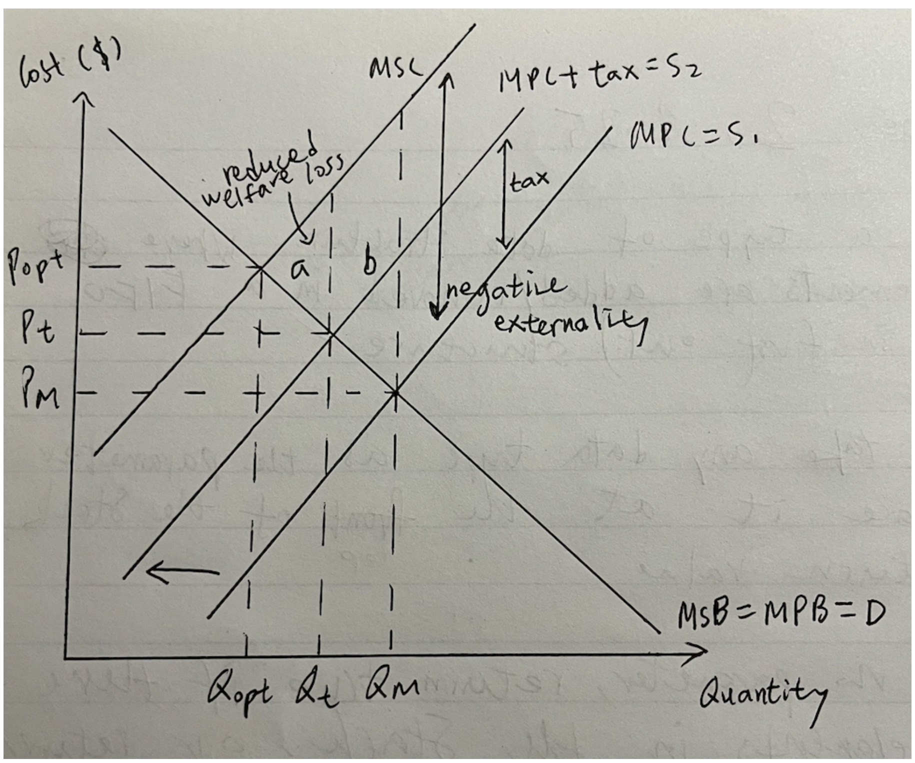
Using real world examples, evaluate two policies that governments might implement to reduce negative externalities of production associated with the environment. [15]

A negative externality of production occurs when the production of a good or service imposes external costs on third parties that are not reflected in the market price. This results in over-production and allocative inefficiency, where MSC > MSB. Examples include air pollution from industrial factories or water contamination from chemical production. Governments may intervene using market-based policies (e.g., Pigouvian or carbon taxes, tradable permits) and command-based policies (e.g., legislation and regulation) to correct this market failure.

One policy governments can use to correct negative production externalities is an indirect tax (or Pigouvian tax), such as a carbon tax, designed to internalize the external cost of pollution. A real world example of this would be China's Environmental Protection Tax (2018) which taxes air, water, and noise pollution. Companies receive lower tax rates if they reduce emissions by 30–50%, incentivizing technological adoption. Furthermore, this policy increased government revenue and encouraged firms to install real-time emission monitoring systems.

(Diagram)



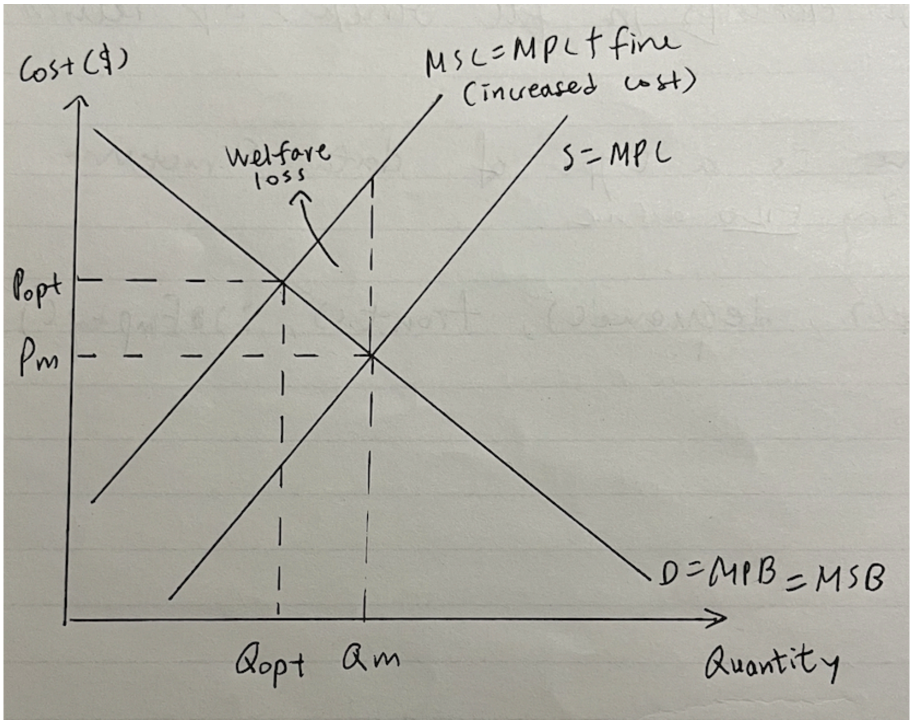
(Pro1)

The main advantage of indirect taxing policies is that they incentivise cleaner production. When a tax is imposed, producers' marginal private cost (MPC) curve, shown as S_1, shifts upward by the value of the tax to S_2 = MPC + tax, moving closer to the marginal social cost (MSC) curve. In the diagram, the vertical distance between S_1 and S_2 represents the tax per unit, internalising the external cost. The market equilibrium therefore moves from (Pm, Qm) to a new after-tax equilibrium at (Pt, Qt), where output falls and the welfare loss triangle between Qm and Qopt is partially reduced (area a remains while b is eliminated). This mechanism encourages producers to adopt less-polluting technologies in order to avoid higher costs, since any reduction in emissions lowers their tax burden. In the real world, such a mechanism drives innovation in cleaner technology and shifts long-term industrial behaviour toward sustainability, aligning private profits with social welfare.

(Con1)
However, the effectiveness of this diagrammatic adjustment between S_1, S_2 and MSC depends critically on the government's ability to measure the value of the external cost accurately. If the tax is too low, the shift from S_1 to S_2 is insufficient, leaving part of the welfare loss triangle (area a + b) uncorrected; if too high, output may move below Qopt, creating new inefficiencies as MSB > MSC beyond that point. Furthermore, while the diagram shows the tax pushing equilibrium to (Pt, Qt) neatly, in reality producers may pass a large share of the tax onto consumers through higher prices—particularly if demand is price-inelastic—reducing consumer surplus and disproportionately affecting lower-income households. Smaller or less efficient firms may also find it harder to absorb these increased costs, potentially losing competitiveness or relocating operations abroad, which shifts pollution rather than reducing it. These real-world distortions mean that the theoretical welfare gain shown by the shrinking triangle between Qopt and Qt may be smaller than depicted on the diagram.

Alternatively, governments can intervene using legislation and regulation, such as setting pollution limits or requiring specific production technologies to reduce harmful emissions. The EU's REACH Regulation restricts the use of hazardous chemicals, requiring producers to prove their safety before sale.

(Diagram)



(Pro2)
Government regulation can correct negative externalities more directly by restricting or penalising polluting production methods. In the diagram, firms' private cost curve (S = MPC) shifts upward to reflect the added compliance cost or fine, shown as MSC = MPC + fine. This upward shift increases the production cost from Pm to Popt and contracts output from the market level Qm (where external costs are ignored) to the socially optimal level Qopt, where MSC = MSB = D. The shaded triangle between MSC and MPC represents the initial welfare loss from over-production, which regulation effectively eliminates by aligning private production costs with social costs. In real-world applications, such policies compel firms to adopt cleaner technologies or comply with emission caps, leading to immediate improvements in environmental quality and public health. The visual representation illustrates how this approach enforces alignment between private and social costs even when producers lack incentive to act voluntarily.

(Con2)
Nevertheless, while the diagram illustrates how regulation shifts the cost structure upward from S = MPC to MSC = MPC + fine, it also highlights potential risks if the policy is poorly calibrated. In theory, this upward shift increases the price from Pm to Popt and reduces output from Qm to Qopt, eliminating the triangular welfare loss area between the two output levels. Yet, if the government overestimates the appropriate size of the fine or compliance cost, the MSC curve could shift even further upward beyond its true social cost. On the diagram, this means output

would fall below Qopt, creating a new welfare loss triangle on the opposite side, indicating under-production rather than over-production.

Furthermore, the diagram shows only the static cost adjustment but omits the administrative and enforcement costs required to make the regulation effective. In practice, maintaining pollution standards involves government spending on inspections, data monitoring, and enforcement mechanisms—costs that are not captured by the simple upward shift in the curve. Economically, these extra expenditures represent an opportunity cost, diverting public funds from other priorities like education or healthcare. In the real world, firms facing the elevated cost curve (higher MSC) may respond by downsizing, automating, or relocating production to countries with looser regulations, thereby shifting the pollution rather than reducing it globally. As a result, the diagram's theoretical movement from point (Qm, Pm) to (Qopt, Popt) may not occur perfectly, and allocative efficiency could remain unattained.

In conclusion, both Pigouvian taxes and regulations can reduce negative production externalities and move the economy toward allocative efficiency (MSC = MSB). However, both policies have certain benefits and drawbacks. Taxes create incentives for long-term innovation and raise public revenue, but their success depends on accurate cost estimation and economic coordination. Regulations are clear and enforceable but can create high compliance costs and potential unemployment. Thus, a combination of market-based (taxes) and command-based (regulations) policies is most effective. Taxes encourage gradual technological transition, while regulations ensure immediate compliance in industries causing severe environmental harm.