

Global Limits of Economic Growth

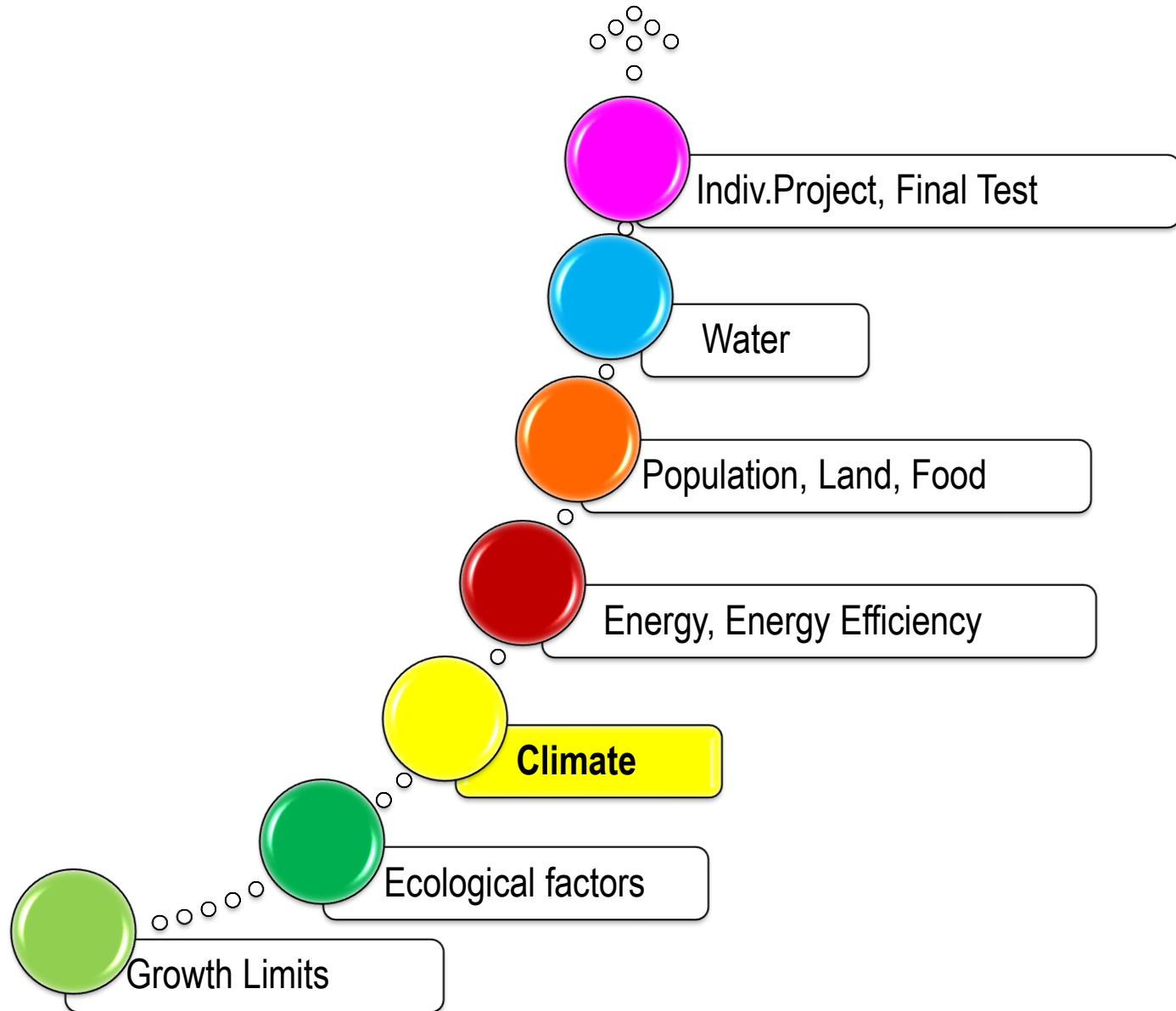
*Lomonosov Moscow State University,
Inter-Departmental Course, 2023-2024, Spring Fall*

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Course Route



Session 4

Global Climate Changes

Pre-Reading and Food-for-Thought Assignment

Pre-Reading and Food-for-Thought Assignment before Session 4 (March, 12)

INTERNATIONAL CLIMATE DOCUMENTS

1. **Paris Agreement:** <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
2. Explore **UN Sustainable Development Goals** related to climate (SDG13 and SGD7):
<https://sdgs.un.org/goals>

Think about:

How do the SDGs correlate between one another?

How do ideas of Paris Agreement correlate with SDGs on climate?

CLIMATE CHANGE_CARBON TAX

1. Read the abstract “Trade and Climate change” from the *World Development Report 2010*, World Bank, p.251-255

Think about:

What countries are supposed to pay most of carbon tax according to the article?

What countries are in favored position in terms of carbon tax?

What is your opinion about distribution of carbon tax among importing and exporting countries?

CLIMATE CHANGE_HOW INDUSTRIES ARE ADAPTING TO IT

Find information on **Climate strategies for companies/industries** of your interest.

Think about:

What do companies need climate strategies?

What companies are more climate sensitive?

Pre-Reading and Food-for-Thought Assignment

focus C

Trade and climate change

Extract from the World Development Report 2010, World Bank (2009)
/Reading Material for the Course "Global Limits of Economic Growth"/

The interaction between the international trade and climate change regimes has potentially major implications for developing countries. While there are positive reasons for exploring synergies between the two regimes and for aligning policies that could stimulate production, trade, and investment in cleaner technology options, instead much focus has been on using trade measures as sanctions in the global climate negotiations.

This focus on sanctions stems mainly from competitiveness concerns in countries that are now racing to reduce greenhouse gas emissions to meet Kyoto 2012 targets and beyond. These concerns have led to proposals for tariff or border tax adjustments to offset any adverse impact of capping carbon dioxide (CO₂) emissions. There is also a concern about "leakage" of carbon-intensive industries into countries that are not implementing the Kyoto Protocol.

The broad objective of bettering current and future human welfare is

mutually supporting objectives and the potential for synergies. While the implementation of the Kyoto Protocol may have brought to light some conflicts between economic growth and environmental protection, the objectives of the protocol also provide an opportunity for aligning development and energy policies in ways that could stimulate production, trade, and investment in cleaner technology options.

Recent attempts to bring together the two agendas have been received with a great deal of skepticism. While trade ministers meeting in 2007 at the

number of regional trade agreements (many of which include developing countries) now have elaborate environmental provisions. However, there is little evidence to show that they have contributed in any meaningful way to achieving positive environmental outcomes.³ Also, regional trade agreements may have limited value in addressing environmental issues that require global solutions, such as climate change.

New developments

The proposed use of punitive trade sanctions to support domestic climate action

Aims of Session 4. *Global Climate Changes*

1. To understand and interpret correctly **climate change manifestations** (continue from session 3)
2. To understand climate change consequences (continue from session 3)
3. To understand **world climate policy and potential of carbon taxing**
4. To calculate gaining from **CO2 trade**
5. To create a **climate change strategy draft** for a selected company

Plan of Session 4

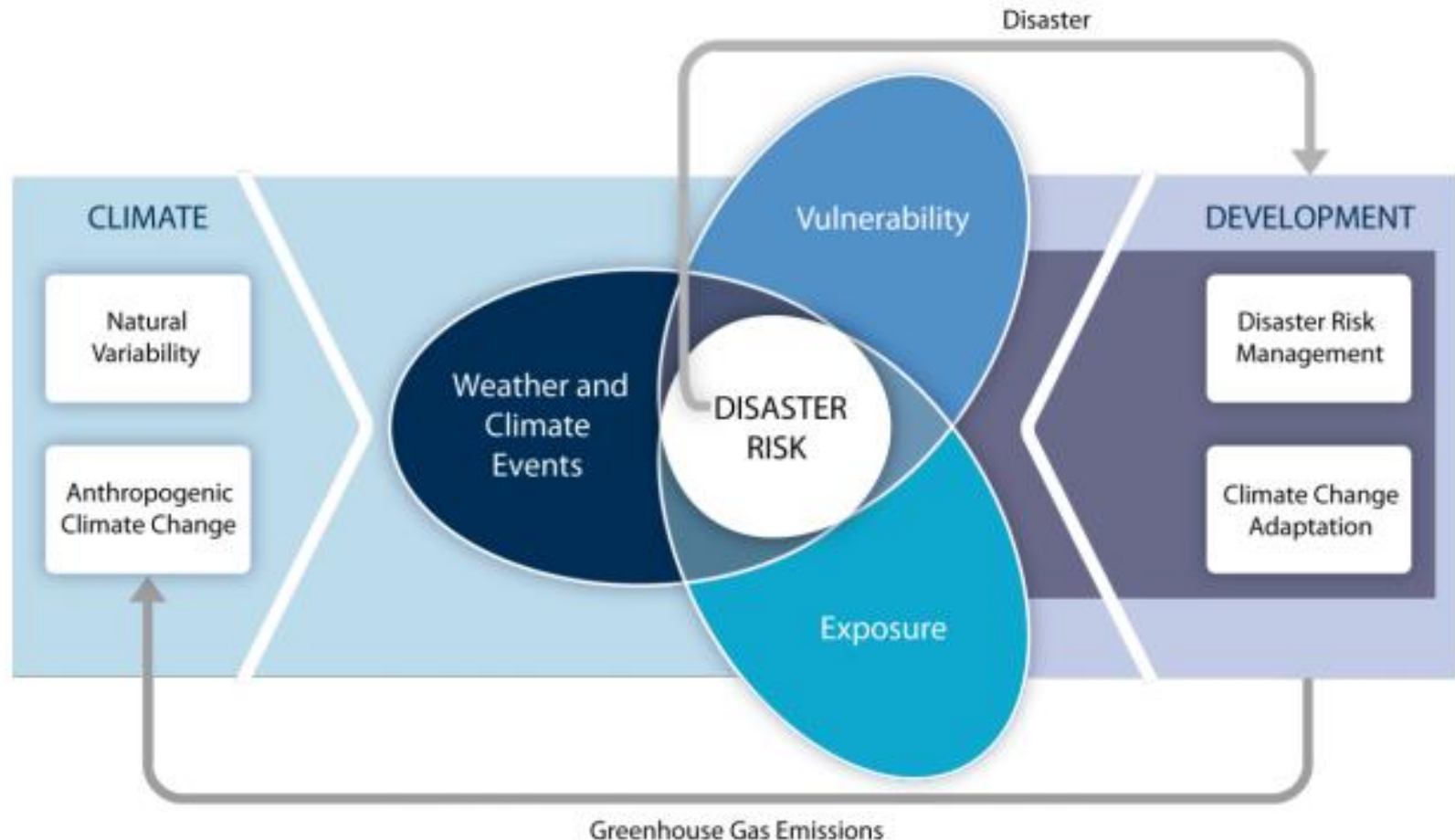
SESSION 4

1. Managing risks of climate change
2. International Agreements on Climate Change
 - Kyoto Agreement
 - Paris Agreement
3. Russian Climate Doctrine
4. Carbon Markets and their Mechanisms
5. Emission Trade Advantages
6. Climate Change Impacts on Business, Companies
Adaptation to Climate Change
 - Team-work on Climate Strategies for Different Companies
 - The use of AI in Climate Change Challenges



The IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation

Increasing vulnerability, exposure, or severity and frequency of climate events increases **disaster risk**



*Disaster risk management and climate change adaptation can influence the degree to which **extreme events translate into impacts and disasters***

Effective risk management and adaptation are tailored to **local** and **regional** needs and circumstances

- changes in climate extremes vary across regions
- each region has unique vulnerabilities and exposure to hazards
- effective risk management and adaptation address the factors contributing to exposure and vulnerability



Managing the risks: heat waves in Europe

National & international efforts

Risk Factors

- lack of access to cooling
- age
- pre-existing health problems
- poverty and isolation
- infrastructure



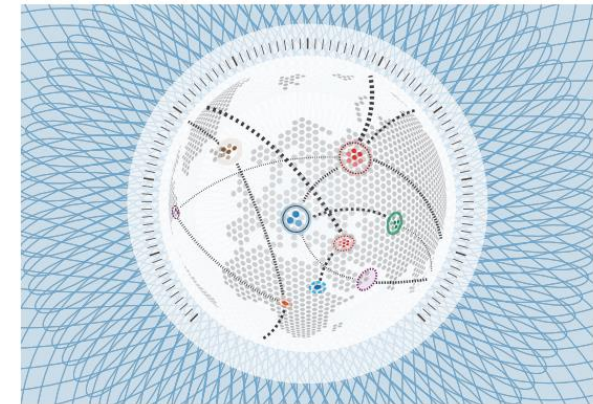
Risk Management/Adaptation

- cooling in public facilities
- warning systems
- social care networks
- urban green space
- changes in urban infrastructure

Projected: *likely* increase in heat wave frequency and *very likely* increase in warm days and nights across Europe

WEF: The Global Risks Report

The Global Risks Report 2017 12th Edition



◆
Economic
Risks

◆
Environmental
Risks

◆
Geopolitical
Risks

◆
Societal
Risks

◆
Technological
Risks

WEF: The Global Risks Report

Environmental Risks	Extreme weather events (e.g. floods, storms, etc.)	Major property, infrastructure and/or environmental damage as well as loss of human life caused by extreme weather events
	Failure of climate-change mitigation and adaptation	The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect populations and help businesses impacted by climate change to adapt
	Major biodiversity loss and ecosystem collapse (terrestrial or marine)	Irreversible consequences for the environment, resulting in severely depleted resources for humankind as well as industries
	Major natural disasters (e.g. earthquake, tsunami, volcanic eruption, geomagnetic storms)	Major property, infrastructure and/or environmental damage as well as loss of human life caused by geophysical disasters such as earthquakes, volcanic activity, landslides, tsunamis, or geomagnetic storms
	Man-made environmental damage and disasters (e.g. oil spills, radioactive contamination, etc.)	Failure to prevent major man-made damage and disasters, including environmental crime, causing harm to human lives and health, infrastructure, property, economic activity and the environment

The Global Risks Report 2024

19th Edition

INSIGHT REPORT

Global Risks Report 2024

Top 10 risks

"Please estimate the likely impact (severity) of the following risks over a 2-year and 10-year period."

2 years



10 years



Risk categories | Economic | Environmental | Geopolitical | Societal | Technological

Source: World Economic Forum Global Risks Perception Survey 2023-2024.

Climate Change as one of Structural Forces

This year, the Global Risks Report introduces the concept of structural forces to our analysis of global risks over the next decade. We define these as the long-term shift in the arrangement of, and relation between, the systemic elements of the global landscape. These forces have the potential to materially impact the speed, spread or scope of global risks, and will be influenced in turn by each other.

Climate change encompasses the range of possible trajectories of global warming and consequences to Earth systems.

Climate change is characterized as a systemic shift in this year's analysis because the threshold of 1.5°C above pre-industrial temperatures, specified in the 2015 Paris Agreement, is anticipated to be crossed by the early to mid-2030s.

However, global warming pathways will still be influenced by the speed at which decarbonization takes place, and deployment of climate solutions. Degradation of environmental systems could also accelerate estimated trajectories, to the extent that they “naturally” contribute to global warming and related effects (such as the reversal of carbon sinks).

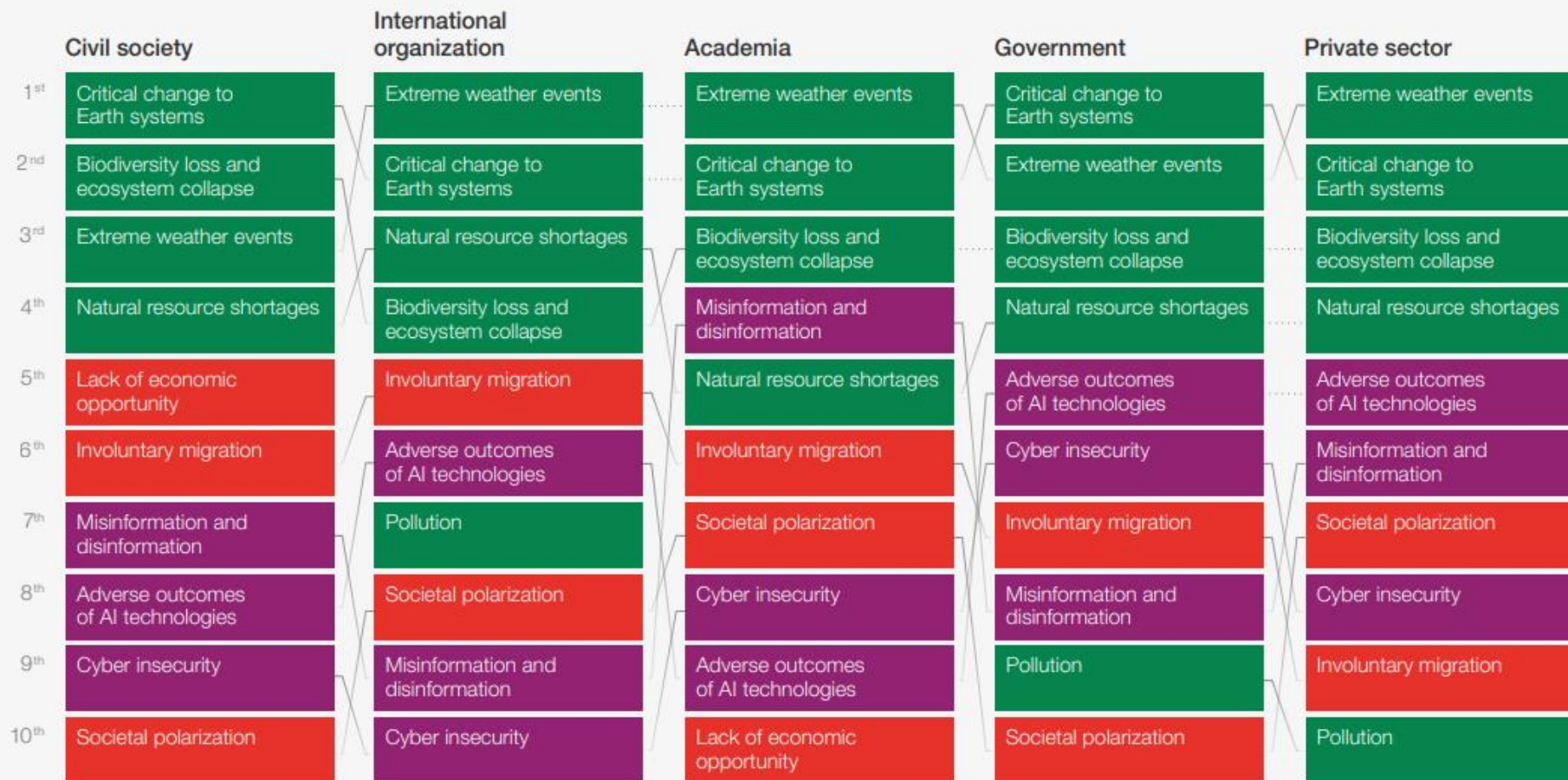
FIGURE 2.5 | Examples of global and regional tipping points



Source

McKay, et. al., 2022; OECD, 2022; Lenton, et. al., 2023.

FIGURE 2.3 | Severity by stakeholder over the long term (10 years)



Risk categories | Economic | Environmental | Geopolitical | Societal | Technological

Source
World Economic Forum Global Risks
Perception Survey 2023-2024.

International Agreements on Climate Change: Milestones

1979	<ul style="list-style-type: none">• 1-st World Conference on Climate<ul style="list-style-type: none">– first evidences of the anthropological impact on the climate
1988	<ul style="list-style-type: none">• Intergovernmental Panel on Climate Change (IPCC)<ul style="list-style-type: none">– 1990 – 1-st evaluation Report
1992	<ul style="list-style-type: none">• UN Framework Convention on Climate Change is approved (UNFCCC) on Rio-92<ul style="list-style-type: none">– The aim is to stabilize GHG concentration in the atmosphere on the level that would prevent dangerous anthropogenic impact on climate system– <u>COP – Conference of the Parties</u>, the main agency of UNFCCC, annually– <u>MOP – Meetings of the Parties</u>, the main agency of Kyoto protocol
1994	<ul style="list-style-type: none">• UNFCCC came into force<ul style="list-style-type: none">– Beginning of international talks on the reduction of GHG concentrations in the atmosphere after 2000

International Agreements on Climate Change: Milestones

1997	<ul style="list-style-type: none">• Kyoto Protocol is approved during 3-d COP<ul style="list-style-type: none">–Beginning of elaboration of the Kyoto mechanisms
2001	<ul style="list-style-type: none">• Bonn Accords, Marrakesh Accords – operational and financial mechanisms are developed• USA dropped out the Kyoto Protocol
2004	<ul style="list-style-type: none">• Russia ratified the Kyoto Protocol
2005	<ul style="list-style-type: none">• Kyoto Protocol came into force<ul style="list-style-type: none">– 55 countries of UNFCCC with min of 55% of the world GHG emissions ratified the protocol
2009	<ul style="list-style-type: none">• Copenhagen Agreement, COP-15/MOP-5
2012	<ul style="list-style-type: none">• The Kyoto protocol was amended to accommodate the second commitment period till Dec.,2020
2015	<ul style="list-style-type: none">• Paris Agreement, COP-21
2021	<ul style="list-style-type: none">• Glasgow, COP-26

Kyoto Protocol Initially

- Annex 1

- Countries that have taken special commitments about reducing GHG concentration according to UNFCCC
- Includes developed countries and some countries with the transition economies

- Annex 2

- Countries that have taken special financial commitments about reducing GHG concentration according to UNFCCC
- Includes only the most developed countries

- Adaptation Fund

- Financed from CDM, JP, etc.

Countries that signed Kyoto Protocol had to reduce their GHG emissions by at least 5% comparing to the levels of 1990 during the period of 2008-2012.

Kyoto Protocol participation map (Dec. 2011)



Brown = Countries that have signed and ratified the treaty
(Annex I & II countries in dark brown)

Blue = No intention to ratify at this stage.

Dark blue = Canada, which withdrew from the Protocol in December 2011.

Grey = no position taken or position unknown

Kyoto Protocol participation map

(commitment period: 2013-2020)



- Parties; Annex I & II countries with binding targets
- Parties; Developing countries without binding targets*
- States not Party to the Protocol
- Signatory country with no intention to ratify the treaty, with no binding targets^[1]
- Countries that have renounced the Protocol, with no binding targets^[2]
- Parties with no binding targets in the second period, which previously had targets^[3]

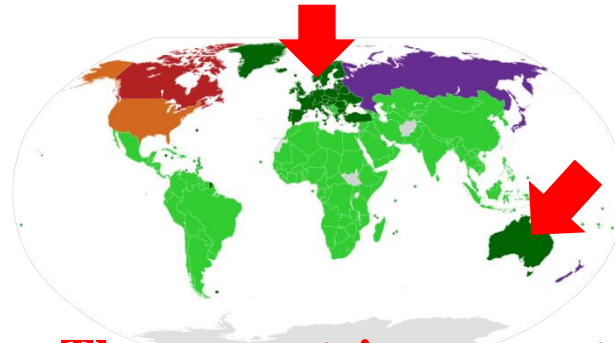
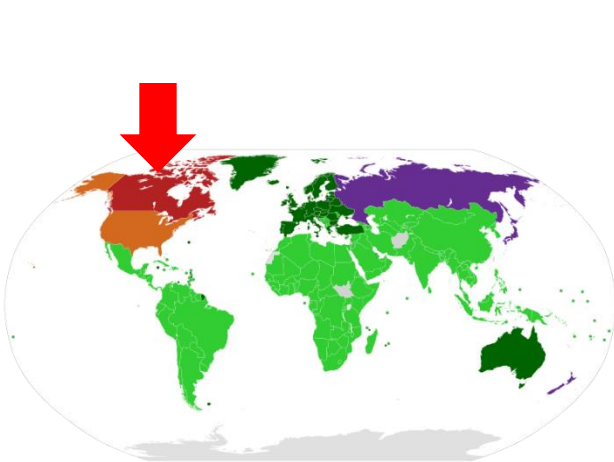
Kyoto Protocol participation map

(commitment period: 2013-2020)

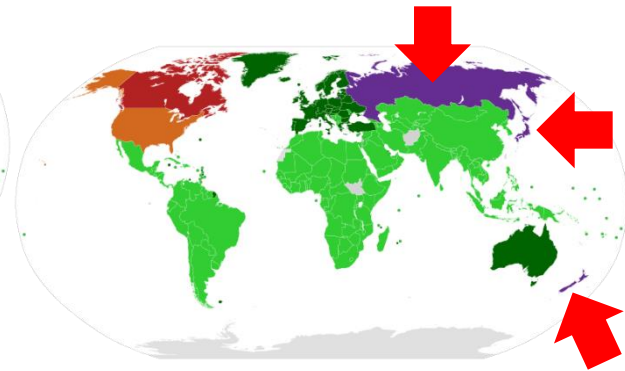
Developed countries without second-round targets are **Canada** (which withdrew from the Kyoto Protocol in 2012) and **the United States** (which has not ratified the Protocol).

The 37 countries with binding targets in the second commitment period are **Australia, all members of the European Union, Belarus, Croatia, Iceland, Norway, Switzerland, and Ukraine.**

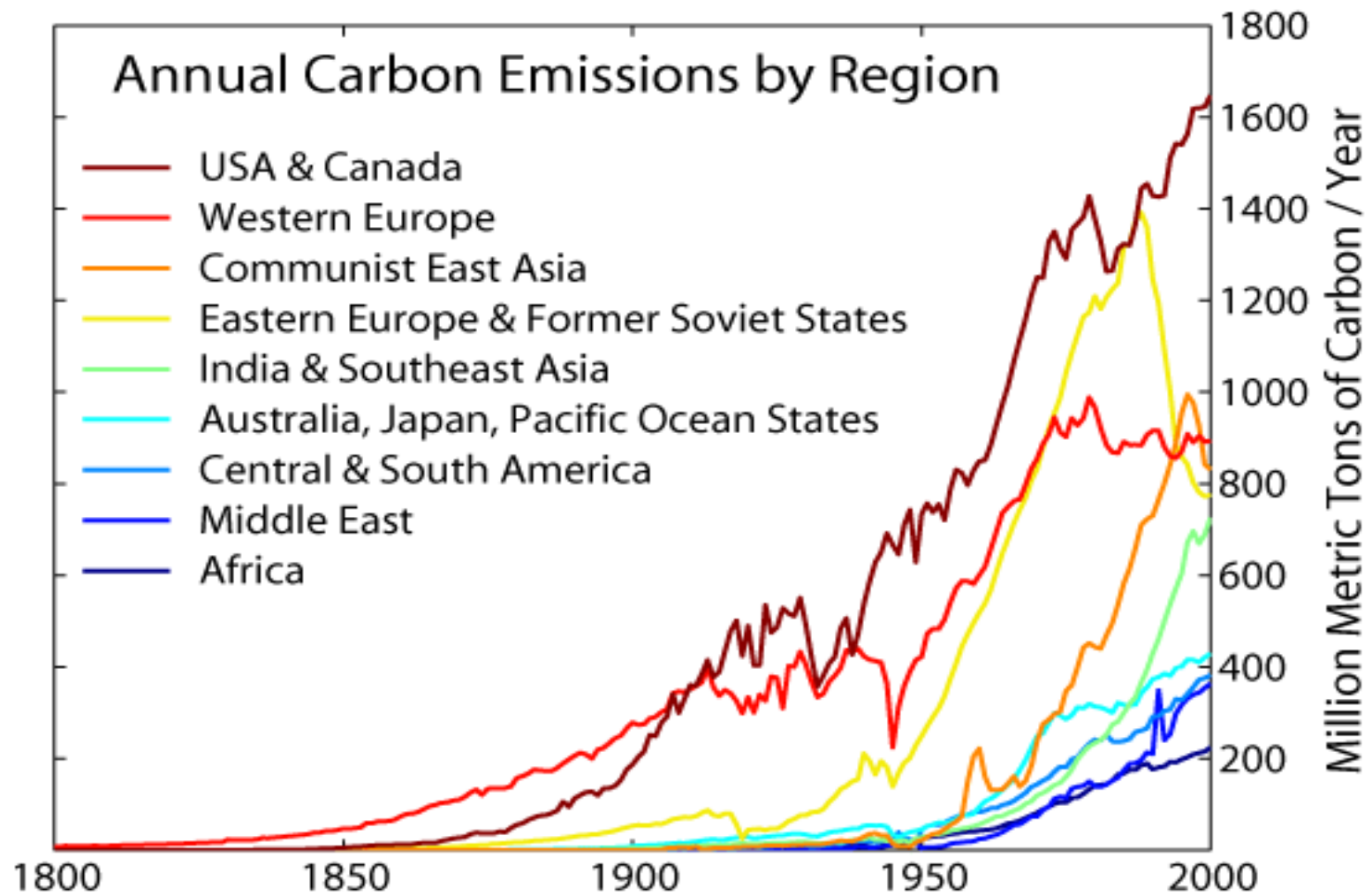
Japan, New Zealand, and Russia have participated in Kyoto's first-round but have not taken on new targets in the second commitment period.



These countries account only for 15% of GHG world emissions



Understanding the reason of “no intention to ratify”



WHAT IS THE PARIS AGREEMENT?

5 Key Elements of the Paris Agreement

Every 5
years countries
**STRENGTHEN
CLIMATE
ACTIONS**

ADAPTATION
is a central pillar
to help world's
most vulnerable

**LONG-TERM
GOAL**
to achieve net
zero emissions

**ENHANCED
TRANSPARENCY**
to ensure
commitments
are met

**CLIMATE
FINANCE**
to support
developing
countries

COP21: UN Climate Conference in Paris 2015

(29.11-11.12.2015)

- The agreement is supposed to keep the temperature rise within the 2°C compared to pre-industrial levels and try to stabilize it within 1.5°C.

*What kind of approach
is being used here?*

- Most countries in the world agreed on common goals to reduce emissions.
- The developed countries commit themselves to support developing assistance in the amount of up to \$ 100 million annually.
- Commitments of countries - participants of the agreement will be updated every five years since 2022.
- An important factor was the change in China and the US position, the world leaders in terms of emissions.

COP21 Major Outcomes of Paris Agreement in 2015

10,000 New Climate Initiatives

187

COUNTRIES
shared national
climate action plans

127+

MILLION HECTARES
of degraded land in Africa
and Latin America
to be restored

400+

**CITIES TO SET
TARGETS** that
could cut urban
emissions in half

\$1T

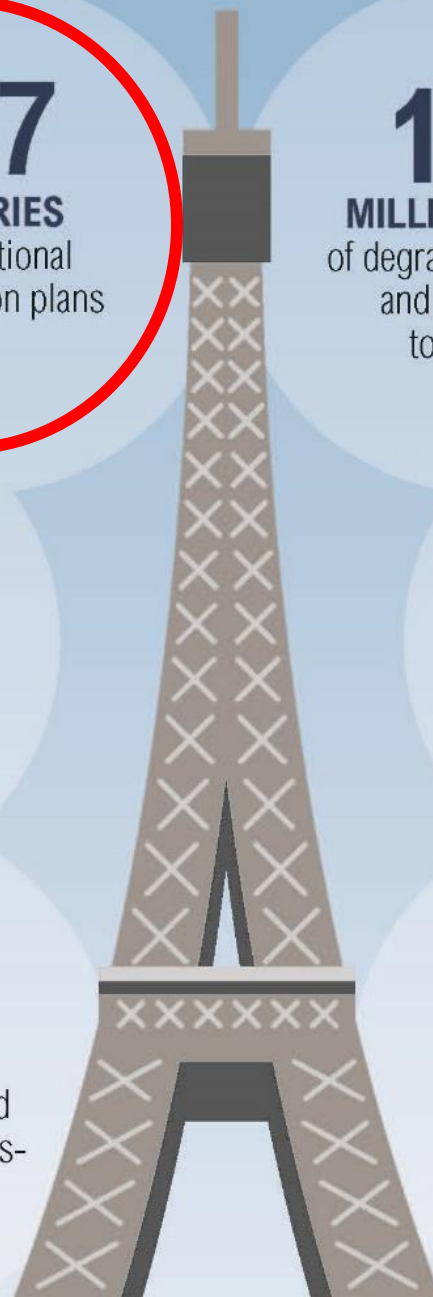
**IN SOLAR
INVESTMENTS**
to be mobilized by new
global alliance

114+

COMPANIES
will use Science Based
Targets to set emissions-
cutting goals

20

COUNTRIES
to double clean
energy R&D



UN Sustainable Development Goals related to climate

- SDG7 and SDG13

7 AFFORDABLE AND
CLEAN ENERGY



**ENSURE ACCESS TO AFFORDABLE, RELIABLE,
SUSTAINABLE AND MODERN ENERGY FOR ALL**

13 CLIMATE
ACTION



**TAKE URGENT ACTION TO COMBAT
CLIMATE CHANGE AND ITS IMPACTS**

Russian Policy on Climate Change

Effects of Climate Change on Russia

Negative effects:

-  Higher health risk for some population groups
-  Higher frequency, intensity and duration of droughts in some regions
-  Extreme precipitations, floods, excessively wet soil harmful to agriculture in some regions
-  Higher risk of fires in woodlands
-  Permafrost retreat dangerous to buildings and utility and communications lines in northern regions
-  Disruption of ecological balance
-  Competitive replacement of biological species
-  Spreading of infections and infestations
-  Higher energy consumption by air conditioners in summertime

Positive effects:

-  Less energy consumption during heating season
-  Better ice conditions, easier cargo transportation across Arctic seas and access to the Arctic shelf for development
-  Structural improvement and area expansion of plant cultivation
-  Increase in livestock breeding efficiency
-  Increase in boreal forest productivity

Goal of the Climate Doctrine of Russia:

To ensure the secure and sustained institutional, economic, ecological and social development of Russia between climate change and the related threats and challenges

The Climate Doctrine of 2023

- In total, the new doctrine contains 21 pages, five sections (general provisions; goals, basic principles and objectives of climate policy; geographical and other features of the Russian Federation in solving climate change problems; implementation of climate policy; subjects of implementation of such policy) and 70 points.
- Unlike the 2009 doctrine, the new document contains specific targets, including achieving carbon neutrality in Russia (a balance between anthropogenic greenhouse gas emissions and their absorption) by 2060.
- To achieve this goal, they use all possible and effective ways. They will rely on peaceful atom, hydropower, as well as environmentally friendly technologies in all areas of the economy.



Mechanisms of Carbon Markets

EMISSIONS TRADING AROUND THE WORLD

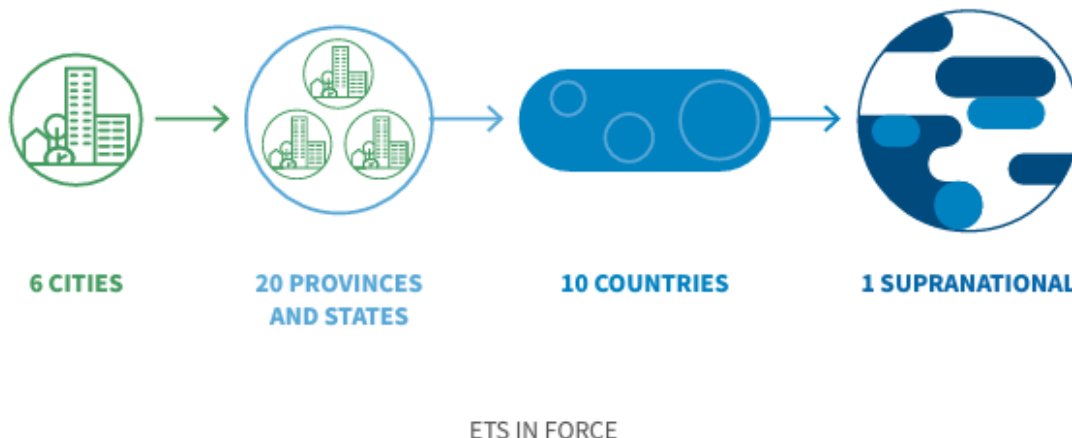
An emissions trading system (ETS) is a market-based instrument that can be used to reduce greenhouse gas (GHG) emissions. The government determines a limit (cap) on total emissions in one or more sectors of the economy and issues allowances according to this limit. Companies in these sectors need to hold one allowance for every tonne of emissions they release. They may receive these allowances for free from the government or buy them in auctions organized by the government. Emissions trading is spreading around the world as a key instrument to cost effectively decarbonize economies.

ALMOST 1/3 OF THE GLOBAL POPULATION LIVES UNDER AN ETS IN FORCE



Emissions trading is spreading around the world

The first major ETS for GHGs – the European Emissions Trading System (EU ETS) – was established in 2005. To date, there are 29 ETSs in force at the supranational, national, and subnational levels, with 20 more under development or consideration. Jurisdictions making up 55% of global GDP are using emissions trading. Emissions trading has emerged as a key instrument to cost effectively decarbonize economies.



Types of Carbon Markets

1. International

- Market in terms of Kyoto protocol (before 2020)
- EU Emissions Trading Scheme (is still the biggest carbon market today)

2. National

- Norway, UK, Australia, Japan

3. Regional

- Regional Greenhouse Gas Initiative
(internal USA market)

4. Corporative

- Chicago Climate Exchange in the USA, BP, Shell

5. Voluntary Markets

- Voluntary purchase of quotas by individual companies

REASONS FOR EMISSIONS TRADING

7 REASONS FOR EMISSIONS TRADING

An emissions trading system (ETS) is a market-based instrument that can be used to reduce greenhouse gas (GHG) emissions. The government determines a limit (cap) on total emissions in one or more sectors of the economy and issues allowances according to this limit. Companies in these sectors need to hold one allowance for every tonne of emissions they release. They may receive these allowances for free from the government or buy them in auctions organized by the government. Currently, there are 29 ETSs operating across five continents. But just what makes emissions trading such an attractive policy instrument?

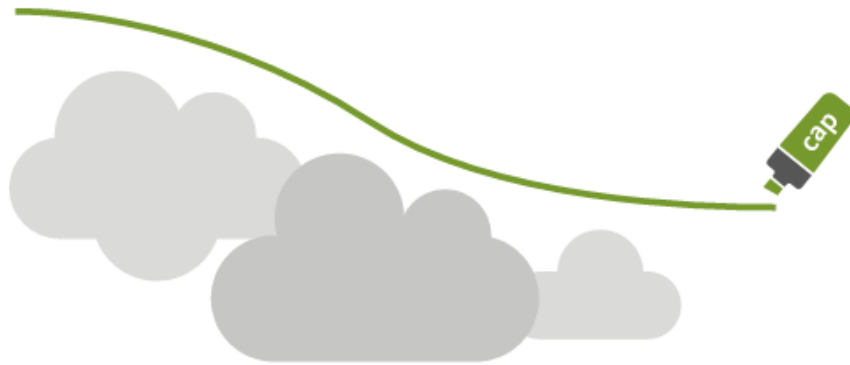


1. ETS sets a clear price on carbon

By creating a market for GHG emissions allowances, an ETS puts a clear price on carbon. This means that the costs to society caused by GHG emissions – such as negative effects on public health, damages linked to extreme weather events, or the impacts of climate change on natural ecosystems – are made visible and integrated into the price that people pay for their goods and services.



REASONS FOR EMISSIONS TRADING



2. ETS puts a firm limit on emissions

In an ETS, the government sets a clear emissions target, capping the maximum amount of emissions¹ that are allowed in selected sectors of the economy. This ensures that the desired environmental outcome will be reached. With a steadily declining cap, an ETS also delivers a predictable reduction pathway, which provides a long-term signal for businesses and investors.

3. Covered entities can choose how, when, and where to reduce emissions

An ETS offers covered entities an inherent level of flexibility regarding their compliance strategies. Depending on their technical, financial, and operational needs, covered entities can choose how they wish to comply. Options typically include: reducing emissions in-house; buying extra allowances from other participants or through auctions; making use of banked allowances; or using offset credits from certain projects.



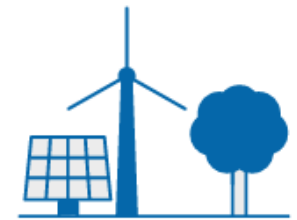
REDUCE EMISSIONS



BUY EXTRA ALLOWANCES



BANK ALLOWANCES



USE OFFSET CREDITS

¹ Intensity-based ETSs impose a limit on the maximum amount of emissions per unit of output.

REASONS FOR EMISSIONS TRADING

4. ETS fits a variety of economic and political contexts

ETSs can be tailored to suit a wide variety of economic and political contexts. There is no one-size-fits-all approach. Systems are currently operating in a range of jurisdictions covering individual cities, states, provinces, countries, and regions, with the design of each system adapted to the implementing jurisdiction's unique economic and governance profile.



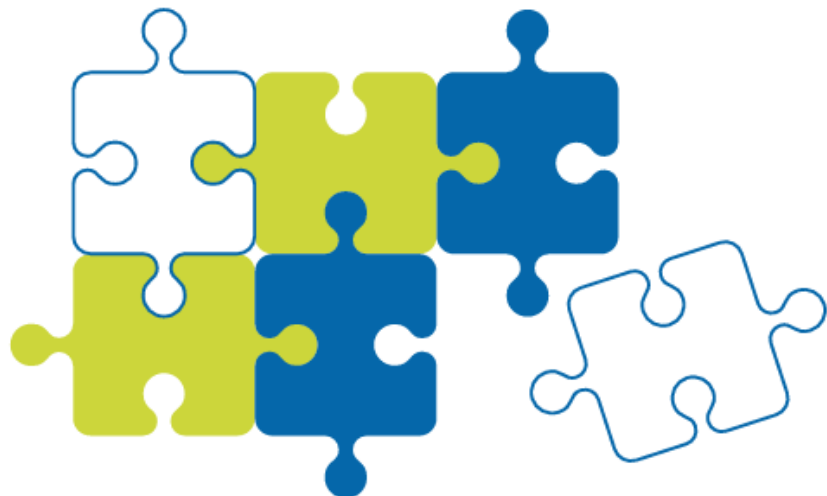
5. ETS can provide an additional source of revenue for the government

ETSs can generate revenues from auctioning allowances. These additional resources are typically collected by the government and can be used in several ways, including supporting climate action beyond the boundaries of the ETS, mitigating the distributional effects of carbon pricing for vulnerable groups, and financing research and development of low-emissions technologies.

REASONS FOR EMISSIONS TRADING

6. Emissions trading provides a range of additional benefits

While the primary goal of emissions trading is to reduce emissions, a well-designed ETS can deliver substantial environmental, economic, and social co-benefits. These can include cleaner air, improving resource efficiency, ensuring energy security, fostering technology innovation, and creating jobs.




7. ETS can be linked to create a bigger, more efficient carbon market

‘Linking’ two or more systems creates a larger carbon market, which opens up more (and potentially cheaper) options to reduce emissions. When systems are linked directly, allowances can be used interchangeably for compliance in both systems (see also ICAP ETS Brief #4).

EU Emissions Trading System by 2026

Which industries will be most affected in Russia by EU cross-border carbon regulation?

Now:

- Steel and steel products
 - Aluminum
 - Nitrogen fertilizers
(app.1.2%)
 - Ammonia
 - Electricity
- 
- (app.8%)

After 2030:

- Oil and petroleum products
(app.60%)
- Coal (app.4%)

% in the export structure of carbon-intensive goods for Russia

Carbon Border Adjusting Mechanism

- **Carbon trade**
- **Reducing GHG emissions**
 - Producing less
 - Consuming less
- **Doing compensation projects**
 - Forest planting work
 - Using best available technologies
- **Green certificates**
 - International Renewable Energy Certificate (I-REC) is the internationally used standard to certify the renewable origin of electricity

Kyoto Flexibility Mechanisms on Carbon Market

1. Emission Trade

Example. Japan buys quotas from Russia

2. Joint Implementation Projects (JP)

Example. Country A replaces a coal-fired power plant with a more efficient combined heat and power plant in a country B

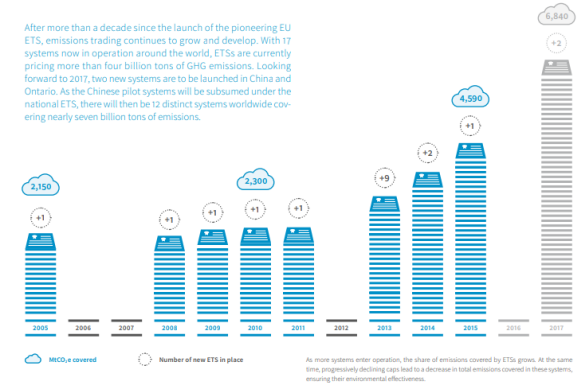
3. Clean Development Mechanisms (CDM)

Example. Japan makes investments in reducing emissions in Russia and receives extra quotas for it

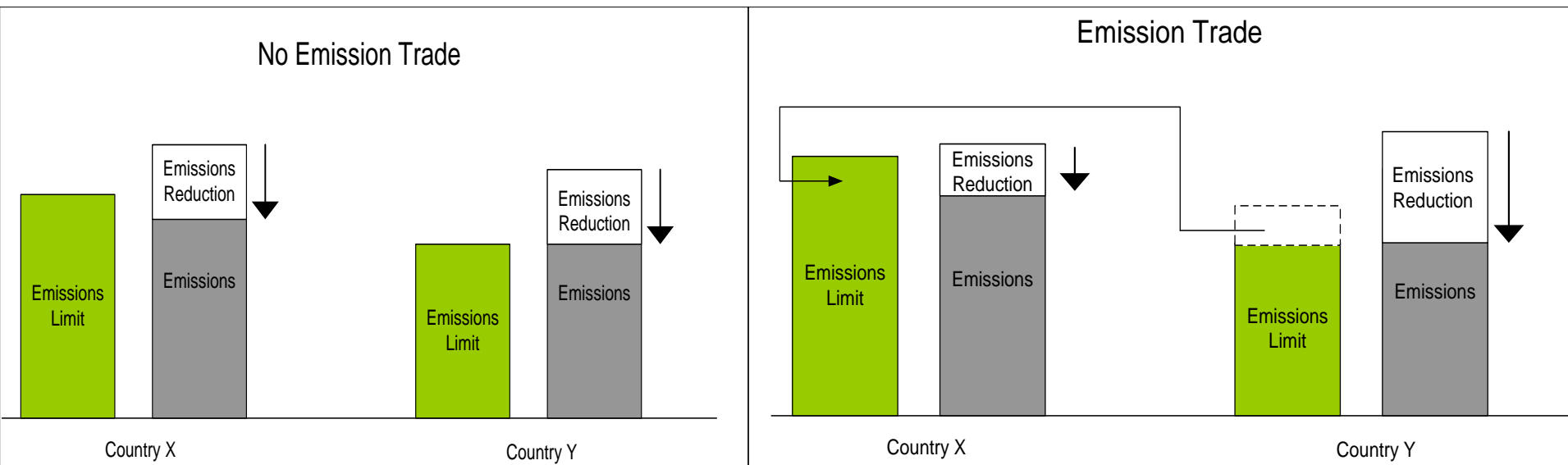
At a Glance

Global Trends in Emissions Trading

After more than a decade since the launch of the pioneering EU ETS, emissions trading continues to grow and develop. With 17 systems now in operation around the world, ETSs are currently pricing more than four billion tons of GHG emissions. Looking forward to 2017, two new systems are to be launched in China and Ontario. As the Chinese pilot systems will be subsumed under the national ETS, there will then be 12 distinct systems worldwide covering nearly seven billion tons of emissions.



Emission Trade Advantages



Emission Trade Advantages

	No Emission Trade			Emission Trade		
	Country X	Country Y	Total	Country X	Country Y	Total
Initial Emission Limits	10	8	18	10	8	18
Emission Trade	-	-	-	+1	-1	0
Emission Limits after Emission Trade	10	8	18	11	7	18
Emissions	12	10	22	12	10	22
Necessary Reduction	2	2	4	1	3	4
Price per ERU for this especially country	\$200	\$100	-	\$200	\$100	-
Total Cost of Reduction	\$400	\$200	\$600	\$200	\$300	\$500
Trade Price*	-	-	-	\$150	-\$150	0
Total Expenditures of Commitments Accomplishments	\$400	\$200	\$600	\$350	\$150	\$500

* Country Y has sold part of its permitted emission volume to the country X at the price of \$150.

Taxing Virtual Carbon

Average tariff on imports of goods and services if virtual carbon is taxed at \$50 a ton of CO₂ (percent)

		Importing countries										
Exporting countries		Brazil	Canada	China	EU15	India	Japan	Mexico	Russian Federation	United States	South Africa	Average
	Brazil	0.0	3.4	3.2	3.2	2.8	4.0	2.7	2.6	3.0	2.9	3.1
	Canada	4.5	0.0	3.4	3.4	3.7	3.2	2.8	2.8	2.6	3.0	2.8
	China	12.1	10.5	0.0	10.5	13.4	10.4	9.9	10.0	10.3	11.1	10.5
	EU15	1.6	1.1	1.1	0.0	1.3	1.2	1.1	1.1	1.2	1.2	1.2
	India	8.3	7.8	9.2	7.7	0.0	6.8	8.1	8.7	7.9	5.3	7.8
	Japan	1.4	1.3	1.5	1.4	1.6	0.0	1.4	1.4	1.2	1.3	1.4
	Mexico	3.5	2.1	4.2	4.0	10.8	4.0	0.0	4.1	1.7	3.5	2.1
	Russian Federation	18.0	14.3	12.4	11.8	12.8	11.3	14.7	0.0	10.4	15.9	11.7
	United States	3.3	3.0	3.1	3.1	3.3	3.0	2.8	2.8	0.0	3.2	3.0
	South Africa	15.9	10.1	10.6	9.8	11.5	11.4	16.6	7.9	8.9	0.0	10.1
	Average	3.7	2.9	2.2	5.0	4.5	4.8	3.3	2.6	3.0	2.9	

Source: Atkinson and others 2009.

Note: The last column is the trade-weighted average tariff faced by the exporting country; the last row is the trade-weighted average tariff applied by the importing country.

Companies Adaptation to Climate Change

Practical Exercise:

How can business survive in a changing climate?

1. How can climate changes influence different industries?
2. What exactly is being influenced?



Climate Change Impacts on Business

	Direct impact (business assets and inputs)	Indirect impact (demand-side effects)
General	<ul style="list-style-type: none">■ Changes in labor conditions■ Damage from natural disasters in affected regions	<ul style="list-style-type: none">■ Changes in total productivity of economy■ Economic shocks caused by natural disasters
Selective	<ul style="list-style-type: none">■ Assets and inputs of climate dependent industries (agriculture, forestry, tourism, etc.)	<ul style="list-style-type: none">■ Shifts in demand for selected goods and services (electric power, insurance, etc.)

Group Work

You are to develop main ideas for a **climate strategy of a company** selected. Consider effects of global warming on the assets and inputs of a company as well as demand-side effects, also consider company's geographical position. Fill in the table below.

DIRECT IMPACT (Business assets and inputs are affected)	INDIRECT IMPACT (Demand-side effects)
A. Description of the climate change impact itself on a company (considering there is global warming with its different regional manifestations)	
<i>Suggest here how business assets and inputs can be affected or benefited</i> 1.	<i>Suggest here what kind of demand-side effects can happen to a company</i> 1.
B. Description of steps a company should take to adapt// mitigate// avoid negative climate change OR contribute from positive climate change	
<i>Suggest here how business should react to affected or benefitted assets and inputs</i> 1. ...	<i>Suggest here what company can do with new demand-side effects, positive or negative ones</i> 1. ...

Suggestions of companies

- **Company «Mosenergo»** guaranties warm and energy generation in Moscow region. The pick demand for this generation usually is during cold seasons.
- **Trade network “X5 Retail Group”** counts for some thousands of trade centers (like “Pyaterochka”, “Perekrestok” and “Karusely”) in large regions of Russia distributing food stuff and domestic articles.
- **Company “Abrau-Durso”** is a Russian company specializing in the production of champagne and sparkling wine. The combination of a unique climate, soil composition, and the wind rose of the foothills of the Caucasus (southern Russia) is crucial for wine production.

How can AI instruments be useful in creating climate strategies?

- Creating a detailed prompt (example):
 - You are a consultant. You are developing climate adaptation and mitigation ideas for a company “Abrau-Durso”. It’s a Russian company specializing in the production of champagne and sparkling wine. The combination of a unique climate, soil composition, and the wind rose of the foothills of the Caucasus (southern Russia) is crucial for wine production. Present climate strategy ideas for this company: (1) describe the climate change impact of global warming on a company, (2) suggest steps a company should take to adapt, mitigate or avoid negative climate change, or even contribute from positive climate change.
 - Choose an AI (*in the example we used ChatGPT4, Gigachat, DeepSeek*)
 - Be in dialog with an AI (*we added “Put your suggestions in the form of a compact table”*), try to improve results received
 - Compare results received, make conclusion what AI was better in coping with this task
 - Test AI for other companies from the list suggested, make conclusions.

Okay, here's a climate strategy outline for Abrau-Durso, addressing both adaptation and mitigation, tailored to their specific situation and potential vulnerabilities:

Climate Strategy for Abrau-Durso: Navigating the Changing Landscape of Sparkling Wine Production

Executive Summary: Abrau-Durso, reliant on the precise interplay of climate, soil, and wind patterns for its quality sparkling wine production, faces significant risks from climate change. This strategy outlines potential impacts and provides actionable steps for adaptation and mitigation, transforming climate challenges into opportunities for innovation and leadership.

1. Climate Change Impact Assessment on Abrau-Durso:

- **Increased Temperatures:**
 - *Impact:* Accelerated ripening of grapes, potentially leading to higher sugar levels and lower acidity, which can compromise the delicate balance needed for high-quality sparkling wine. Changes in flavour profiles and aroma development could alter the characteristic *terroir* of Abrau-Durso wines.
 - *Specific Risk:* Early budding and flowering, making vines more vulnerable to late frosts. Longer growing seasons may also increase the risk of heat stress on vines and workers.
- **Changes in Precipitation Patterns:**
 - *Impact:* More frequent and intense droughts could stress vines, reduce yields, and affect grape quality. Conversely, increased rainfall or flooding during critical periods (e.g., flowering, harvest) could promote fungal diseases and dilute grape sugars, leading to lower-quality grapes.
 - *Specific Risk:* Increased variability in rainfall patterns makes water management more challenging and unpredictable.
- **Extreme Weather Events:**
 - *Impact:* Hailstorms, heatwaves, and sudden frosts can cause significant damage to vines and infrastructure, leading to substantial economic losses.

lower-quality grapes.

- *Specific Risk:* Increased variability in rainfall patterns makes water management more challenging and unpredictable.
- **Extreme Weather Events:**
 - *Impact:* Hailstorms, heatwaves, and sudden frosts can cause significant damage to vines and infrastructure, leading to substantial economic losses.
 - *Specific Risk:* Increased frequency and intensity of these events could disrupt production schedules and compromise grape quality.
- **Changes in Pest and Disease Pressure:**
 - *Impact:* Warmer temperatures and altered precipitation patterns can favour the spread of existing pests and diseases and introduce new ones, potentially requiring increased use of pesticides (counter to sustainable practices).
 - *Specific Risk:* Vineyards may become more susceptible to phylloxera, downy mildew, and other grapevine diseases.
- **Impact on water resources:**
 - *Impact:* Increased competition with local community

2. Adaptation Strategies for Abrau-Durso (Responding to Inevitable Changes):

- **Vineyard Management Practices:**
 - *Action: Climate-Resilient Grape Varieties:* Gradually introduce and trial grape varieties that are more heat-tolerant, drought-resistant, or disease-resistant while maintaining the desired flavour profiles. This requires careful experimentation and collaboration with viticultural researchers.
 - *Action: Rootstock Selection:* Use rootstocks that are better adapted to drought conditions and can improve water uptake.
 - *Action: Canopy Management:* Adjust pruning and canopy management techniques to provide more shade for the grapes, reducing heat stress and sunburn. Techniques like leaf removal timing, vine orientation and density should be adapted according to the changing climate.
 - *Action: Soil Management:* Improve soil health through organic matter additions, cover cropping, and reduced tillage to enhance water retention and reduce erosion.

- **Action: Water Management:** Implement efficient irrigation systems (e.g., drip irrigation) to minimize water use and target water delivery to the roots. Develop drought contingency plans for managing water scarcity.

- **Water Management optimization**

- **Action:** Develop a strategy to collect water, to recycle the used water. To invest into the optimization of the irrigation process.

- **Precision Viticulture:**

- **Action:** Employ sensor

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technologies, drones, and data analytics to monitor vineyard conditions (temperature, humidity, soil moisture) in real-time and make informed decisions about irrigation, fertilization, and pest control.

- **Infrastructure Adaptation:**

- **Action:** Invest in infrastructure improvements to protect against extreme weather events, such as hail nets, frost protection systems (e.g., wind machines, sprinklers), and improved drainage systems.

- **Harvest Management:**

- **Action:** Adjust harvest timing based on grape ripeness and sugar levels to maintain optimal acidity and flavour profiles. Consider night harvesting to avoid high temperatures.

- **Relocation (Long-Term):**

- **Action:** In the long term, investigate the feasibility of establishing vineyards in higher-altitude or more northerly regions within Russia that may become more suitable for grape growing as the climate changes. This requires careful site selection and investment in new infrastructure.

3. Mitigation Strategies for Abrau-Durso (Reducing Greenhouse Gas Emissions):

- **Energy Efficiency:**

- **Action:** Conduct energy audits and implement energy-efficient technologies in winery operations, including lighting, refrigeration, and bottling.

- **Action:** Invest in renewable energy sources, such as solar panels or wind turbines, to power winery operations.

- **Transportation:**

- **Action:** Optimize transportation routes and logistics to reduce fuel consumption.

- **Action:** Encourage the use of alternative fuels and electric vehicles for transportation of grapes, wine, and personnel.

- **Action:** Partner with distributors and retailers who prioritize sustainable transportation practices.

- **Packaging:**

- **Action:** Reduce the weight of glass bottles and explore alternative packaging materials, such as lighter-weight glass, recycled glass, or sustainably sourced cardboard.

- **Action:** Optimize bottle design to minimize material usage.

- **Action:** Promote the use of refillable bottles and recycling programs.

- **Carbon Sequestration:**

- **Action:** Implement soil management practices that enhance carbon sequestration, such as cover cropping and no-till farming.

- **Action:** Participate in carbon offset programs or invest in forestry projects that remove carbon dioxide from the atmosphere.

- **Sustainable Supply Chain:**

- **Action:** Partner with suppliers who share Abrau-Durso's commitment to sustainability and implement sustainable practices in their own operations.

- **Action:** Conduct life cycle assessments (LCAs) to identify and address the environmental impacts of the entire supply chain.

4. Positive Climate Change Contribution (Turning Challenge into Opportunity):

- **Marketing and Branding:**

- *Action:* Position Abrau-Durso as a leader in climate-smart winemaking and communicate the company's commitment to sustainability to consumers.
- *Action:* Develop marketing campaigns that highlight the company's environmental initiatives and promote the purchase of sustainably produced sparkling wine.

- **Collaboration and Knowledge Sharing:**

- *Action:* Partner with research institutions, universities, and other wineries to share knowledge and best practices on climate adaptation and mitigation.
- *Action:* Participate in industry initiatives and conferences to advocate for sustainable practices in the wine industry.

- **Ecotourism:**

- *Action:* Develop ecotourism activities that showcase Abrau-Durso's commitment to sustainability and provide visitors with an opportunity to learn about climate change and its impact on the wine industry.

- **Carbon-Neutral Certification:**

- *Action:* Strive to achieve carbon-neutral certification for its operations to showcase and prove carbon footprint reduction efforts.

5. Monitoring, Evaluation, and Reporting:

- *Action:* Establish a system for monitoring key climate-related indicators, such

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as temperature, precipitation, soil moisture, and grape quality.

- *Action:* Regularly evaluate the effectiveness of adaptation and mitigation strategies and make adjustments as needed.
- *Action:* Report on the company's climate performance to stakeholders, including employees, investors, and consumers. Transparency builds trust and accountability.

Key Success Factors:

- **Leadership Commitment:** Strong leadership commitment from the top of the organization is essential for driving climate action.
- **Stakeholder Engagement:** Engaging employees, suppliers, distributors, and consumers in the company's climate efforts is crucial for success.
- **Long-Term Vision:** A long-term vision that integrates sustainability into the core business strategy is necessary for navigating the challenges and opportunities of climate change.
- **Innovation and Experimentation:** Embrace innovation and experimentation to identify the most effective adaptation and mitigation strategies.
- **Collaboration and Knowledge Sharing:** Partner with research institutions, universities, and other wineries to share knowledge and best practices.

By implementing this comprehensive climate strategy, Abrau-Durso can protect its unique *terroir*, enhance its brand reputation, and contribute to a more sustainable future for the sparkling wine industry. Furthermore, it can turn a challenge into a strategic advantage, showcasing its resilience and commitment to quality in a changing world.

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Climate Change Impact	Adaptation/Mitigation Strategy
Rising temperatures affecting grape quality	Implement precision irrigation systems to conserve water. Use drought-resistant grape varieties.
Soil degradation due to extreme heat	Introduce cover crops to improve soil health. Invest in regenerative agriculture practices.
Increased risk of pests and diseases	Develop integrated pest management programs. Promote biodiversity to support natural predators.
Water scarcity	Install rainwater harvesting systems. Explore alternative water sources like desalination.
Fluctuating weather patterns	Enhance weather monitoring and forecasting capabilities. Diversify vineyard locations to spread risks.
Carbon footprint from production	Transition to renewable energy sources for winemaking. Optimize logistics to reduce transportation emissions.
Market demand shifts	Educate consumers about sustainable wine production. Position products as eco-friendly and climate-conscious.

Aspect	Climate Change Impact	Adaptation/Mitigation Strategies	Opportunities
Temperature Rise	Increased temperatures can alter grape ripening, affect flavor profiles, and reduce yields.	<ul style="list-style-type: none"> - Invest in heat-resistant grape varieties. - Adjust harvest timing. - Implement shade nets or cooling systems. 	<ul style="list-style-type: none"> - Experiment with new grape varieties suited to warmer climates. - Expand production of warm-climate wines.
Water Scarcity	Reduced water availability due to droughts and changing precipitation patterns.	<ul style="list-style-type: none"> - Adopt drip irrigation and water-efficient technologies. - Harvest and store rainwater. - Recycle water used in production. 	<ul style="list-style-type: none"> - Promote water stewardship as part of brand sustainability. - Develop drought-resistant vineyards.



Aspect	Climate Change Impact	Adaptation/Mitigation Strategies	Opportunities
Extreme Weather Events	Increased frequency of storms, hail, and frost can damage vineyards and disrupt production.	<ul style="list-style-type: none"> - Install weather monitoring systems. - Use hail nets and windbreaks. - Diversify vineyard locations. 	<ul style="list-style-type: none"> - Build resilience into the supply chain to ensure consistent production.
Soil Degradation	Changes in soil moisture and erosion due to irregular rainfall and temperature shifts.	<ul style="list-style-type: none"> - Implement soil conservation practices (e.g., cover crops, mulching). - Use organic fertilizers to improve soil health. 	<ul style="list-style-type: none"> - Market wines as sustainably produced with healthy soil practices.

Aspect	Climate Change Impact	Adaptation/Mitigation Strategies	Opportunities
Pests and Diseases	Warmer climates may increase the prevalence of pests and diseases.	<ul style="list-style-type: none"> - Integrate pest monitoring and biological control methods. - Use organic and biodynamic farming practices. 	<ul style="list-style-type: none"> - Differentiate products as organic or biodynamic to appeal to eco-conscious consumers.
Carbon Footprint	Company operations contribute to greenhouse gas emissions.	<ul style="list-style-type: none"> - Transition to renewable energy sources (e.g., solar panels). - Optimize logistics to reduce emissions. - Offset emissions through reforestation projects. 	<ul style="list-style-type: none"> - Market the brand as carbon-neutral or low-carbon to attract sustainability-minded customers.

Aspect	Climate Change Impact	Adaptation/Mitigation Strategies	Opportunities
Market and Consumer Trends	Growing consumer demand for sustainable and eco-friendly products.	<ul style="list-style-type: none"> - Certify vineyards as sustainable (e.g., ISO 14001, organic certifications). - Communicate sustainability efforts transparently. 	<ul style="list-style-type: none"> - Leverage sustainability as a competitive advantage in marketing and branding.
Positive Climate Shifts	Potential for longer growing seasons in some regions.	<ul style="list-style-type: none"> - Experiment with extended growing seasons to produce new wine varieties. - Expand vineyard areas if conditions improve. 	<ul style="list-style-type: none"> - Introduce innovative products tailored to new climate conditions.



Key Takeaways:

- **Adaptation:** Focus on vineyard resilience, water management, and pest control to maintain production quality and yields.
- **Mitigation:** Reduce the company's carbon footprint through renewable energy, efficient logistics, and sustainable practices.
- **Opportunities:** Leverage climate change to innovate products, enhance sustainability branding, and appeal to eco-conscious markets.



Промпт Стил

Create an image for a climate strategy of a wine producing company. There should be grapes, mountains and climate change.



Use AI,
but
be critical
to the results
obtained.



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