A **public good** is a good that is **non-rival** and **non-excludable**. This means, respectively, that consumption of the good by one individual does not reduce availability of the good for consumption by others; and that no one can be effectively excluded from using the good. In the real world, there may be no such thing as an absolutely non-rival and non-excludable good; but economists think that some goods approximate the concept closely enough for the analysis to be economically useful. For example: national defense, basic research, hurricane sirens, etc.

The aggregate demand curve for a public good is obtained by the vertical summation (not horizontal as is the case with private goods) of the individual demand curves. At each quantity level, we see the willingness to pay of each individual and then estimate society’s total willingness to pay by adding the willingness to pay of the various individuals.

A competitive market will not provide public goods because there is no way to get people to pay for them (they are non-excludable). Public goods are therefore usually provided by the government. Ideally the government would tax each person for use of the public good in the amount that the person is willing to pay. This is impossible though because there is no way for the government to observe people’s preferences (i.e. their demand curve for the good). People will understate their willingness to pay in the hope that somebody else will pay for the public good and they will be able to enjoy it for free (because it is non-rival and non-excludable). This is the **free rider problem**.

### Externalities

**Definition 1.** An **externality** occurs when an economic activity causes external costs or external benefits to third party stakeholders who did not directly take part in the economic transaction. Basically, the producers and consumers in a market either do not bear all of the costs or do not reap all of the benefits of the economic activity.

Externalities have important implications for social welfare. The socially optimal level of consumption of a good is where the marginal social benefit (MSB) of the good equals the marginal social cost (MSC).
If there are no externalities then MSB = demand (marginal private benefit) and MSC = supply (marginal private cost). In this case the equilibrium market outcome is socially optimal ($q^*$).

1. Consumption Externality

A negative consumption externality is when the buyer doesn’t bear the full cost of consumption (listening to loud music).

A positive consumption externality is when the buyer doesn’t get the full benefit of consumption (holiday lights).

In the case of a consumption externality: $\text{MPB} \neq \text{MSB}$.

2. Production Externality

A negative production externality is when the producer doesn’t bear the full cost of production (mine water pollution).

A positive production externality is when the producer doesn’t get the full benefit of production (research).

In the case of a production externality: $\text{MPC} \neq \text{MSC}$.