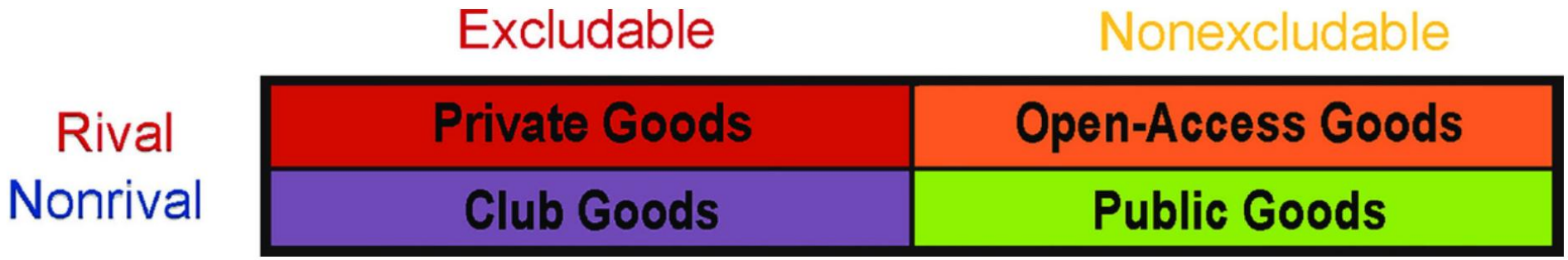
# Problem

- D = 200 – Q
- MEB = 100 - Q
- MC = 180
- Find:
  - $q_1$;
  - $q^*$;
  - the subsidy needed to change the equilibrium quantity from $q_1$ to $q^*$

# 3. Public vs. Private Goods



# 3.1 Public goods

- Non-excludability
  - No one can be prevented from enjoying the benefits or bear the costs of the good
  - Depends on the physical characteristics of the good and the property rights
  - Examples: climate change, biodiversity, air quality…many environmental resources
- Non-rivalry or indivisible consumption
  - A person's consumption does not reduce the good's availability to anyone else
  - Depends on the characteristics of the good
  - Examples: climate change, biodiversity, air quality
  - Not all environmental resources: national parks or wilderness areas can be too crowded



Hanley, N., Shogren, J., White, B. (2013) Introduction to environmental economics, Oxford University Press, UK - Chapter 2

# 3.2 Impact of public goods on market efficiency

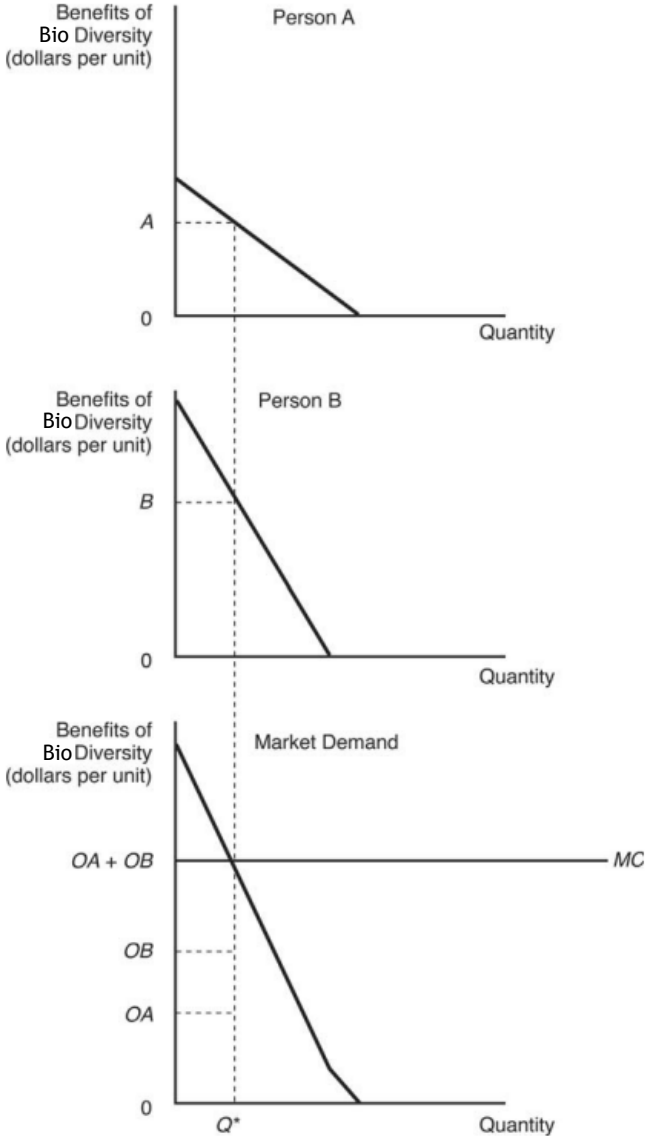
| | Clean | Don't |
|---|---|---|
| Clean | 10;10 | 0;15 |
| Don't | 15;0 | 2;2 |

- **Free riding**
  - People do not pay for but still enjoy the benefits provided by public goods
  - Even if the **social benefits exceed the costs**, everybody has an incentive to wait for somebody else to provide the good
  - It's the **prisoner dilemma**, or social trap, or tragedy of the commons
  - Outcome:
    - nobody will pay and the good will not be provided – worst possible outcome
  - Best outcome (most efficient):
    - marginal social cost = marginal social benefit
  - Solution
    - Build a **club**, still the quantity provided will be smaller than the optimal since there will be spillovers



Hanley, N., Shogren, J., White, B. (2013) Introduction to environmental economics, Oxford University Press, UK - Chapter 2

# 3.3 Efficient provision of public goods




- Person A and B have different WTP for **biodiversity** (upper diagrams)
- At the aggregate level, the WTP of both individuals is the vertical sum of $WTP_A$ and $WTP_B$ (lower diagram):
  - Given the quantity X of biodiversity, what is the € A and B are willing to pay for it?
  - Feasible since non-rivalry!
- Assume MC is the cost of maintaining biodiversity (let's assume it is constant)
- The **optimal** (max social welfare) quantity of biodiversity to be provided is **Q***, BUT
  - each person should pay for it AND
  - B should pay a larger amount than A.



Tietenberg, T. & Lewis, L.(2019). *Environmental economics and policy*. Pearson Education. 6 ed. - Chapter 4

# 3.3 Efficient provision of public goods

- Would the private market supply Q*?
- No, because
  1. Each person should pay a different price (high transaction costs)
  2. The WTP of each person should be known by the provider, but each individual has the incentive to understate his/her WTP freeriding on others' contribution
- Solution:
  - Let the government provide it! **BUT**
    - Fiscal revenues needed!
    - Social benefits of protecting the environment larger than social benefits of other uses of public funds (e.g. reduce unemployment, increase social housing, …)



Tietenberg, T. & Lewis, L.(2019). *Environmental economics and policy*. Pearson Education. 6 ed. - Chapter 4

# Problem

- Assume
  - MC of biodiversity = 4
  - $WTP_A = 2 - Q$
  - $WTP_B = 3 - 2\,Q$
- Find
  - optimal (max social welfare) quantity of biodiversity to be provided Q*
  - contribution to be paid by each individual

- Would the contribution of only one individual be enough to cover the cost of providing the ecosystem service?
- What is the net social benefit of Q* ?
- What is the max transaction cost that is feasible to provide Q* ?