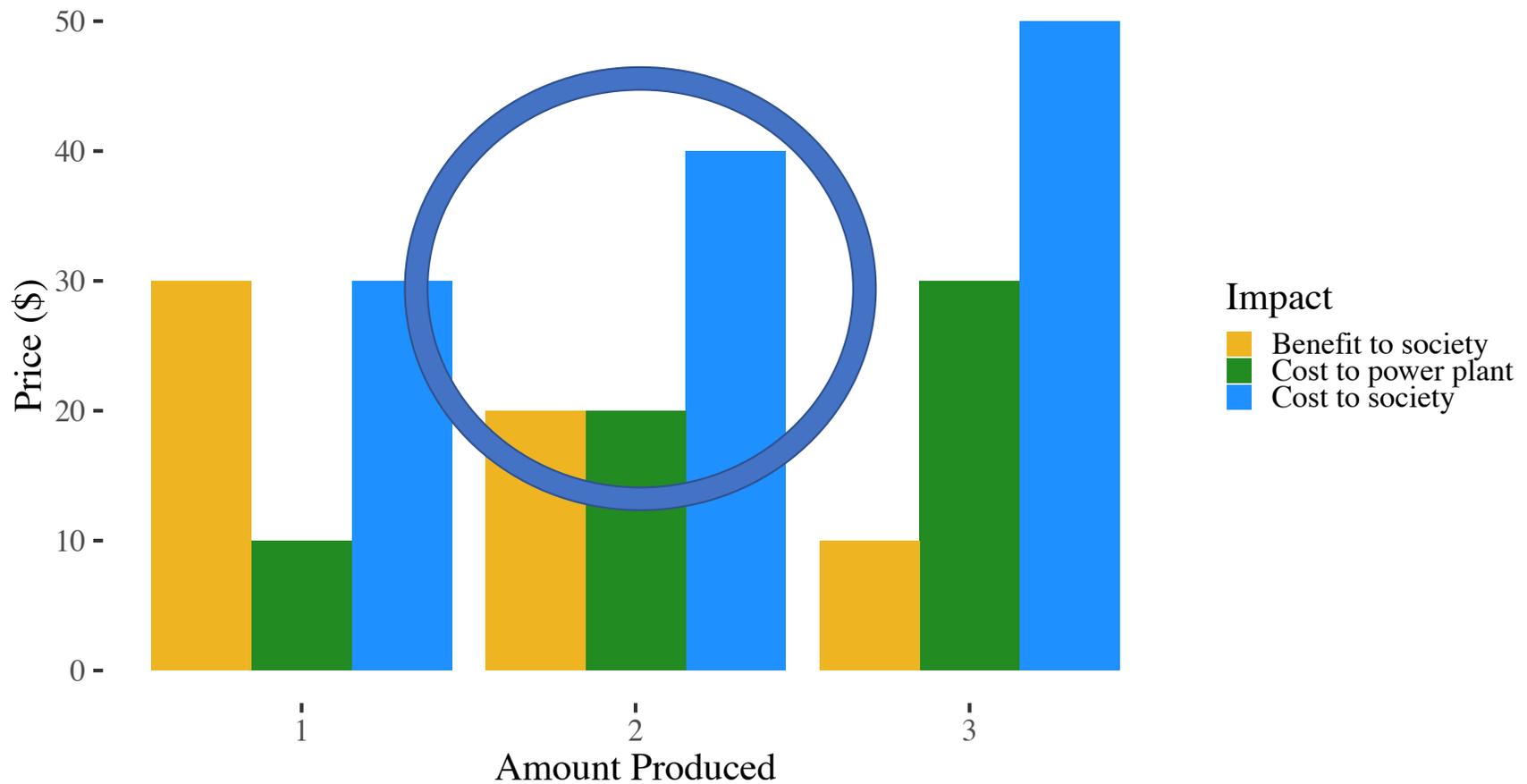
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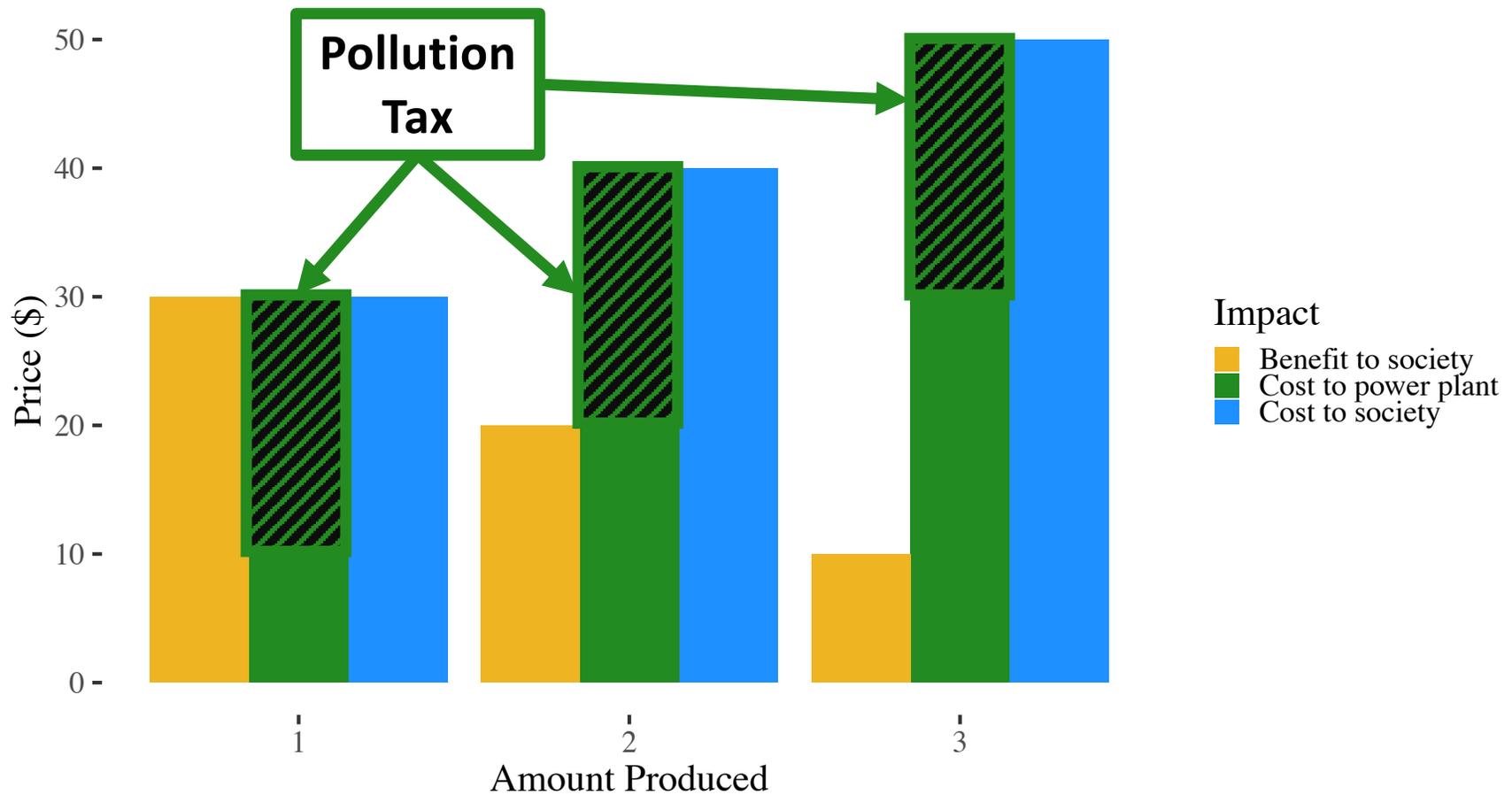
- **Air pollution – Society at large**



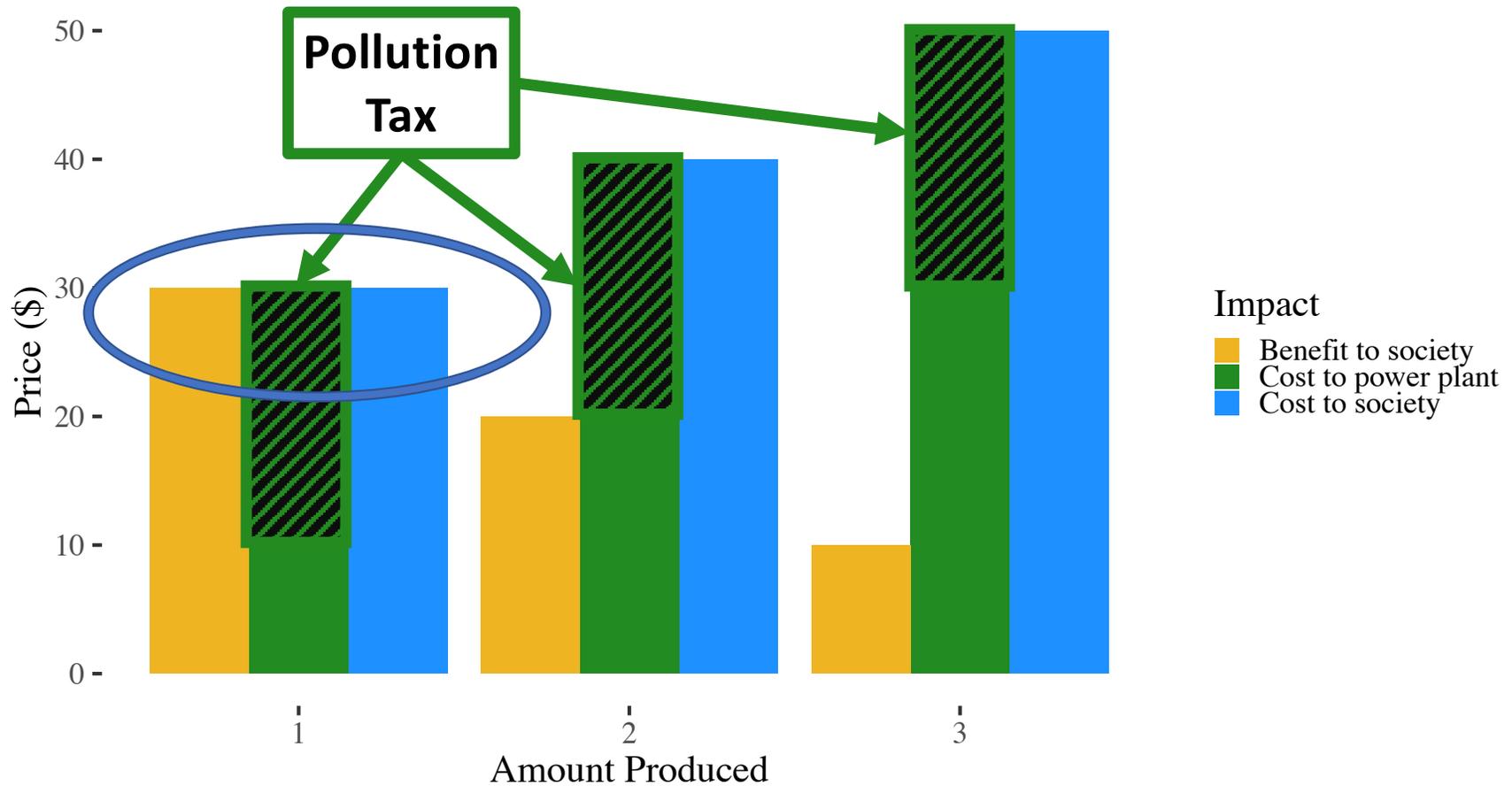
Remember, the **power plant** makes decisions based on the costs it pays, which means that **society** suffers.



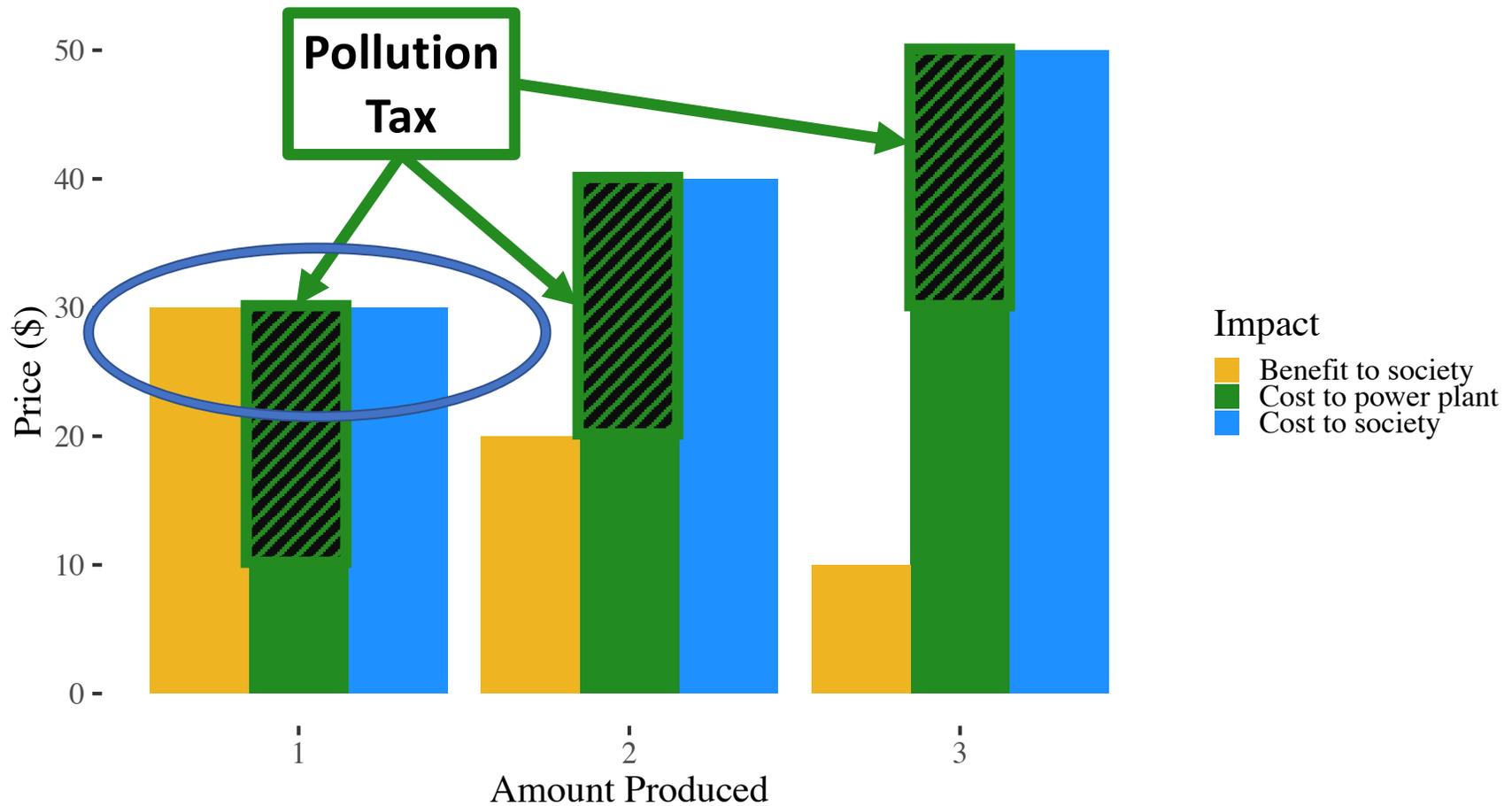
If you taxed the power plant the right amount, you could precisely align the cost to society AND the powerplant.



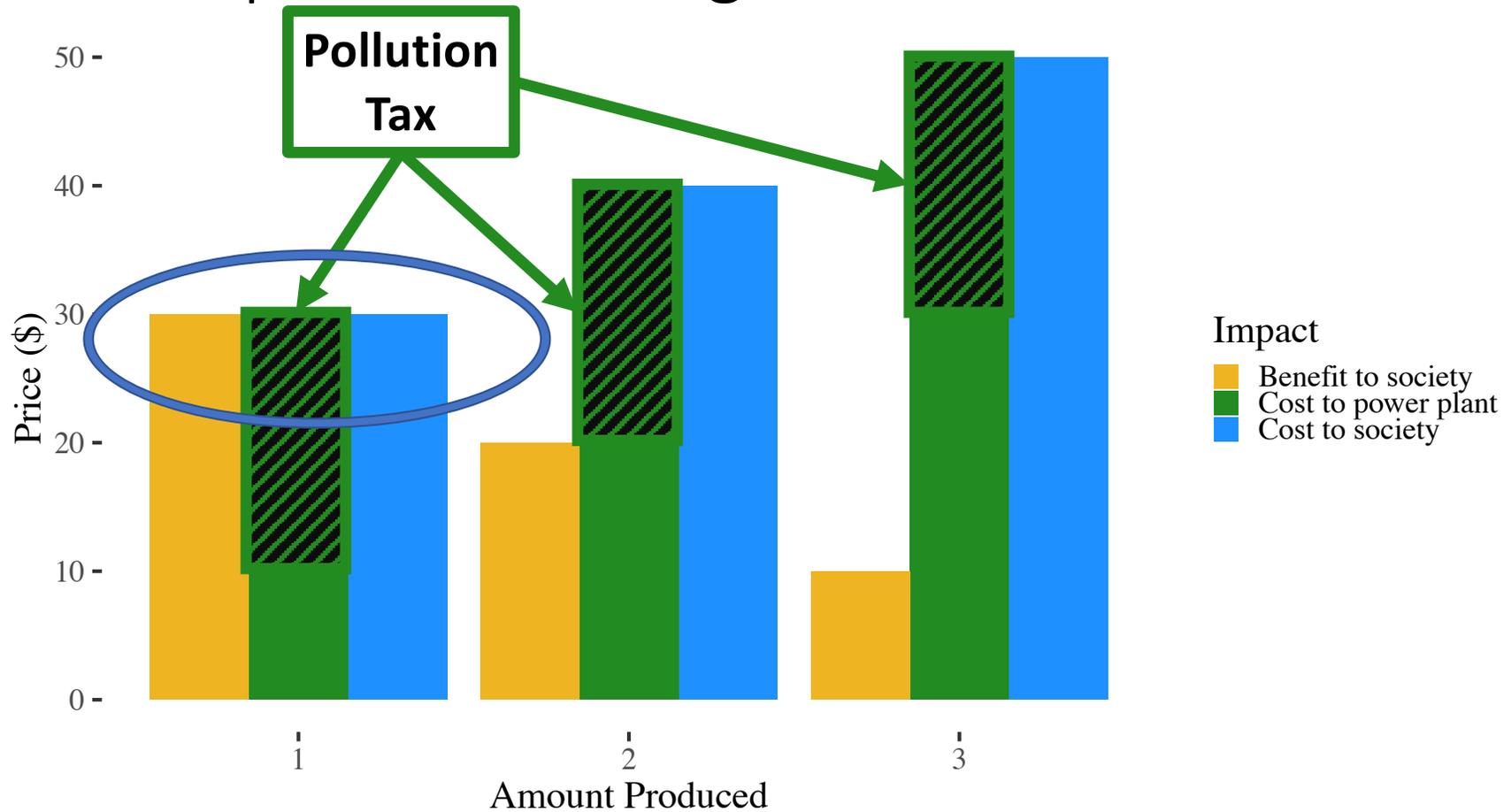
The economically efficient outcome is now the 'correct' one for society.



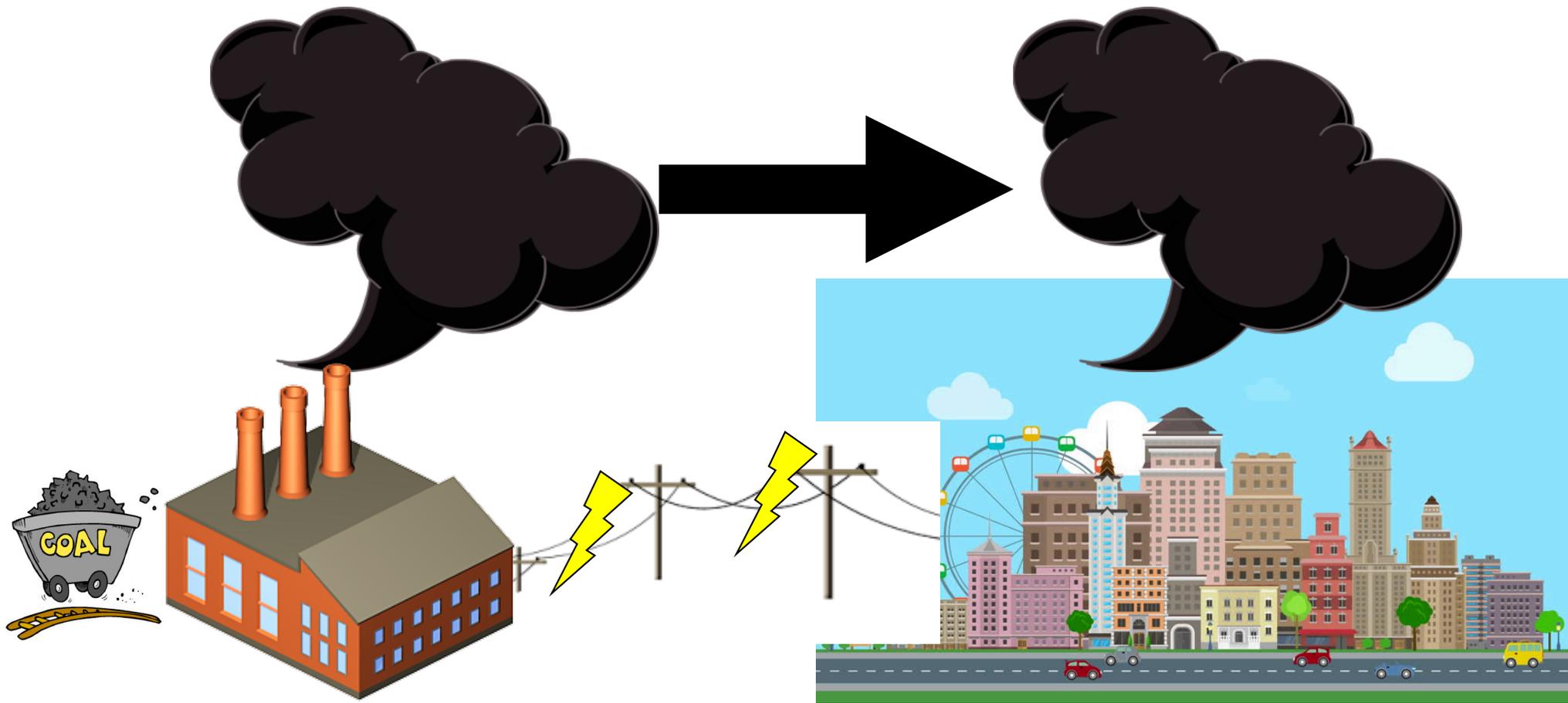
What are the effects of this kind of tax? Who would pay it?



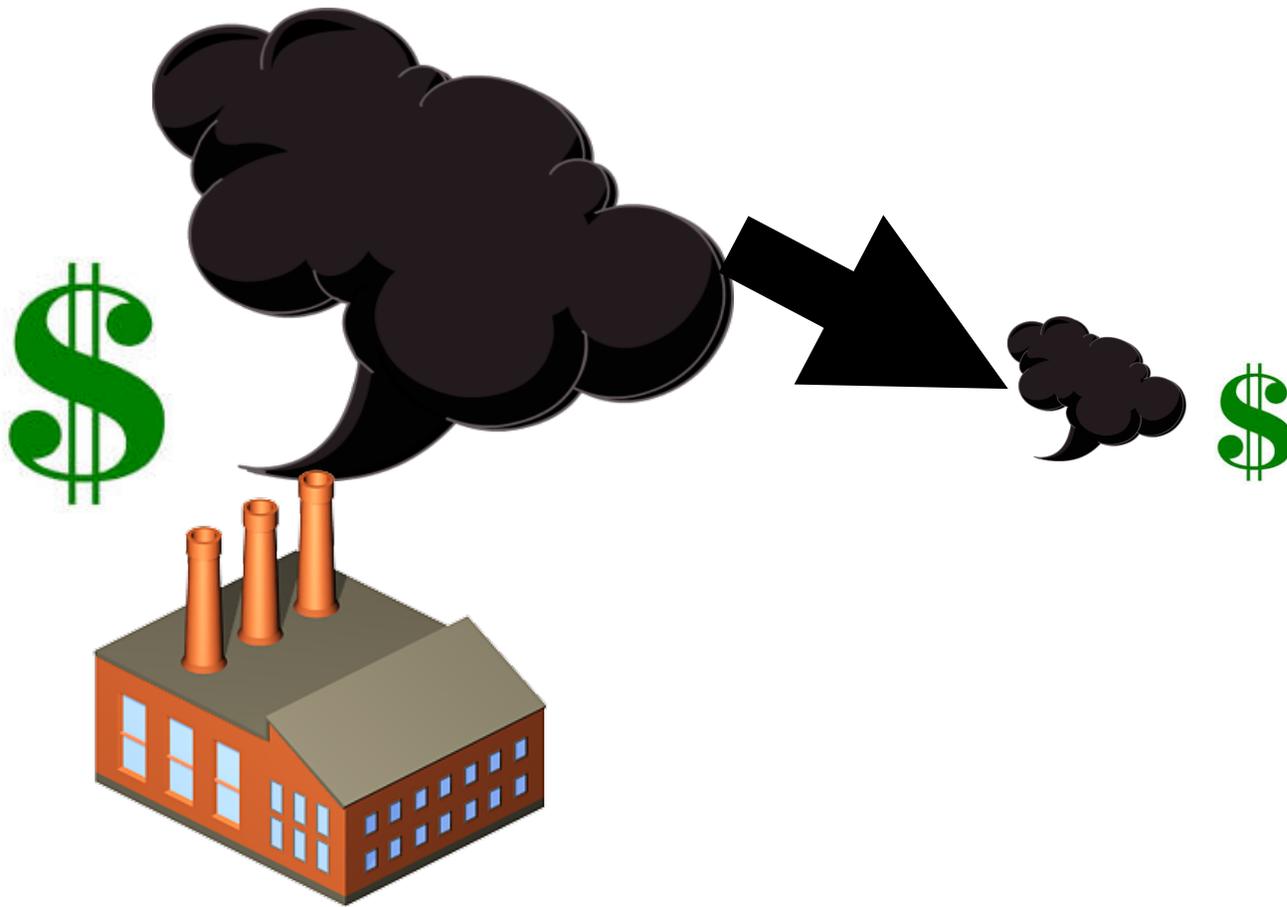
By taxing emissions, we are attempting to limit the amount of pollution to a given level.



Instead of going about this indirectly, we could issue permits to pollute only up to the same desired level.



If a power company had to buy these permits, they would have an incentive to reduce their emissions



We can do even better, though! Imagine two power plants in different places.

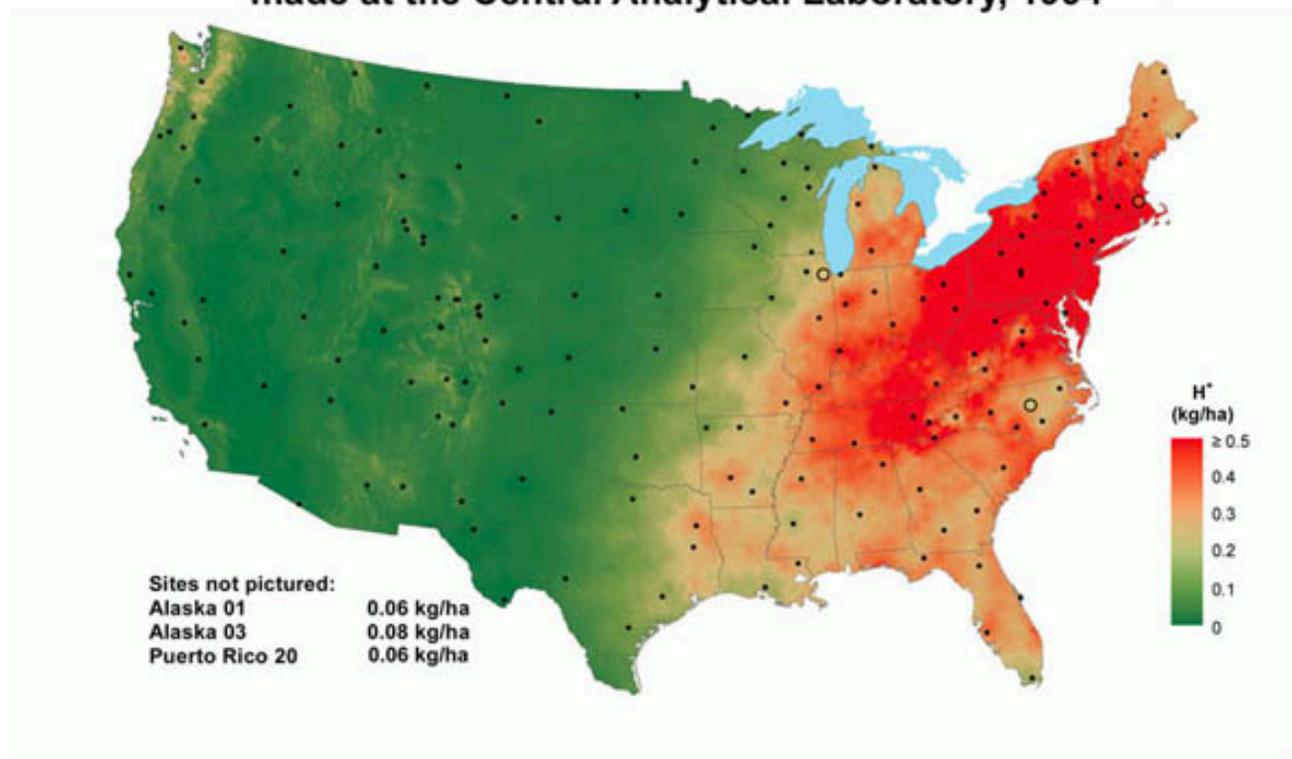


Different adaptations are cheaper in different places.
Trading the permits allows for this efficiency.



Cap & Trade is already being used in the USA, and it's ~75-80% cheaper than the equivalent C&C policy.

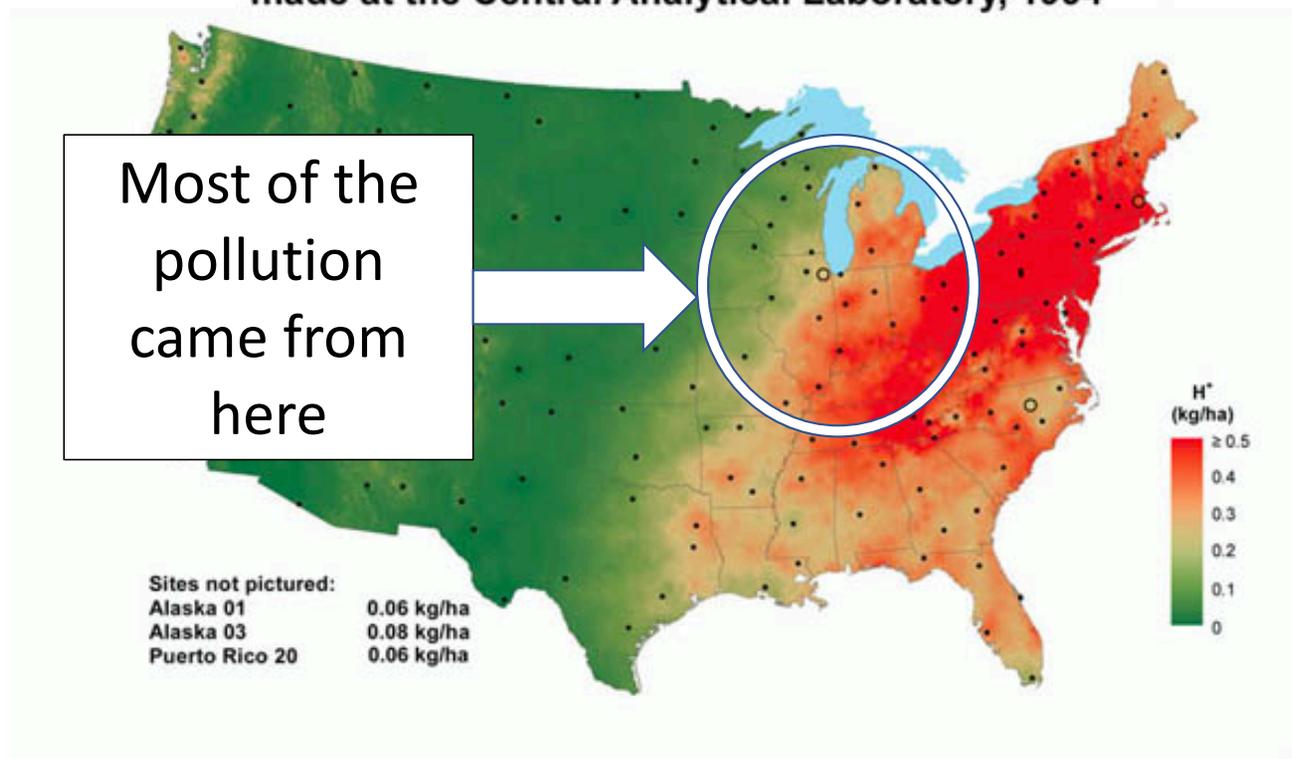
Hydrogen ion wet deposition from measurements made at the Central Analytical Laboratory, 1994



National Atmospheric Deposition Program/National Trends Network
<http://nadp.isws.illinois.edu>

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Questions about Part I, to discuss:

- What have you heard about these different types of policies before?
- What kind of environmental problems do you think market-based solutions are best for? What might they be worst for?
- Who benefits from C&C-type policies? Who benefits from Market Based Solutions?

Part II: What are some of the costs of pollution that you can think of?

Part II: What are some of the costs of pollution that you can think of?

Costs that are easy to quantify

- The built environment
- Food production
- Damage to the economy
- Natural disasters
- Human Health

Costs that are hard to quantify

- Secondary costs
 - Climate change induced conflicts and refugees
- Damage to ecosystems and 'nature'

What are some ways we could put a dollar value on nature?

What are some ways we could put a dollar value on nature?

- Natural resources
- Tourism/Recreation
- Water and air quality
- Erosion resistance
- Mental health value
- Future Biotechnology potential
- Ecosystem services
- Existence Value

Intact and healthy dune ecosystems greatly reduce erosion damage to property!

Before



After



Cities with more natural areas (parks, accessible hinterlands) have healthier citizens.

- >50% of the world's population lives in urban settings
 - It will be 70% in a few decades
- City dwellers are at higher risk of mental health disorders
 - 20% higher risk of anxiety disorders
 - 40% higher risk of mood disorders
 - 2x the likelihood of developing schizophrenia
- Time spent walking in nature has been shown to improve mood and cognitive function. It also dampens anxiety.

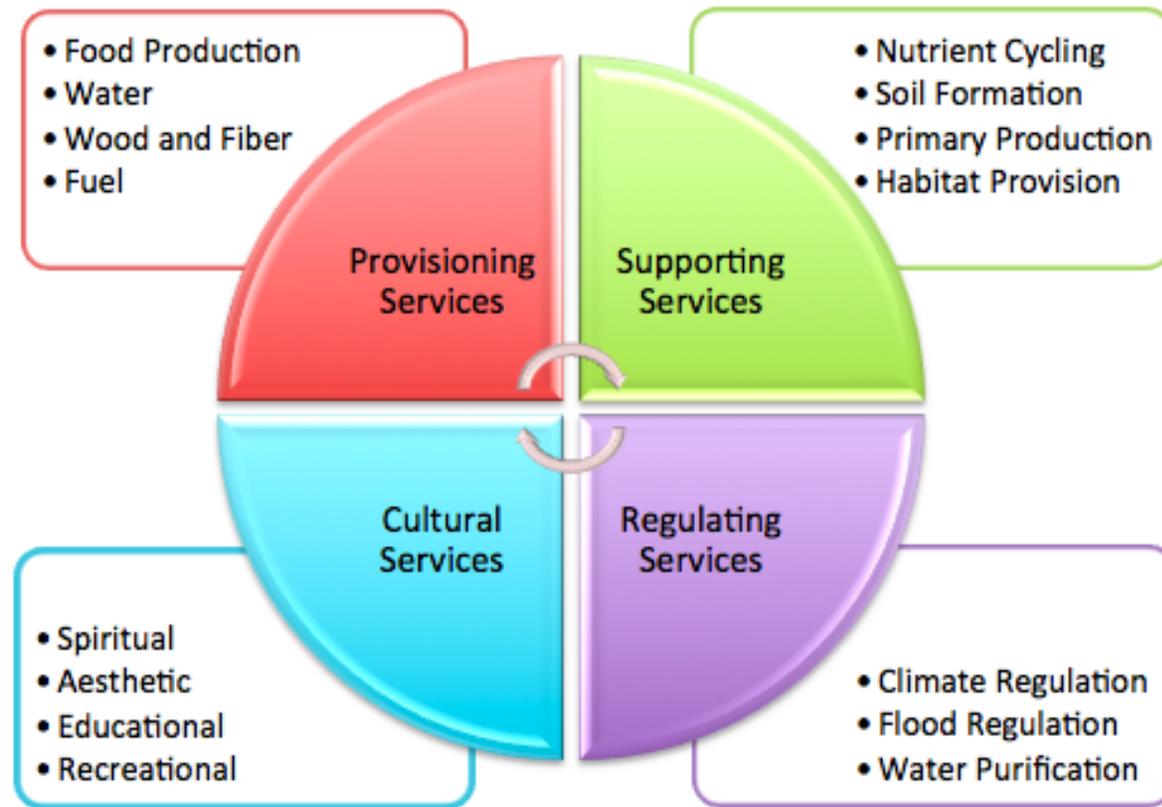
Bratman et al., 2015

Diverse ecosystems preserve potentially usable genes for new biotechnologies.

- Science has described ~1.25 million species. This is estimated to be <15% of the total number of species extant in the world.
- Pencillin was developed from a fungus!
- Deep-sea vent dwelling bacteria have yielded new sources of blood thinners.



Ecosystem services provided between \$125 – \$145 trillion dollars per year in 2011.



Source: Millenium Ecosystem Assessment, 2005.

Constanza et al., 2014

Healthy forests around coffee plantations increase yields by 20% and decrease pest growth by 27%



A Costa Rican coffee plantation

Ricketts et al. 2004

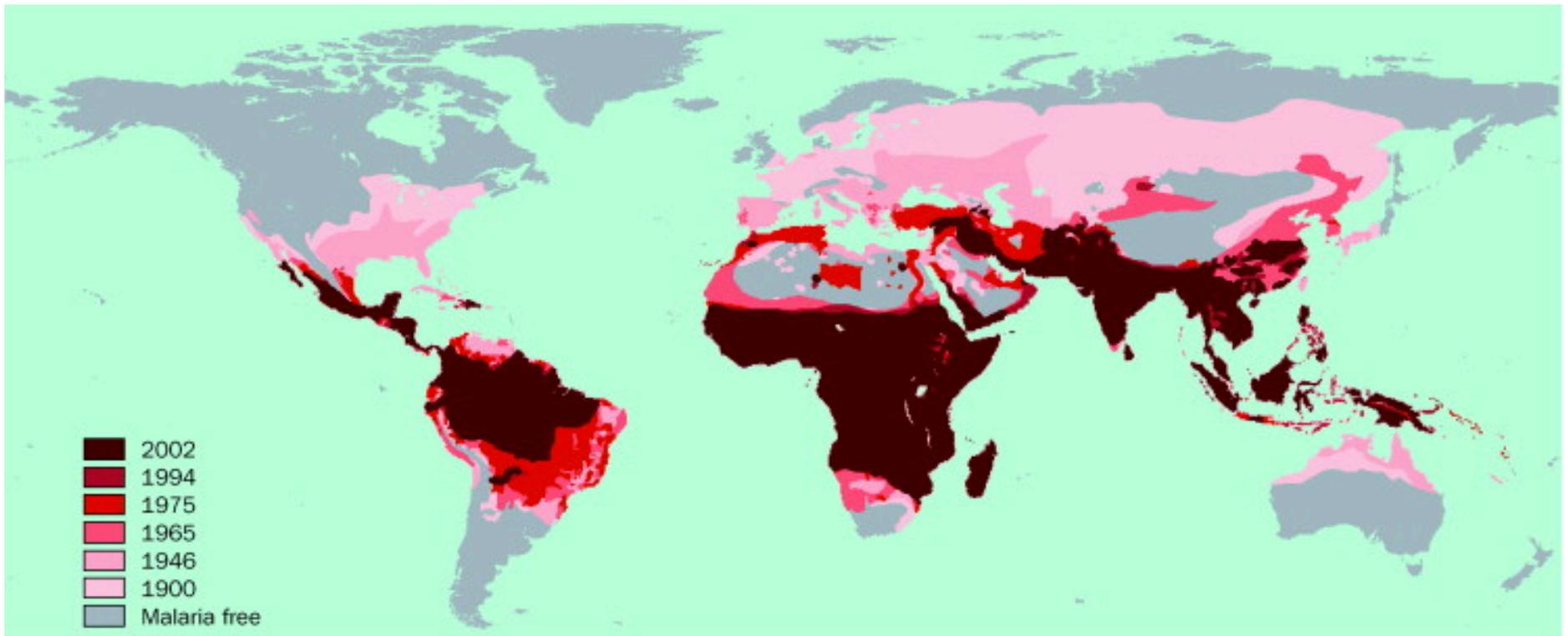
What about the value of nature in and of itself? Can we attach a dollar value to something just existing?



But doesn't nature have a right to exist, regardless of a dollar value?

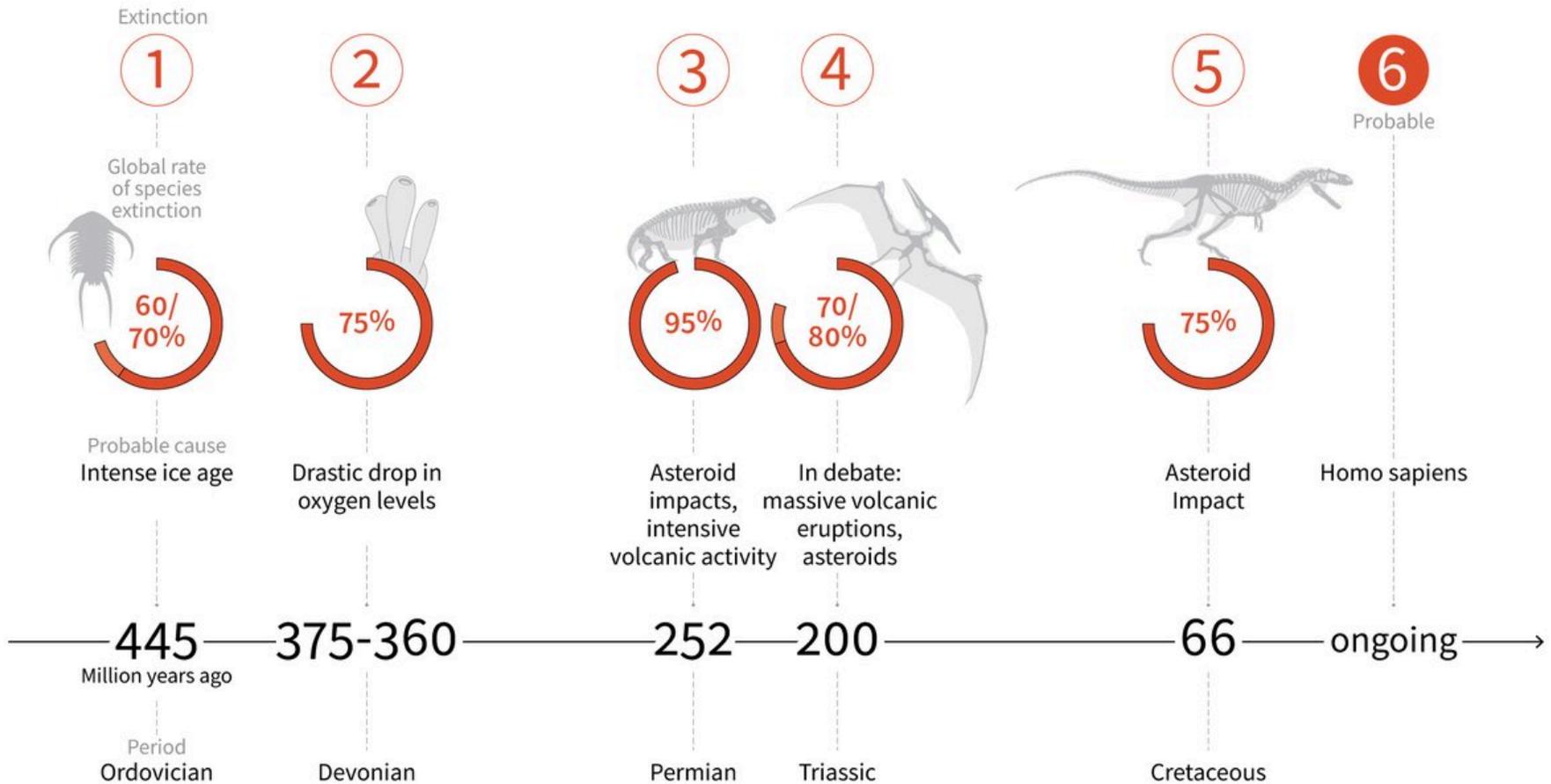


These questions aren't easy! There are real benefits to using environmentally damaging technology.



Earth's "mass extinctions"

During the last 500 million years, Earth has experienced five periods when at least half the living creatures were wiped out



Sources: National Geographic, Encyclopedia Britannica, scientific studies

Thomas Robert Malthus was wrong and so were all his followers. We can do this - we already have.

