The tragedy of the commons

When people each gain from using more of a shared, limited resource, their combined use can damage or deplete it. The immediate benefit goes to the user; much of the cost is spread across others.

1. RECOGNIZE A COMMON-POOL RESOURCE

Difficult to exclude users

Keeping potential users out is costly or difficult.

Use reduces availability

What one person removes is no longer available to others.

Examples: fish in a shared lake, forage on shared pasture, or groundwater in an aquifer used by many wells. A renewable resource can still be depleted if use exceeds recovery.

2. TRACE THE INCENTIVE PROBLEM

One user takes more resource > That user gains extra benefit > Many users do the same > Shared resource declines

Each user receives the full benefit of their extra harvest but bears only part of the resulting shared loss. Taking more can seem worthwhile individually even when widespread overuse makes everyone worse off in the long run.

3. SHARED DOES NOT MEAN UNMANAGED

Open access means there are no effective restrictions on entry or use. A community-owned resource can instead have clear membership, agreed limits and enforcement. The tragedy describes a risk from poorly controlled incentives, not an inevitable outcome of all sharing. Cooperation can change the outcome.

Common-pool characteristics and incentives: Anderies, Janssen and Ostrom (2004).
Evidence on collective management: Nobel Prize, Economic Sciences 2009 presentation.

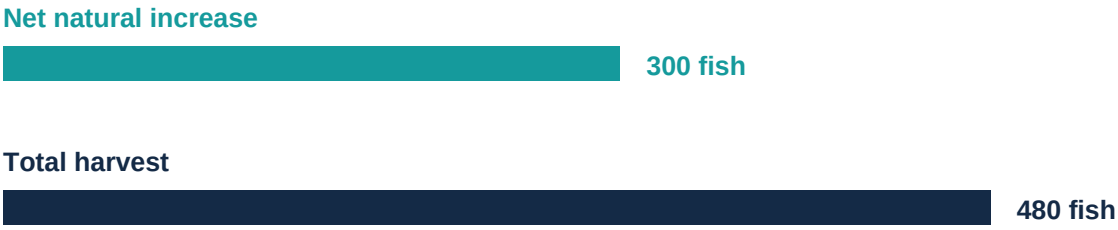
Scope: College Board AP Environmental Science CED, Topic 5.1, p. 95.

From extra harvest to depletion

A shared fishery illustrates how individually modest harvests can add up to an unsustainable total. Compare total removal with the population's net natural increase, not just one person's catch.

1. A SIMPLIFIED ONE-WEEK FISHERY BUDGET

Assume 12 fishers each take 40 fish. Without fishing, births minus natural deaths would add 300 fish this week. Assume no migration.



Harvest = 12 × 40 = 480 fish per week.
Stock change = 300 - 480 = -180 fish in this week.

2. A BALANCE IS NOT A PERMANENT SAFE QUOTA

In this example, 300 fish total, or 25 per fisher with equal shares, would match that week's net increase. This is an illustration, not a real catch recommendation. Reproduction, mortality and habitat conditions change; a depleted population may need a lower harvest to rebuild. Uncertainty also matters.

3. THE SAME PATTERN CAN AFFECT GROUNDWATER

Each farm benefits from pumping irrigation water, but heavy combined pumping can lower the shared water table. Neighbors may face deeper wells and higher pumping costs. Persistent withdrawals exceeding recharge draw down groundwater storage. Other effects can include reduced streamflow and, in susceptible aquifers, land subsidence.

Real catch limits, population information and uncertainty: NOAA Fisheries.
Shared consequences of pumping: USGS, Groundwater Decline and Depletion.

Scope: College Board AP Environmental Science CED, Topic 5.1, p. 95.

Keeping shared resources usable

Extension: management responses. Protecting a commons means changing the rules or incentives so that individual choices account for the resource's limits and other users' needs.

1. MATCH THE RESPONSE TO THE PROBLEM

APPROACH	HOW IT HELPS	WHAT IT NEEDS
Total-use limits	Cap combined harvest or pumping, then allocate shares among users.	Resource data and a way to measure actual use.
Community rules	Users agree who can participate and when, where or how much they may take.	Participation, monitoring and consequences for violations.
Defined use rights	Clarify who may access, withdraw from and manage the resource.	Clear boundaries, accountability and fair access arrangements.

A rule on paper is not enough. Check use, check resource condition, enforce agreements and revise limits when conditions change.

2. EXAMPLE: CATCH LIMITS WITH ACCOUNTABILITY

Fishery managers use scientific information to set catch limits while accounting for uncertainty. Monitoring helps reveal whether catches exceed the limit; corrective measures can reduce further overharvest. Limiting each boat works only if the combined catch, including other users, stays within the overall limit.

3. THERE IS NO SINGLE AUTOMATIC SOLUTION

Community, public and private management can all succeed or fail. Ask whether a proposal reduces total pressure, can be monitored, and distributes costs fairly. Protecting a resource requires effective institutions, not simply changing its ownership label.

Collective rules, monitoring and sanctions: Nobel Prize, Economic Sciences 2009.
Catch limits and uncertainty: NOAA Fisheries, Setting an Annual Catch Limit.

Scope: College Board AP Environmental Science CED, Topic 5.1, p. 95.