Why doesn't the world just agree?

The sky is a **global commons**: every island's cut helps every island → each prefers the other to pay (**free riding**) → Games 1's dilemma, with countries for players and **no council above them** · a treaty works only if something **inside it** changes a payoff (Montreal's trade clause, a **club's tariff**). The lesson picks no side.

1 Two islands, one sky

Games 1, Micro 8

- Each island: **Cut** or **Don't** · a cut costs the cutter `6`, takes `4` off **each** island → alone `4 − 6 = −2` (other **+4**, free) · both `+2` each · nobody `0`
- **Best reply** = best move given the other's · circle it: Don't wins every time (`+4 > +2`, `0 > −2`) ⇒ **dominant strategy** ⇒ **Nash equilibrium** (nobody moves alone) = Don't / Don't **0 / 0** < +2 / +2 ⇒ **prisoner's dilemma**
- **Free riding** = the benefit of a cut you did not pay for · **global commons** = shared by every country, fenced by none (sky, high seas) · 10 islands: one cut → world `10 × 4 − 6 = 34`, cutter still **−2** (keeps a tenth) · real sky ≈ 195 countries
- Practice · cost `5`, gives `3` each: alone **−2** / **+3** · both **+1** · nobody **0** → ends 0 / 0 · 6 islands: all cut `6 × 3 − 5 = +13` each · five cut, sixth stays out `5 × 3 = +15` ⇒ free ride still pays **+2**

LESSON · CUT COSTS 6, GIVES 4 EACH

	Palmera Cut	Palmera Don't
Coralia Cut	+2 / +2	−2 / +4
Coralia Don't	+4 / −2	0 / 0

2 The reef's fixes, checked

Lesson 2

- Reef fixed by an **owner**, **Ostrom's rules**, tradable **quotas** → sky: no owner, no one to set a quota
- **Elinor Ostrom** (American, Nobel 2009) · her conditions vs the sky: boundaries × (a ton warms every island) · rules the users write ✓ (= a treaty) · users who watch each other ✓ (official smoke counts, satellites) · **penalties that bite** × ⇒ the hardest
- **Enforcement** = what makes breaking a rule cost more than keeping it · between countries nothing from above → built **into the deal** · Ostrom 2009: act at many levels ("polycentric")
- Practice · **one council can act**: town lake, bus smoke in its valley, mill river | **countries must agree**: high-seas tuna, CO_2, ozone layer → test: does the harm stay in one council's reach?

3 Real treaties

easy case · two designs

- **Montreal Protocol** (1987, 198 parties = every country + EU) → ozone-thinning chemicals (ozone layer = UV shield) ↓ ≈ **98%** by 2011 (UNEP, UN environment program) · easy case: **few factories** + **substitutes ready** + **trade clause** (Art. 4: no imports from outsiders 1990, no exports 1993) = a club before the word
- **Carbon** = hard case: coal, oil, gas ≈ **80%** of world energy (International Energy Agency, 2023), in every furnace, car, kitchen · science in one line: human influence has warmed the planet, "unequivocal" (IPCC, UN climate panel, 2021)
- **Kyoto** (1997, in force 2005): binding targets, **37** rich countries + EU, ≥ **5%** below 1990 over 2008-12, none for the rest · US signed, Senate never ratified, Canada left 2011 · the 36 met them; world kept rising | for: a number can be checked
- **Paris** (2015, in force 2016, 194 parties = countries + EU): every country its own pledge (**NDC**, nationally determined contribution), new every **5 years**, each a step beyond (ratchet) → warming "well below 2 °C" vs late 1800s · no court, no fine: pressure = published numbers | for: covers the whole sky

4 Climate club

change the table

- **Climate club** (William Nordhaus, American, Yale, Nobel 2018; *American Economic Review* 2015): members cut + trade freely + **tariff** (tax on imports) on outsiders · e.g. $25 carbon price, tariff ≈ 2%
- Outsider, other cuts: `4 − tariff` · `$1`: 3 > 2 → free ride still pays · `$3`: `1 < 2` ⇒ **Cut** = best reply to a club that cuts
- But Don't / Don't still an equilibrium (no club → no tariff) ⇒ **two equilibria** = **coordination game** (Games 3) → works once it exists; someone must found it · no sanctions → no stable large club (Nordhaus)
- Practice · stay out `3 − tariff` vs in the club `+1`: $2 → tie (1 = 1) · **$3** → 0 < 1 · chain: tariff → staying out costs → cutting pays more → outsider joins

CLUB TARIFF $3 · 4 − 3 = 1

	Palmera Cut	Palmera Don't
Coralia Cut	+2 / +2	−2 / +1
Coralia Don't	+1 / −2	0 / 0

Practice · Coralia stays out: 3 − tariff



5 So what

question 9

- **For clubs and border charges**: Montreal had one; without a cost to staying out, no large stable club · **against**: the member's own buyers pay part of a tariff (Trade 3), the poorest countries can least afford it, WTO (World Trade Organization) rules may not allow it (Trade 9) · EU **carbon border adjustment** since 1 Jan 2026 (reported, not judged)
- **Ten questions to ask about any green policy** (so far): **1** · What does the smoke really cost, and who pays that cost now? · **2** · Who owns the resource? · **3** · Does it cut where cutting is cheapest? · **4** · Price or quantity, and which mistake is worse here? · **5** · The cheap fix, the visible one, or the next invention? · **6** · Does it work at the peak, or only on the average day? · **7** · What is a dollar of damage in 2100 worth today, and at which discount rate? · **8** · Did the smoke really fall, or did it just move abroad? · **9** · **Who can free-ride on it, and what brings them in?**

Watch out: an **agreement ≠ enforcement** · a signature changes the table only if something inside it changes a **payoff** (a penalty, a trade clause, a published number) · "both cutting pays, so they will" ×: Don't is still each one's best reply · a bigger world makes the shared gain bigger, **not** the free ride smaller · university: "the stability of coalitions"