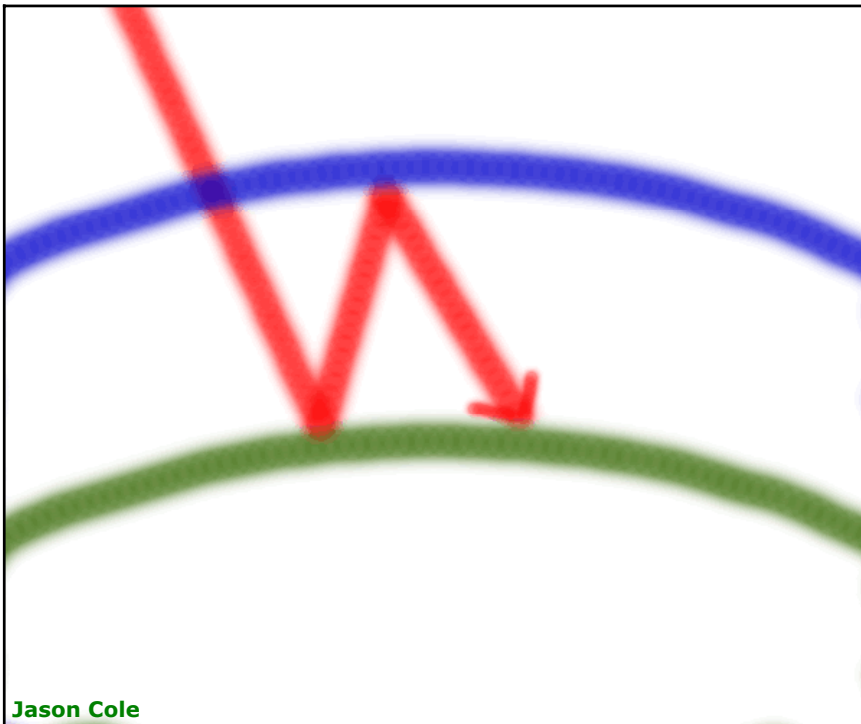


The Economic Approach to Environmental Management for Climate Change

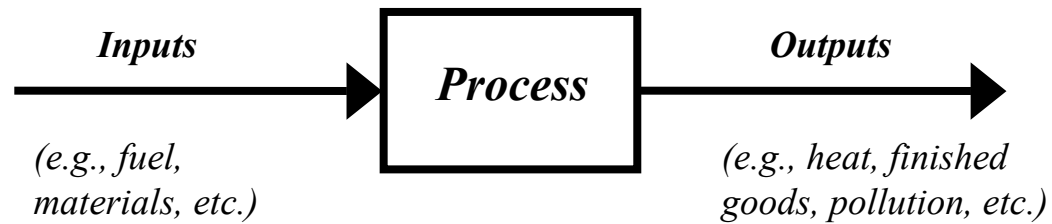
Roger Rauber
United Nations DESA
rauber@un.org

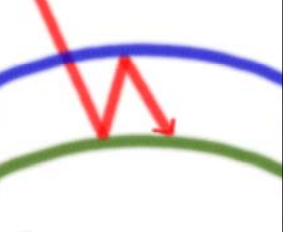
*Kyoto Protocol: Challenges
& Opportunities for
Sustainable Development
Tehran, I.R. of Iran
25 October 2003*





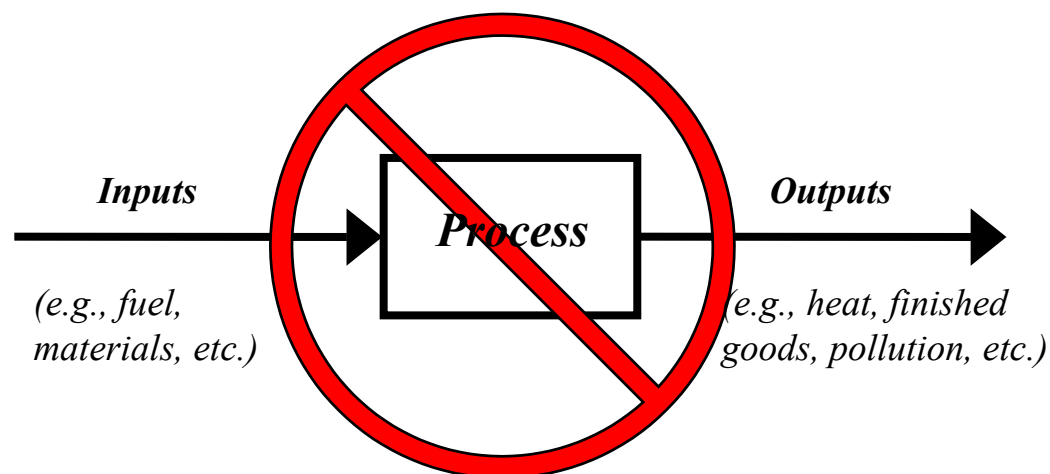
An Engineer's View

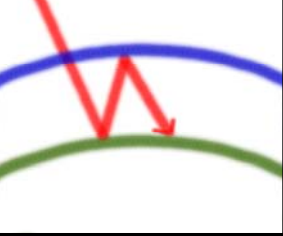




Pollution Control Options

A. Prohibition





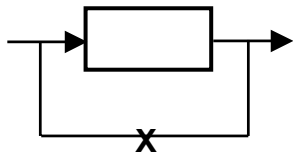
Pollution Control Options

B. Engineers' Approach



Emission standards

limit the amount of pollution being emitted (e.g., tons/year, pounds per day, etc.)



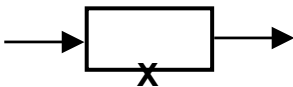
Performance standards

limit the amount of pollution being emitted based on the amount of material being processed (e.g., pounds of SO₂ per million BTUs of heat input from the fuel source).



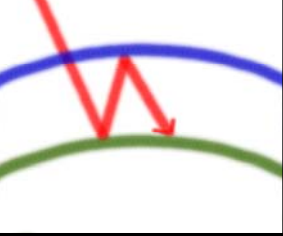
Input/Product standards

limit the quality of materials, e.g. fuels, which can be used (e.g. limits on sulfur content of distillate and fuel oils).

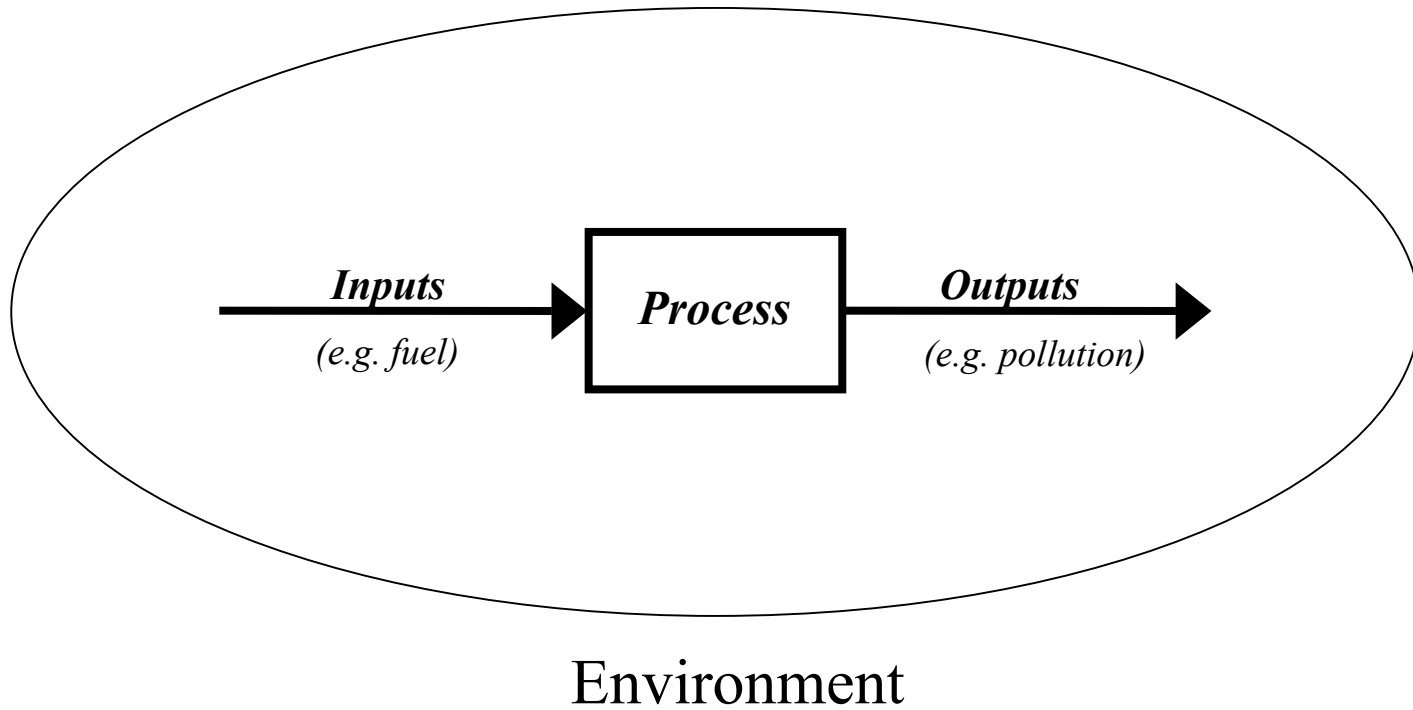


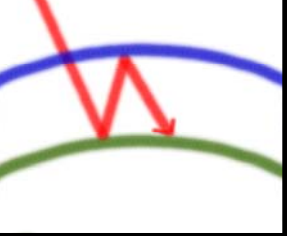
Design standards

tell the polluter how the process must be designed (e.g., to minimize wastage of materials).



Where is Environment?





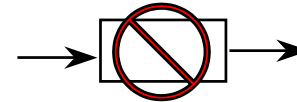
Engineering “Command/Control” Regulation

Goals
physical modeling

Regulatory Means

Environmental Quality Standards

A. Prohibitions

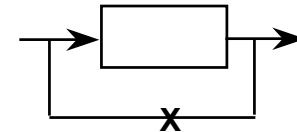


B. Technology-Based Standards

Emission Standards



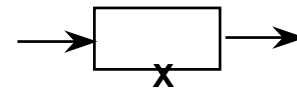
Performance Standards

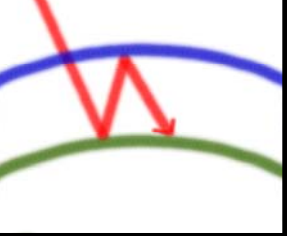


Input/Product Standards

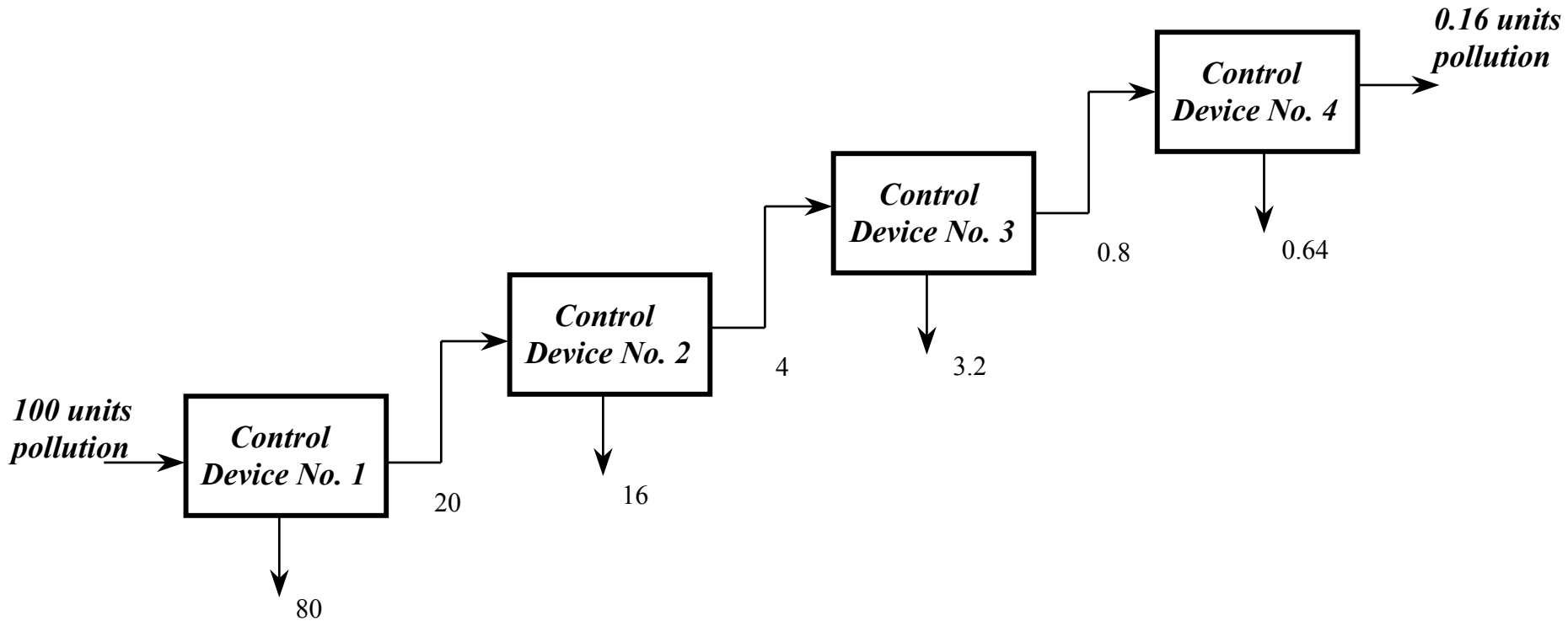


Design Standards

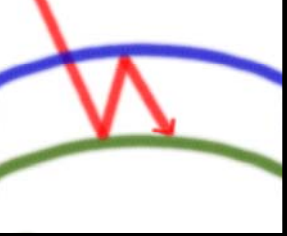




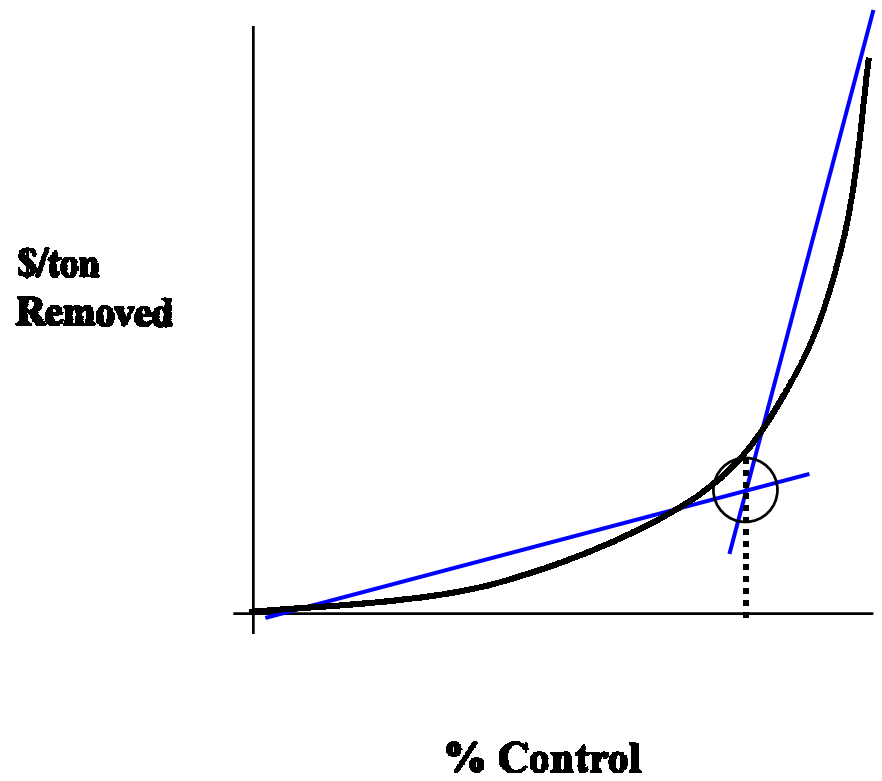
Where is Economics?



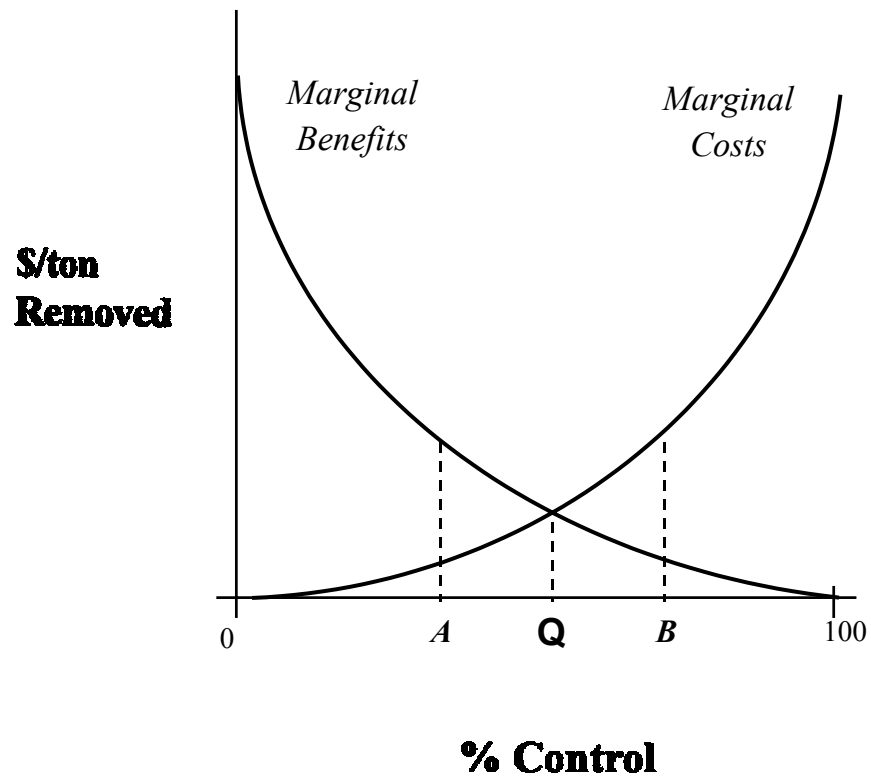
<i>Pollution Units Removed</i>	80	16	3.2	0.64
<i>% Control</i>	80%	96%	99.2%	99.84%



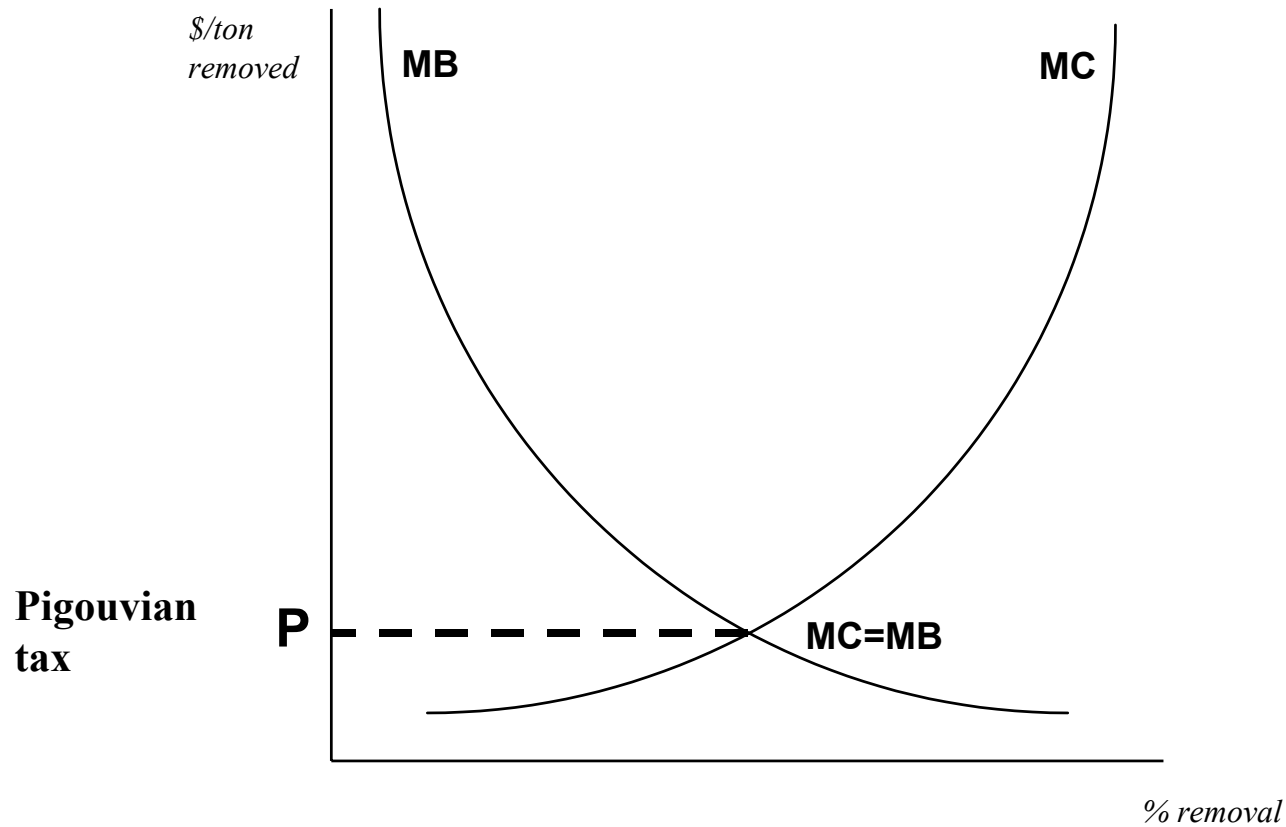
Engineers' "Kink" in Marginal Cost Curve



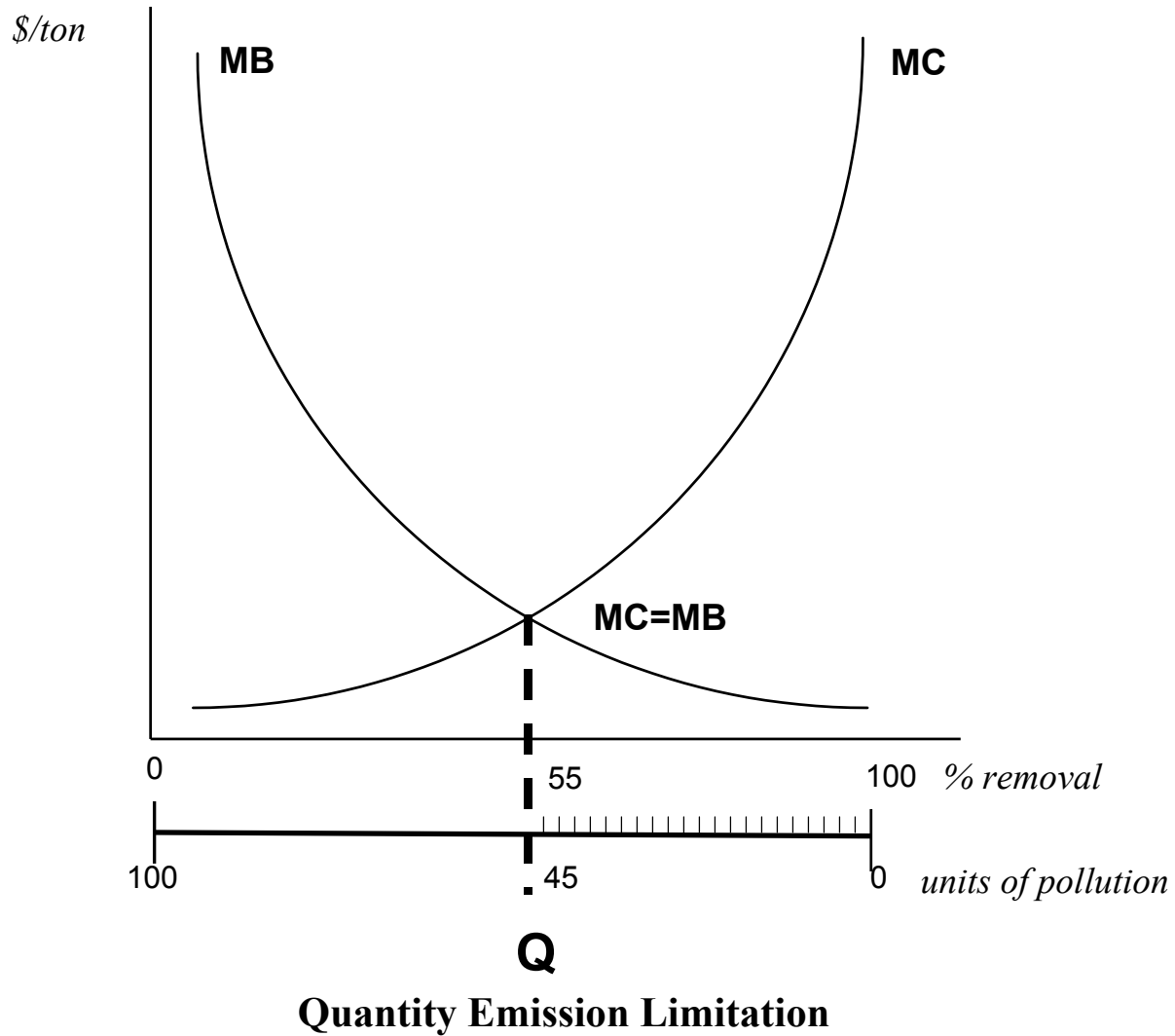
Economists' Marginal Costs and Benefits

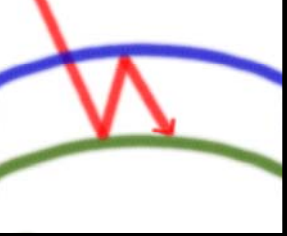


The Price-Based Approach: Pigouvian Taxation



The Quantity-Based Approach: Emissions Trading

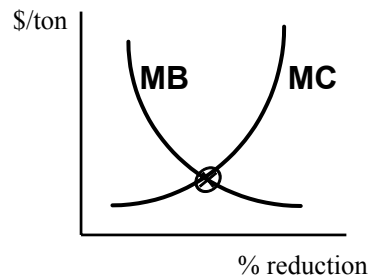




Economic Regulatory Approach

Goals

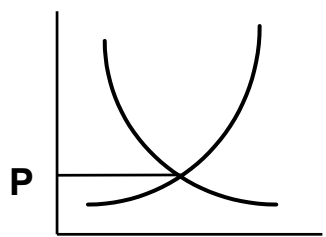
*Marginal Costs (MC) =
Marginal Benefits (MB)*



Regulatory Means

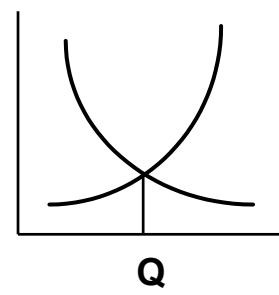
*Pollution Taxes
(Price-based)*

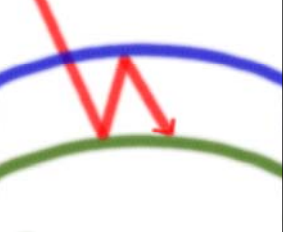
Pigouvian Taxation



*Pollution Markets
(Quantity-based)*

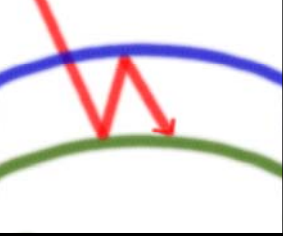
Emissions Trading





Why Economic Mechanisms?

- Governments focus on environmental goals, rather than stack-by-stack means.
- Economic efficiency gives comparable levels of environmental quality for lower costs.
- Efficiency can influence goal setting (i.e., savings targeted towards environment).
- Every ton of pollution has costs, giving facilities an incentive for reduction.



Engineering vs. Economic Worldviews

Engineering

Economics

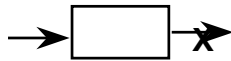
Goals



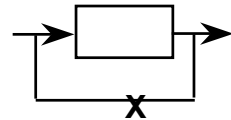
Regulatory Means



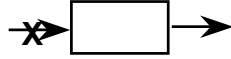
Emission Stds.



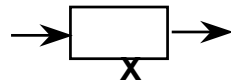
Performance Stds.



Input/Product Stds.

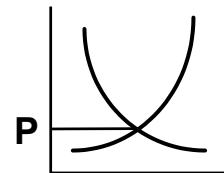


Design Stds.



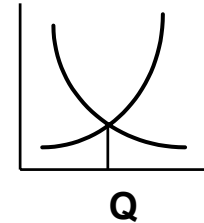
*Pollution Taxes
(Price-based)*

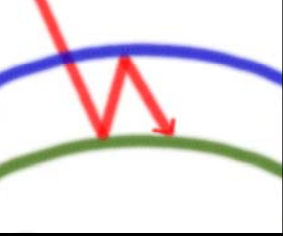
Pigouvian Taxation



*Pollution Markets
(Quantity-based)*

Emissions Trading





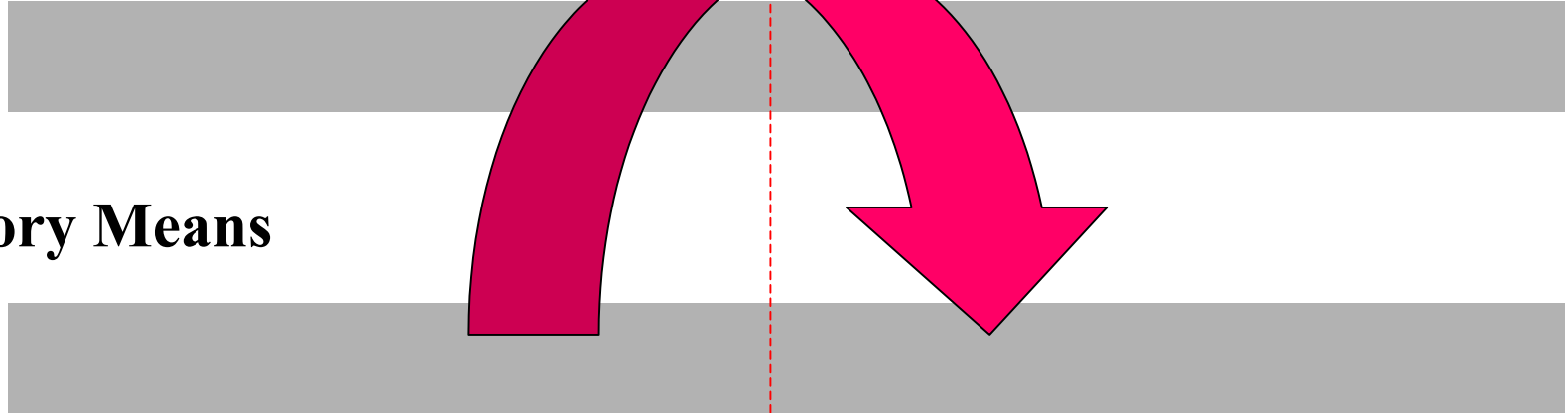
Regulatory Means Transition #1: Engineering to Economics

Engineering

Economics

Goals

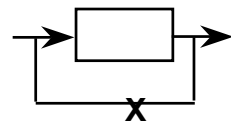
Regulatory Means



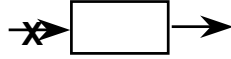
Emission Stds.



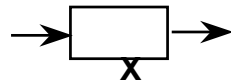
Performance Stds.



Input/Product Stds.

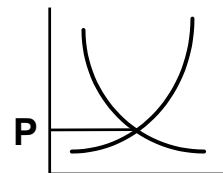


Design Stds.



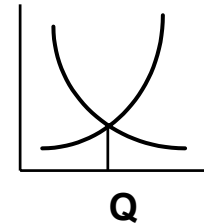
*Pollution Taxes
(Price-based)*

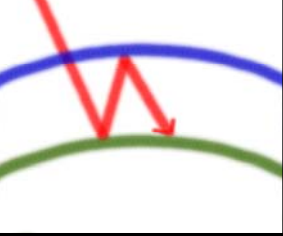
Pigouvian Taxation



*Pollution Markets
(Quantity-based)*

Emissions Trading





Regulatory Means Transition #2: Price to Quantity

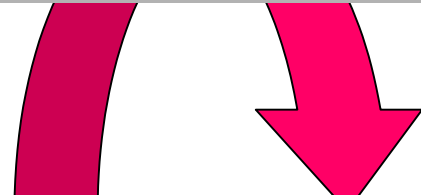
Engineering

Economics

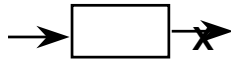
Goals



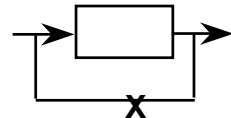
Regulatory Means



Emission Stds.



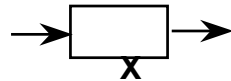
Performance Stds.



Input/Product Stds.

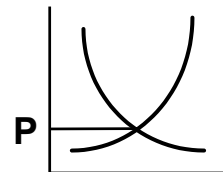


Design Stds.



*Pollution Taxes
(Price-based)*

Pigouvian Taxation



*Pollution Markets
(Quantity-based)*

Emissions Trading

