Course syllabus

Climate Change

March – July 2025

Term IX

Professor

Carrión Puelles, Naldi Susan

I. General course information

Subject:	**Climate Change**		
Pre-requisite:	100 credits	**Code:**	12279
Precedent:	None	**Semester:**	2025-1
Credits:	3	**Term:**	IX
Weekly Hours:	3	**Course type:**	On-Campus
Type Program(s):	Elective unit at Environmental Management Engineering	**Course Coordinator:**	Mayra Arauco Livia marauco@esan.edu.pe

II. Summary

This course provides students with a comprehensive and interdisciplinary understanding of climate change—its causes, mechanisms, global and regional impacts, and the responses formulated at personal, business, governmental, and international levels. Students will explore the physical science of climate systems and greenhouse gases, analyze vulnerability and risk frameworks, evaluate the role of human activities and economic sectors, and critically assess mitigation and adaptation strategies within a climate justice framework.

The course balances technical content (climate modeling, emissions accounting, policy analysis) with applied learning through three Real Situation Analyses (RSAs) and a Capstone Project focused on assessing the carbon footprint and resilience strategy of a real-world business or activity. Students will learn how global climate science intersects with local action, and how individual and institutional responses can shape sustainable futures.

III. Course Objectives

1. Understand the scientific foundations of climate change and its observable impacts on Earth's systems.
2. Analyze the drivers of anthropogenic climate change, including individual, industrial, and systemic contributors.
3. Evaluate regional and global vulnerability and risk using IPCC and NASA frameworks.
4. Examine national and international climate governance mechanisms, including NDCs and COP processes.
5. Apply technical tools to measure and compare carbon footprints at personal and organizational levels.
6. Design evidence-based mitigation and adaptation strategies in response to climate-related risks in the context of small and medium-sized enterprises.
7. Communicate climate information effectively using quantitative, qualitative, and visual methods.
8. Reflect critically on the social, political, and ethical dimensions of climate action.

IV. Learning Objectives

By the end of this course, students will be able to:

- Explain key scientific processes such as the greenhouse effect, the carbon cycle, and climate feedbacks.
- Interpret climate data from global sources (e.g., NASA GISTEMP, IPCC AR6).
- Identify and assess different types of climate risks (physical and transitional) and their implications for communities and businesses.
- Compare national climate commitments (NDCs) and analyze implementation challenges.
- Conduct carbon footprint assessments using digital tools and standardized protocols.
- Develop risk-informed climate strategies for real-world business activities.
- Understand the role of finance and governance in enabling or constraining climate action.
- Present findings and solutions through structured reports and public presentations.

V. Methodology

The course uses a problem-based, participatory learning model combining:

- Lectures to build theoretical and technical understanding.
- Case studies, simulations, and debates to develop critical thinking.
- Fieldwork-based projects (RSAs and Capstone) to connect classroom learning to real-world application.
- Digital tools and data platforms (e.g., GHG calculators, IPCC portals, NASA GISTEMP) for applied analysis.
- Collaborative learning through group research, presentations, and peer review.

Capstone fieldwork is carried out outside of class time, while classroom sessions offer methodological guidance, discussion framing, and expert feedback to support each stage of the project.

VI. Assessment

The Average Permanent Evaluation is calculated based on the student's learning process follow up: Reading Controls/ Quizzes / Cases/ Presentations / Research Work / Class Contribution. The weighted average of these marks results in the corresponding score.:

The evaluation system is comprehensive and continuous with the objective of promoting learning in the student. The final grade is composed of Continuous Evaluation (CA) (70%), and Final work report and presentation (30%).

The continuous evaluation average is based on the student's learning process follow up: In-Class Applied Activities, quizzes & Participation, Real Situation Analyses (RSA 1, 2, 3), Capstone deliverables 1, 2, 3 (progressive) and a Final evaluation (Capstone 4). Two graded quizzes will be administered; the lowest score will be dropped only if both are completed. Progressive fieldwork stages of the Capstone project focused on emissions mapping, risk assessment, and strategy design, detailed in the following table:

CONTINOUS ASSESSMENT AVERAGE (CAA) 70%		
Component	**Description**	**Weight (%)**
In-Class Applied Activities	Case studies, debates, simulations, and exercises.	15%
Quizzes & Participation	2 graded quizzes + active participation (lowest quiz dropped)	10%
Real Situation Analyses (RSA 1, 2, 3)	3 group reports + presentations.	20%
Capstone Deliverables 1, 2, 3 (progressive)	**Business carbon footprint & climate risk analysis stages**.	25%

The final exam will be the final Capstone project report and presentation, that would be held during the final week. This one will include linking previous capstone's deliverables with sustainable development goals (impacts and contributions) and outline developing strategies that could be proposed to improve the protected area territorial management.

Final Evaluation 30%		
Component	**Description**	**Weight**
Final Evaluation (Capstone 4)	**Final project report + final oral presentation (final exam)**	30%

The Final Grade (FG) is calculated using the following formula:

FA = (0,70 x CAA) + (0,30 x FP)

Where:
FA = Final Average
CAA = Continuous assessment average
FP = Final Project (Deriverable 4)

VII. Program Content

WEEK	CONTENT	ACTIVITIES / EVALUATION
INTRODUCTION TO CLIMATE CHANGE SCIENCE & LAUNCH OF RSA 1		
1° March 17 th to 22 th	◆ **Lecture:** • Course overview: RSAs, Capstone project, methodology • Weather vs. Climate + Greenhouse Effect + Climate system components. • Public preceptions of climate change globally and regionally (Ipsos & WHO studies)..	**Interactive Activities:** ◆ **Icebreaker:** Share your personal connection to climate change or Share a local event or experience you believe is related to climate change (pair-share) **Weather vs. Climate** Why do many people confuse weather events with long-term climate trends? How does confusing weather and climate affect public perception?

		What might this misunderstanding mean for business owners? **What's the Big Deal With a Few Degrees?** https://youtu.be/6cRCbgTA_78?si=sFUsWq5zK3c1fkCP ◆ **RSA 1 Workshop:** In teams, students design a survey (≥100 respondents) to explore: • Perceptions, engagement, and actions on climate change. • Teams define demographic variables (gender, age, urban/rural, country). Discuss survey distribution strategies (email, social media, etc.). • Link survey results to Capstone SME risk awareness ◆ **Discussion:** What could be the biggest barriers people face when acting on climate change? ◆ Assign **RSA 1 Fieldwork**: • Students must deploy their survey between Week 1 and Week 3 and collect ≥100 responses as a team.
GREENHOUSE GASES, CARBON CYCLE + RSA 1 SURVEY PROGRESS & DATA ANALYSIS PREP		
2° March 24th to 29th	◆ **Lecture:** • Carbon cycle (natural and anthropogenic). Natural sinks & human disruption (fossil fuels, land-use change) • Main GHGs (CO2, CH4, N2O) sources and Global Warming Potential (GWP). • Carbon Cycle disruptions due to fossil fuels, agriculture, deforestation. • Introduction to personal and business carbon footprints. • Carbon Budgets + tipping points (e.g., Arctic permafrost melt) • How perception data helps policymakers and businesses (tie back to Capstone mindset).	◆ **Interactive Activities:** • **Warm-Up:** Which GHG do you think is most responsible for climate change: CO2, Methane, or Nitrous Oxide? Which GHG has the highest warming potential per molecule? Brief discussion: Why do you think so? • **Group brainstorm:** Identify the main greenhouse gases and sources Which sectors contribute most to CO2 globally? • **Video:** **The Carbon Cycle -- Essential for Life on Earth** https://youtu.be/hgFpvDNfXOk?si=mj1u453JKRpKQVna **It's Climate Crunch Time. It's Time to Level Up** https://youtu.be/GWmVrlkmglQ?si=X6ByqetJXmW8MDQu https://www.unep.org/resources/emissions-gap-report-2024 • **Discussion:** How could deforestation impact the carbon cycle in Latin America? How could Peru's carbon cycle be affected by deforestation or mining? • **Applied Activity:** - What patterns or surprising results are you seeing in your survey responses so far? - **Review survey collection progress**: How many responses have you collected? Are there gaps (e.g., missing demographics like rural respondents)? - **Draft an analysis plan**: How will you disaggregate data? (Gender, age, urban/rural, etc.) What software/tools will you use? (Excel, Google Sheets, etc.) Start identifying categories and trends you expect to explore next week. **Instructor feedback** on survey data issues + guidance on structuring tables/visualizations.

		• **Discussion:** Why might different age groups or rural vs. urban communities perceive climate change differently? How can public perception influence SMEs' response to climate risks?
RSA 1 SURVEY RESULTS + PRESENTATIONS + CLIMATE DATA TRENDS & UNCERTAINTY		
3° March 31st to April 5th	◆ **RSA 1 Presentation:** • Each team presents their analysis + insights (including socio-demographic patterns presentations) ○ Survey analysis by demographics. ○ Insights into perception, involvement, and action trends. ○ Compare findings to global trends (e.g., Ipsos or WHO reports). • Peer feedback + instructor comments. ◆ **Lecture:** • Long-term climate trends (temperature, sea level rise, GHG concentrations) • Scientific uncertainty vs. misinformation • Historical climate data: ice cores, tree rings, satellite data. • Human vs. natural drivers: • CO2 trends since the Industrial Revolution. • Temperature anomalies and feedback loops. • **Mini-case**: Global warming trends in the Andean region. • Climate models & IPCC reports: Introduction to IPCC's role in climate data standardization • Data uncertainty + communication challenges (e.g., fake news). https://www.ipcc.ch/report/ar6/wg2/	◆ **Interactive Activities:** • **Discussion 1:** - How accurate is public understanding of climate change? - What trends did you notice while analyzing your survey responses? - What was the most surprising trend your survey showed? • **Discussion 2:** - Does local climate data align with the public perception you observed? - Why does the public often misinterpret uncertainty as unreliability? - Why is uncertainty not the same as doubt in scientific modeling? - How should businesses navigate public skepticism about climate change data? • Video https://www.ted.com/talks/lee_hotz_inside_an_antarctic_time_machine • Platform https://data.giss.nasa.gov/gistemp/ https://data.giss.nasa.gov/gistemp/graphs_v4/ ◆ **Applied Activity** • N**ASA GISTEMP Data Lab Activity**: - Students explore temperature anomaly trends globally and regionally. **NASA GISS Climate Data Mining** https://youtu.be/02TQUtXXLo4?si=GerfhYlhQ4CJqgow **Reading Zonal NASA GISS Temperature Data with RStudio** https://youtu.be/IZUHH4oy1M4?si=rZ_7B0IrtLf-ror0 - Compare **Regions vs. global trends** (last 50–100 years). - Create basic line graphs in Google Sheets. - Answer: Does the climate data for your selected region align with public perceptions from your RSA 1 survey?
CARBON FOOTPRINTING (PERSONAL + SME) + RSA 2 LAUNCH		
4° April 7 th to 12th	◆ **Lecture:** • Personal Carbon Footprint (transport, housing, food, consumption) • Carbon-emitting activities in Businesses (e.g., fuel consumption, electricity use). • Emissions classifications (direct/indirect, upstream/downstream). • GHG Protocol for Businesses:	◆ **Interactive Activities:** • **Discussion:** Which are the carbon 'hotspots' in your day-to-day life? Rank carbon-intensive activities (transport, food, electricity, waste). Why might Businesses underestimate Scope 3 emissions? How does national infrastructure (e.g., transport, energy mix) affect footprint size? ◆ **Exercises & Assignments:** • **RSA 2 Personal Carbon Footprint Calculation**: ○ Students calculate personal carbon footprints using:

	• Scopes 1 (direct emissions), 2 (energy-related), and 3 (value chain) • Common SME emissions categories (energy consumption, logistics, waste, etc.) • Introduction to business-related carbon accounting standards Footprint calculators and tools (e.g., ISO 14064, GHG Protocol). ◆ **Draft Presentations** • Each group **presents a short draft of their emissions map and classification**.	▪ **WWF Calculator** ▪ **GHG Protocol Individual tool** ○ Compare differences between platforms (methodologies, scopes). **Team Task**:In groups: ○ Start drafting RSA 2 report (compare team members' footprints). ○ Brainstorm factors affecting variations (e.g., rural/urban settings, income levels, infrastructure). ○ Compare personal footprints to Peru's national average. **Homework**: • Teams complete **RSA 2 group report outside class** (due Week 7). • **Capstone Launch**: ○ Select an SME a business or organization for fieldwork and emissions mapping (Capstone Deliverable 1) and plan data collection steps. -
CARBON ACCOUNTING TOOLS & SME EMISSIONS MAPPING		
5° April 14 th to 16th	◆ **Lecture:** • Deeper dive into GHG Protocol corporate standard. • SME-specific footprint mapping: • Scope 1 examples: fuel combustion, company vehicles. • Scope 2: electricity consumption. • Scope 3: waste, business travel, supply chain. • ISO 14064: Carbon reporting for organizations.	◆ **Interactive Activities:** • **Discussion:** What emission sources could your Capstone overlook? How would local energy sources (e.g., hydroelectric, thermal) influence emissions data? ◆ **Exercises & Assignments:** • **Capstone Deliverable 1 Prep:** In teams: - What emission sources could your Capstone SME overlook? - How would local energy sources (e.g., hydroelectric, thermal) influence emissions data?" - **Identify CO2-emitting activities in your selected SME/business.** - Classify as Scope 1 or 2 (direct/indirect emissions). - **Conduct field visits outside class (Week 6–7)** to gather emissions data for Capstone Deliverable 1. - Consider that is a short week due to national holidays
RSA 2 PRESENTATIONS + FIELDWORK COACHING		
6° April 21st to 26th	◆ **RSA 2 Presentations:** Groups present: • Comparative personal footprint analysis (team average vs. national average). • Discussion of influencing factors (infrastructure, policies, individual choices). • Early strategies to reduce footprints and challenges for implementation. • Teams provide feedback on each other's RSA 2 reports. ◆ **Lecture:** • Global examples of businesses' carbon footprinting. • Common barriers in emissions accounting (e.g., lack of monitoring, supply chain gaps).	◆ **Interactive Activities:** • **Discussion:** What's one challenge you faced in calculating your personal footprint? ◆ **Exercises & Assignments:** • What would be the main Scope 3 sources for a tourism SME in Peru? • **Capstone Deliverable 1 Prep:** In teams: - What data has been collected? - Are there gaps in Scope 1 or Scope 2 info? - Begin **refining emissions maps** based on field interviews and observations. - Discuss applicable national/international standards (e.g., ISO 14064).
GLOBAL GOVERNANCE + COP SIMULATION		

7° April 28th to May 3rd	◆ **Lecture:** • https://youtu.be/xN156DPnnao?si=KK-sk-ZB1LBYhvnf • UNFCCC structure and timeline: Rio Earth Summit → Kyoto Protocol → Paris Agreement. • COP structure: negotiation blocks (e.g., G77, EU, SIDS). • Role of non-state actors (NGOs, businesses, civil society). • Equity: Common but Differentiated Responsibilities (CBDR).	◆ **Interactive Activities:** • **Discussion 1:** What country do you think plays a leadership role in international climate policy? Historical responsibility in emissions (developed vs. developing nations). • **Discussion 2:** Why is it difficult for COP agreements to satisfy both developed and developing countries? ◆ **COP Negotiation Simulation** • Teams role-play country delegations with differing climate positions (e.g., Peru, EU, China, USA, Small Island State). • Simulate COP negotiations: • Agree on temperature goals (1.5°C/2°C), financial pledges, and emissions targets. • Each group presents a 3-min final "national statement.": • This simulation highlights equity debates in climate policy and exposes students to negotiation complexity at international levels. ◆ **Capstone Progress**: • Group review and feedback about processes
MIDTERM QUIZ + CAPSTONE DELIVERABLE 1 PRESENTATIONS		
8° May 5th to 10th	◆ **Midterm Quiz (60 minutes):** Short-answer & case-based questions: • Climate vs Weather • Carbon Cycle • Personal vs. business-level carbon footprinting. ◆ **Capstone Deliverable 1 Presentations:** • SME emissions map (Scope 1 and 2 sources). • Classification of emission types (direct/indirect). • Review of applicable carbon accounting standards (GHG Protocol, ISO 14064). • Challenges encountered during field data collection.	📌 **Deliverable:** Midterm presentation needs to be uploaded to our university platform and presented during class.
NDCS + RSA 3 LAUNCH + QUIZ 1		
9° May 12th to 17th	◆ **Lecture:** • Anatomy of an NDC (structure): mitigation, adaptation, and climate finance and technology transfer. How NDCs translate into national laws, incentives, and SME regulations (e.g., subsidies for energy efficiency, reporting requirements). • Peru's NDC vs. regional counterparts (e.g., Colombia, Brazil). • How NDCs link to Business-level policies ◆ **Quiz1**	◆ **Interactive Activities:** • **Discussion:** What is your country's most ambitious NDC targets? Are NDC targets sufficient to address businesses and communities needs in your country? ◆ **Discussion:** What do you expect will be the biggest gap in NDC implementation for your selected countries?. Do NDCs address SME challenges directly or indirectly? What role do national business associations have in NDC implementation? ◆ **Applied Activity – RSA 3 NDC Research Lab** • **Teams start RSA 3:** ○ Compare NDCs from countries represented in the group (home countries + Peru). ○ Identify mitigation & adaptation focus areas.

		○ Research NDC implementation gaps using UNFCCC and Climate Watch data ○ **Team Task**:In groups: ○ Start drafting RSA 3 report/presetnation ○ Brainstorm factors affecting variations. ○ Compare their progress. ○ Continue RSA 3 research outside class
CLIMATE CHANGE'S BUSINESSES FINANCE		
10° May 19th to 24th	◆ **Lecture:** • The Economic Costs of Climate Change: Short-Term and Long-Term. • How NDCs link to Business-level policies (e.g., subsidies for energy efficiency, reporting requirements). • Market-Based Solutions: Carbon Pricing, Emissions Trading, Carbon Taxes • The Role of Businesses: Corporate Social Responsibility and ESG • Financing Climate Action: Green Bonds, Climate Funds	◆ **Discussion:** • How might businesses be indirectly affected by COP decisions? • How do NDCs filter down into national business regulations? • What do you expect will be the biggest gap in NDC implementation for your selected countries?. • Do NDCs address business challenges directly or indirectly? • What role do national business associations have in NDC implementation? • Do international climate agreements influence small businesses?. • Why do SMEs rarely participate directly in international climate governance? ◆ **Applied Activity – RSA 3 Research Lab:** **RSA 3 Report Development**: • Teams compare NDCs for each group member's country. • Identify: • Mitigation targets • Adaptation measures • Implementation gaps
RSA 3 PRESENTATIONS + IPCC RISK FRAMEWORKS (GLOBAL & REGIONAL IMPACTS)		
11° May 26th to 31st	◆ **Lecture:** • IPCC's concept of risk: Hazard + Exposure + Vulnerability. • Global and regional risks overview • Latin America regional risks: - Amazon Basin (deforestation, droughts). - Andes (glacier retreat, water scarcity). - Coastal zones (flooding, fisheries decline). • Social and economic vulnerabilities • IPCC confidence levels and data challenges • IPCC WGII report structure and summary of key findings for Latin America. • (Amazon, Andes, coastal Peru): Major ecosystem risks: Amazon deforestation, biodiversity loss, desertification, ocean acidification • Social and economic risk: Impacts on health, water security, agriculture, and economic resilience.	◆ **Interactive Activities:** • **Discussion:** Which country you analyzed appears furthest behind in NDC implementation? Which regions are most vulnerable to climate change according to the IPCC? Which ecosystems are most exposed to climate risk in your region/country? Which sector is most at risk in your region/country due to climate change? Which business sector appear on the list of vulnerable sectors? What challenges would your country face in implementing its NDC across different sectors? What adaptation challenges would business face? **Comparative Analysis:** Students **compare Global North and Global South context?** How might businesses be exposed differently based on region (global north or south) or rural - urban locations? • **Video:** https://youtu.be/P393XGyzOew?si=ReePCbPPBfYVLGmq https://youtu.be/koc9O285W50?si=TonZ0aiF68oZ53ZR ◆ **Exercises & Assignments:** • **IPCC Report Introduction:**

	◆ **RSA 3 Presentations:** Each group presents: - Comparative NDCs across their selected countries. - Adaptation and mitigation strategies. - Evaluation of progress and gaps.	- Students explore the **IPCC AR6 Summary for Policymakers**. - In groups: Identify one key risk relevant to governments, businesses, communities (e.g., drought risk, infrastructure vulnerability). - Class discussion: How could these risks affect businesses in your country? (e.g., coffee producers, logistics, fishing cooperatives). - Create a brief SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) focused on that region or sector. - How would these risks impact businesses in that region?
SME RISK ASSESSMENT (CAPSTONE DELIVERABLE 2)		
12° June 2nd to 6th	◆ **Lecture:** • Businesses exposure to physical risks (e.g., floods, droughts) and transitional risks (e.g., regulatory shifts). • Tools for risk identification: - Risk matrices - Likelihood/impact grids - Value chain assessments. • Climate risk categories: • **Physical risks** (extreme weather, resource scarcity, water stress) • **Transitional risks** (carbon pricing, regulation, supply chain disruptions) • Risk scoring and prioritization (likelihood × impact matrix) • Business exposure and adaptive capacity: what makes SMEs vulnerable? • Examples from Peruvian or Latin American SMEs that have experienced climate-related disruptions.	◆ **Discussion:** Which is a bigger challenge for your selected business activity or SME: extreme weather or policy changes? How would you assess risk differently in a service-based SME vs. a resource-based one? What climate risks might be overlooked in your SME's operations? ◆ **Exercises & Assignments:** - Each team selects one region (Amazon, Andes, Coastal Peru) or an economic sector (e.g., smallholder agriculture, ecotourism). - Using the IPCC WGII Summary, they: Map **hazards**, **exposures**, and **vulnerabilities** for their chosen focus. Draft a mini "climate risk profile" tailored to that region or sector. ◆ **Applied Activity – Capstone Deliverable 2 Workshop:** • Teams begin developing a risk matrix for their Capstone SME by reviewing interview/observation data from the field • Identify key risks (e.g., fuel price volatility, water scarcity, supply chain interruptions). • Score risks by likelihood and potential business impact. • Prioritizes the top 2–3 risks • Teams will validate their risk assessment by interviewing their business / SME contact or reviewing additional data
MITIGATION STRATEGIES + CAPSTONE DELIVERABLE 2 PRESENTATIONS		
13° June 9th to 14th	◆ **Capstone Deliverable 2 Presentations:** - Present the SME's climate risk matrix. - Highlight the most critical risks and vulnerabilities. - Link risks to upcoming mitigation/adaptation strategies. ◆ **Lecture:** • **Mitigation Strategies for countries and Businesses** - Energy efficiency upgrades (lighting, machinery, transport). - Renewable energy integration (solar, hydro, hybrid). - Carbon Capture and Storage (CCS):	◆ **Discussion:** • Which mitigation actions do you think Businesses in Peru / Your country prioritize most: energy efficiency, renewable energy, or offsets? • What makes a mitigation strategy feasible or unrealistic? • Which mitigation strategy is most realistic for your Capstone SME? • What might prevent SMEs from adopting available mitigation solutions • Is CCS viable for small and medium enterprises, or only for heavy industries? ◆ **Applied Activity – Capstone Mitigation Strategy Mapping** • Teams draft preliminary mitigation strategies: ○ Identify feasible technologies ○ Estimate emissions reduction potential (qualitative or % estimate) ○ Identify resource and finance needs

	- Low-carbon supply chains & circular economy. ◆ **Quiz 2**	
ADAPTATION STRATEGIES + CIRCULAR ECONOMY CONCEPTS		
14° June 16th to 21st	◆ **Lecture: Adaptation Planning + Circular Economy** • **Countries and Business/SME adaptation strategies:** - Physical protection (e.g., flood defenses, drought-resilient crops). - Diversifying products/services. - Community resilience building - Financial resilience (insurance, diversification). • Introduction to **Circular Economy** for adaptation: • Reduce–Reuse–Recycle models • Lifecycle analysis in SME production	◆ **Discussion:** • What's harder for SMEs—reducing emissions or adapting to changing climate risks? • Rank most feasible SME adaptations (e.g., diversify supply chain, improve infrastructure, invest in insurance). • Which adaptation tools are viable in rural or under-resourced areas? • Can circular principles help SMEs reduce both risks and costs? • Which adaptation tools are viable in rural or under-resourced areas? • Can circular principles help SMEs reduce both risks and costs? ◆ **Interactive Activities:** **Deliverable 3:** • Teams finalize their Deliverable 3: • Integrate risk matrix • Develop mitigation + adaptation action plans • Add at least one circular economy measure
CAPSTONE DELIVERABLE 3 PRESENTATIONS + CLIMATE-SMART SOLUTIONS + SUSTAINABLE BUSINESS MODELS		
15° June 23rd to 28th	◆ **Lecture: Adaptation Techniques:** • Climate-Smart Agriculture • Technologies in adaptation: low-cost water efficiency, weather-resilient design • Business Model Frameworks • **Capstone Deliverable 3 group presentations**: - mitigation/adaptation strategies. - Climate finance recommendation	◆ **Interactive Activities:** **Deliverable 4:** • Teams finalize their Deliverable 4: • SME emissions map • Risk matrix • Mitigation & adaptation strategy • Transparency, certification, and ESG reporting trends. • Climate finance recommendation • SDG and NDC's alignment
FINAL CAPSTONE PRESENTATIONS + COURSE WRAP-UP		
16° June 30th to July 5th	◆ **Deliverable 4 Presentations** • SME emissions map • Risk matrix • Mitigation & adaptation strategy • Transparency, certification, and ESG reporting trends. • Climate finance recommendation • SDG and NDC's alignment -	◆ **Discussion:** What climate messages might resonate best with your SME's key stakeholders? What would be an example of a greenwashing risk for your Capstone SME? What trends did we notice across multiple SMEs? How will you apply carbon management, risk assessment, or climate adaptation in your future roles? Small group discussions on **personal takeaways** from the course. what worked well, and what could be improved next semester

VIII. Bibliography

- Andrew E. Dessler (2015). Introduction to Modern Climate Change - Cambridge University Press.
- Berkhout F. (2021). Simply Climate Change

Below are several sources of possible reading that complement the course. They are not intended to be exhaustive.

- Dryzek, Norgaard & Schlosberg (2013). Climate Challenged Society. OUP.
- Lovejoy & Hannah (2019). Biodiversity and Climate Change
- Mathez & Smerdon (2018). Climate Change: The Science of Global Warming and Our Energy Future.
- Mathez & Smerdon (2018). Climate Change in Human History: Prehistory to the Present.
- **IPCC (2023).** *AR6 Synthesis Report – Summary for Policymakers.* https://www.ipcc.ch/ar6-syr/
- NASA GISS. (2023). *GISTEMP Surface Temperature Analysis*. Retrieved from https://data.giss.nasa.gov/gistemp
- NASA Climate. (2021). *Using GISTEMP: Global Temperature Anomalies Over Time* [YouTube Video]. https://youtu.be/IeWY1sq9WjU

Digital Platforms and Eucational Tools

- **Climate Watch Data Platform:** https://www.climatewatchdata.org
- **GHG Protocol Scope Definitions & Tools:** https://ghgprotocol.org/scope-1-and-scope-2
- Video Platforms & Engfagement tools: Youtube & Mentimeter. (for real-time polls, reflections, and discussions)

IX. Lecturer

Carrión Puelles Naldi ncarrion@esan.edu.pe