# Tragedy of the commons

Guest lecture in the course "The Global Economy – Environment, Development and Globalisation"





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## Content

- Tragedy of the commons
- Short history
- Important definitions
- Solutions
- Examples of tragedies/drama
- Current challenges

## More than 50 years ago ...

- Garrett Hardin published his influential paper: 'The Tragedy of the Commons'
- This paper is in the top 5 of all research outputs ever (in <u>Altmetric</u>)

This is where our story today begins....

# Tragedy of the Commons (Hardin 1968)



Source: medium.com

"Picture a pasture open to all. [...] the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another... But this is the conclusion reached by each and every rational herdsman sharing a commons.

Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit - in a world that is limited." [With the consequence of over-exploited commons]

Solution: Privatisation or state control

## From the Tragedy to the Drama of the Commons



Source: medium.com



Elinor Ostrom on the Myth of Tragedy of the Commons (Video; 2:38 min)

# From the Tragedy to the Drama of the Commons

- Overexploitance is avoidable! There is not necessarily a tragedy. But there are settings in which Hardin is correct.
- Privatisation and state ownership are not the only solutions.
- Collective self-governance can avoid a tragedy..



"In efforts to move beyond Hardin, it is important that one does not dismiss his predictions for some CPRs. The major problem of his original analysis was that he presented **'the tragedy' as a universal phenomenon**. [...] Overharvesting frequently occurs when resource users are totally anonymous, do not have a foundation of trust and reciprocity, cannot communicate, and have no established rules" (Basurto and Ostrom 2009).

## Short history: From the Tragedy...



Pamphlet by the British mathematician William Forster Lloyd

Popul tends to would 1 finite w capita sl steadily A fair The Tragedy of the Commons the view The population problem has no technical solution it requires a fundamental extension in morality. in terms we mus tions wit Garrett Hardi is clear human immedi availabl At the end of a thoughtful article on sional judgment. . . ." Whether they ulation (2). the future of nuclear war. Wiesner and were right or not is not the concern of York (1) concluded that: "Both sides in the present article. Rather, the concern A 6 the arms race are . . . confronted by the here is with the important concept of a finite p ima of steadily increasing military class of human problems which can be growth power and steadily decreasing national called "no technical solution problems," case of above a security. It is our considered profes- and, more specifically, with the identifisional judgment that this dilemma has cation and discussion of one of these. that new no technical solution. If the great pow-It is easy to show that the class is not conditio ers continue to look for solutions in a null class. Recall the game of ticktion of the area of science and technology only. tack-toe. Consider the problem. "How tham's result will be to worsen the situa-"
It is well known that I cannot, if I asthe gre No I would like to focus your attention sume (in keeping with the conventions not on the subject of the article (na- of game theory) that my opponent un- It is n tional security in a nuclear world) but derstands the game perfectly. Put anmaximi on the kind of conclusion they reached, other way, there is no "technical solu- the san namely that there is no technical solu- tion" to the problem. I can win only by von tion to the problem. An implicit and almost universal assumption of discus- "win." I can hit my opponent over the of parti professional and head; or I can drug him; or I can falsify

#### A history by Caroline Schill

The Tragedy of the Commons: "The tragedy of the **Twenty-Two Years Later** David Feeny,' Fikret Berkes,' Bonnie J. McCay,': COMMONS has become part of the Hardin's Tragedy of the Commons model predicts tation or degradation of all resources used in comm conventional wisdom in uous prediction, a surprising number of cases exist i able to restrict access to the resource and establish for its sustainable use. To assess the evidence, w property resources and present a taxonomy of pr. environmental studies. which such resources may be held. Evidence accumul two years indicates that private, state, and commun tially viable resource management options. A more resource science and Hardin's should incorporate institutional arrangem to provide for better analysis and prediction. policy, economics, KEY WORDS: co-management; common property; fisheries; f able development; water resources; wildlife. ecology, and political It was twenty years ago today; Sgt. Pepper taught the ba (John Lennon and Paul McCartney (1967). Sgt. Pepper's Club Band, Northern Songs Ltd.). science.' INTRODUCTION Garrett Hardin's The Tragedy of the Commons was published 22 years ago (Hardin, 1968). Although it focused attention on overpopulation, the 1990 GOVERNING Clearly defined boundaries the COMMONS ource units, are clearly defined. Proportional equivalence between benefits and costs sales requiring labour, materials, and/or money inputs Collective-choice amangements Many of the individuals affected by harvesting and protection rules

1833 1987 1954/55 1968 boundaries of the resource sustem, and the individuals or hour THE ECONOMIC THEORY OF A COMMON-PROPERTY RESOURCE: THE FISHERY IL SCOTT GORDON ules specify the amount of resource products that a user is allocal Garleton College, Ottawa, Ontario lack of theoretical of biologists have been f m chief airn of this paper is to en-mine the economic theory of ana-ral resource utilization as it per-toring industry. It will on the failing industry. It will be the failed of the economic cases have a sent cases have a sent cases have a sent case have a sent cases have a sent case have a sent cases have a sent case have a sent cases have a sent c nodily these rules. iii to the labing industry. It will pear, I logs, that roost of the prob-ms associated with the words "con-realism" or "displicition" or "overco-isitation" in the fishery are, in reality, antifestations of the fact that the natu-l resources of the sea yield no economic nt. Fishery resources are unusual in the et of their common-mercentry nature." Monitoring THE FISHERY: THE OBJECTIVES OF SOLE OWNERSHIP Monitors, who actively audit biophysical conditions and user behavi ANTHONY SCOTT ELINOR OSTROM to the users and/or are the users themselves. rende Taleser presentes are unsmall is table but in fact of their common property matter in the but they are not unique, and similar produces are ensured in their common pro-perty of the sector of the sector of the sector of the protected in the fillweigt parts is writing attra-perty and the sector of the sector of the protected in the fillweigt parts is writing attra-perty and the sector of the protected in the fillweigt parts is writing attra-tion of the sector of the protected in the fillweigt parts is writing attra-tion of the sector of the protected in the fillweigt part of the sector of the writing attraction of the sector of the University of British Columbia Graduated sanctions The rights of property, as such, have not been venerated by those moster minds who have built up eccessing training the authority of the science has been wrongly assumed by some who have pushed the claims of vester rights to extreme and antisocial uses. It may be well therefore to note that Users who violate rules-in-use are likely to receive graduated sand The Evolution of Institutions and context of the offense! from other users, from officials accounts the tendency of careful economic study is to base the rights of private prop-erty not on any abstract principle, but on the observation that in the pas-٤. Conflict-resolution mechanisms for Collective Action Users and their officials have rapid access to low-cost, local arenas they have been inseparable from economic progress. . . .--ALTHED MARS Principles of Economics (5th ed.), p. 48. between users and officials. Minimal recognition of rights to organise The rights of users to devise their own institutions are not challence Gordon (1954): 'The Economic authorities, and users have long-term tenure rights to the resource Nested enterprises (for resources that are parts of larg а. Theory of a Common-Property Appropriation, provision, monitoring, antercoment, conflict resolution THE WORLD COMMISSIO organised in multiple layers of needed enterprises. Political Economy Resource: The Fishery' of Institutions and Decisions Examples success cases (local), Scott (1955): The Fishery: The AND DEVELOPMENT Objective of Sole Ownership + design principles



1994



Experiment participants fit behaviour predicted by Hardin when:

- group members are anonymous
- no feedback on individual actions
- no communication

Introduction of communication or punishment reduces 'tragedy cases' drastically (through trust and reciprocity)

- Large groups make it harder to avoid tragedy

#### A Behavioral Approach to the Rational Choice Theory of Collective Action Presidential Address, American Political Science Association, 1997 ELINOR OSTROM Indiana University

an initial theoretical scenario, and the final section concludes by examining the implications of placing reciprocity, reputation, and trust at the core of an empirically tested, behavioral theory of collective action.

xtensive empirical evidence and theoretical developments in multiple disciplines stimulate a need to E expand the range of rational choice models to be used as a foundation for the study of social dilemmas and collective action. After an introduction to the problem of overcoming social dilemmas through collective action, the remainder of this article is divided into six sections. The first briefly reviews the theoretical predictions of currently accepted rational choice theory related to social dilemmas. The second section summarizes the challenges to the sole reliance on a complete model of rationality presented by extensive experimental research. In the third section, I discuss two major empirical findings that begin to show how individuals achieve results that are "better than rational" by building conditions where reciprocity reputation, and trust can help to overcome the strong temptations of short-run self-interest. The fourth section raises the possibility of developing second-generation models of rationality, the fifth section develops

would not be reading this article if it were not for some of our ancestors learning how to undertake collective action to solve social dilemmas. Successive generations have added to the stock of everyday knowledge about how to instill productive norms of behavior in their children and to craft rules to support collective action that produces public goods and avoids "tragedies of the commons."1 What our ancestors and contemporaries have learned about engaging in collective action for mutual defense, child rearing, and survival is not, however, understood or explained by the extant theory of collective action.

1994

et me start with a provocative statement. You we are hand-waving at our central questions. I am afraid that we do a lot of hand-waving. The lessons of effective collective action are not simple-as is obvious from human history and the immense trapedies that humans have endured as well as the successes we have realized. As global relationships become even more intricately intertwined and complex, however, our survival becomes more dependent on empirically grounded scientific understanding. We have not yet developed a behavioral theory of collective action based on models of the individual consistent with empirical evidence about how individuals make decisions in social-dilemma situations. A

1998

#### Implications for Policy

(Excerpt from Ostrom 1998)

Using a broader theory of rationality leads to potentially different views of the state. If one sees individuals as helpless, then the state is the essential external authority that must solve social dilemmas for everyone. If, however, one assumes individuals can draw on heuristics and norms to solve some problems and create new structural arrangements to solve others, then the image of what a national government might do is somewhat different.



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#### A Behavioral Approach to the Rational Choice Theory of Collective Action Presidential Address, American Political Science Association, 1997 ELINOR OSTROM Induana University

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Elinor Ostrom, Roy Gardner, & James Walker

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Description of the publisher:

"[The "tragedy of the commons"] has had tremendous value for stimulating research, but it only describes the reality of human-environment interactions in special situations. Research over the past thirty years has helped clarify how human motivations, rules governing access to resources, the structure of social organizations, and the resource systems themselves interact to determine whether or not the many dramas of the commons end happily.

In this book, [...] leaders in the field review the evidence from several disciplines and many lines of research and present a state-of-the-art assessment."

#### A Behavioral Approach to the Rational Choice Theory of Collective Action Presidential Address, American Political Science Association, 1997 ELINOR OSTROM Induana University

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Elinor Ostrom receives Nobel Memorial Prize in Economic Sciences "for her analysis of economic governance", in particular how common property could be successfully managed by groups using it.

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#### RULES, GAMES, & COMMON-POOL RESOURCES

Elinor Ostrom, Roy Gardner, & James Walker



History by Caroline Schill



## The struggle to govern the commons

- Far from trivial to solve so-called collective action problems
- Cooperation among multiple and diverse actors is necessary to avoid the Tragedy
- What makes collective action emerge, sustain and be successful fascinated a wide variety of scholars (e.g. anthropologists, social scientists, economists, mathematicians)



## **Important Definitions**

## What are Common Pool Resources?

... are natural or human-made resources characterised by **substractiblity** and costly **excludability** (Ostrom 1990)

- Substractibility: the use of the resource decreases the availability for all users
- Excludability: it is difficult, very costly, infeasible, undesirable to exclude others from using the resource.



Ostrom, E. 1990: Governing the Commons. The evolution of institutions for collective action. Cambridge University Press, Cambridge) <sup>13</sup>



# **Definitions: types of property rights**

A good can be primarily determined by its physical nature, but the de facto type may be affected by the way it is used.

**Property rights:** describe which actions can be carried out by which actor (who has the authority)

- Private property
- Public property
- Open access
- Common property

# Definitions: types of property rights II

## Private property:

- Bundles of rights held by and exchanged among individuals or legally recognised corporate entities;
- Generally recognised and enforced by the state;
- Usually exclusive and transferable
- Examples: privately forests and rangelands

## **Public Property:**

- Bundles of rights held by official agents of some unit of government, general public has commonly equal access and use rights
- Examples: forests and rangelands held by the government, highways or public parks

## Definitions: types of property rights III

### Common (or communal) Property:

- Bundles of rights held, defined, and exchanged by some communal entity as a whole; often rights of equal access and use; rights may be legally recognised, in other cases the rights are de facto.
- Examples: 70% of the land in sub-Saharan Africa, water-users associations, many inshore fisheries and forests.

#### **Open Access:**

No effective restrictions on use of resource

• Examples: Many offshore ocean fisheries

Tragedy of the Commons = Open access CPR (no governance in place)

(Feeny et al. 1990, McGinnis 2011, Dell'Angelo et al 2017)<sup>17</sup>

## Note about concepts

- **Property rights and good types:** are idealised types and analytic types. In practice, many resources can be classified in overlapping or even conflicting combinations; e.g. co-management (communities + governments)
- **Commons**, the term: is informally used to refer to public goods, common pool resources, or any area with *uncertain* property rights. For analytical purposes it is necessary to be more specific.

## Solutions: Privatisation, stat control, self-governance

**Privatisation or state ownership** (Hardin 1968, see Feeny et al. 1990 and Basurto and Ostrom 2009 for references)

- Still today many governments and other authorities have the belief that those two options are the only viable ones
- ITQs as example in fisheries

Collective, self-organised governance (e.g. Ostrom 1990, Feeny et al. 1990, Dietz et al. 2003)

- Ostrom's design principles (Ostrom 1990)
- Trust, reciprocity, norms, communication, sanctioning (Ostrom 1998)
- There are no panaceas! (Ostrom 2007)
   Note: holds mainly for local levels, smaller groups of people

## **Design principles for governing** the commons

- 1. Clearly **defined boundaries** and users
- **Congruence** among rules and with local conditions
- 3. Collective-choice arrangements
- Monitoring 4.
- **Graduated sanctions** 5.
- 6. **Conflict-resolution mechanisms**
- 7. **Recognition of rights** to organise
- 8. Nested enterprises

(Ostrom, E. 1990: Governing the Commons. The evolution of institutions for collective action. Cambridge University Press, Cambridge)

#### DESIGN PRINCIPLES FOR GOVERNING SUSTAINABLE RESOURCES

The following principles are frequently observed in sustainable institutional regimes:

• Clearly defined boundaries. The boundaries of the resource system, such as irrigation systems or fisheries, and the individuals or households with rights to harvest resource units are clearly defined.

• Proportional equivalence between benefits and costs. Rules specifying the amount of resource products that

*Warning: Blueprint thinking* conditions and rules require (among the other threats) collective-choice arrangements. Many of the individuals affected by harvesting of the individuals affected by harvesting group who can modify these rules.

> • Monitoring. Monitors, who actively audit biophysical conditions and user behavior, are at least partially accountable to users and/or are users themselves.

• Graduated sanctions. Users who violate rules-in-use are likely to receive

graduated sanctions (depending on the seriousness and context of the offense) from other users, officials accountable to these users, or both.

• Conflict-resolution mechanisms. Users and their officials have rapid access to low-cost, local arenas to resolve conflict among users or between users and officials.

• Minimal recognition of rights to organize. The rights of users to devise their own institutions are not challenged by external governmental authorities, and users have long-term tenure rights to the resource.

• Nested enterprises (for resources that are parts of larger systems). Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

SOURCE: E. Ostrom, Governing the Commons: The Evolution of Institutions for Collective Action (New York: Cambridge University Press, 1990), 90.

# Solutions: better understanding humans

- What motivates us to take action / care about our co
- Importance for policies, underlying behavioural assumptic
- Trust, reciprocity, norms, communication, sanctionin

### Example: role of norms for behavioural change

- Social norm: "a predominant behavioural pattern within a group, supported by a shared understanding of acceptable actions and sustained through social interactions within that group" (Nyborg et al. 2016)
- E.g. diet variation across countries not only prices, income, and nutrition content; it appears that other forces, like norms, are involved.
- Important success factors: whether actions of others are observable —> example of recycling vs. use of antibiotics



## Examples common pool resources – what is on your mind?

• Discuss briefly with your neighbour

## Examples

Over-usage of antibiotics



Gains in livestock and treating

common illnesses

# RAPA.

#### Long-term:

Evolution of antibiotic resistant bacteria which threatens the entire population

Energy based on fossil fuels



#### Short-term:

Cheap energy for customers and profits for its owners

#### Long-term:

Pollution for thousands of years in the atmosphere From TEDEd video

## Examples

Littering



Purchase of bottled water



### Watering



#### Deforestation



#### Traffic jams



•••

# **Current challenges**

#### **Global commons**

- Most solutions and successful cases have been reported at local level What can be scaled up? How can we address climate change?
- Example: Transnational Corporations as 'Keystone Actors' in Marine Ecosystems (Österblom et al. 2015, 2017)

#### **Commodification of nature** - Payments for Ecosystem Services

- What are the consequences of introducing monetary
- incentives? Evidence of crowding out of intrinsic motivation, but evidence not conclusive yet

## Urban commons: loss of nature experiences -

will we care less in the future?

## In sum

- Tragedy of the commons painting the picture Hardin & Ostrom
- Short history From Tragedy to Drama of the commons
- Important definitions goods typology & property rights
- Solutions
- Examples of tragedies/drama
- Current challenges