جامعة الملك فهد للبترول والمعادن
King Fahd University of Petroleum & Minerals

ME 441: Energy and the Environment

Chapter 1:

Energy Basics

Dr. Mohamed Elsamadony

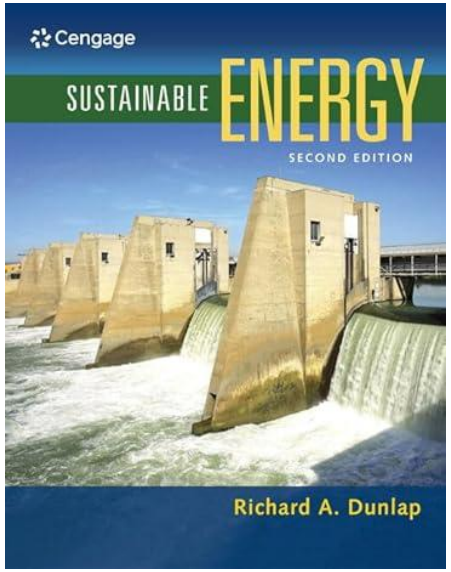
Mohamed.elsamadony@kfupm.edu.sa

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Learning Objectives:

The relationship between energy and power.
The forms of energy.
The laws of thermodynamics.
Heat engines and their Carnot efficiency.
Heat pumps and their coefficient of performance.
How electricity is generated and distributed.

Introduction



Textbook: Sustainable Energy,
Authors: Richard A. Dunlap
Publisher: Cengage Learning; 2nd ed. edition

Office Hours: [11:00AM – 12:00 PM (UT)] or *by appointment*

Introduction

Course Breakdown (*Approximate*)

Topics
Chapter 1: Energy Basics
Chapter 2: Global Warming and Climate Change
Chapter 3: Case Studies in Design for Environment
Chapter 4: Environmental Impact Assessment
Chapter 5: Introduction to Renewable Energies
Chapter 6: Mitigation Strategies

Introduction

Course Evaluation:

Assessment task	Week Due	% Total Assessment Score
Major Exam	8	25
Assignments	1-14	5
Quizzes	1-14	10
Attendance	1-15	5
Project	15	20
Final Exam	15	35

Notes:

- ***Attendance*** in the class will be strictly observed.

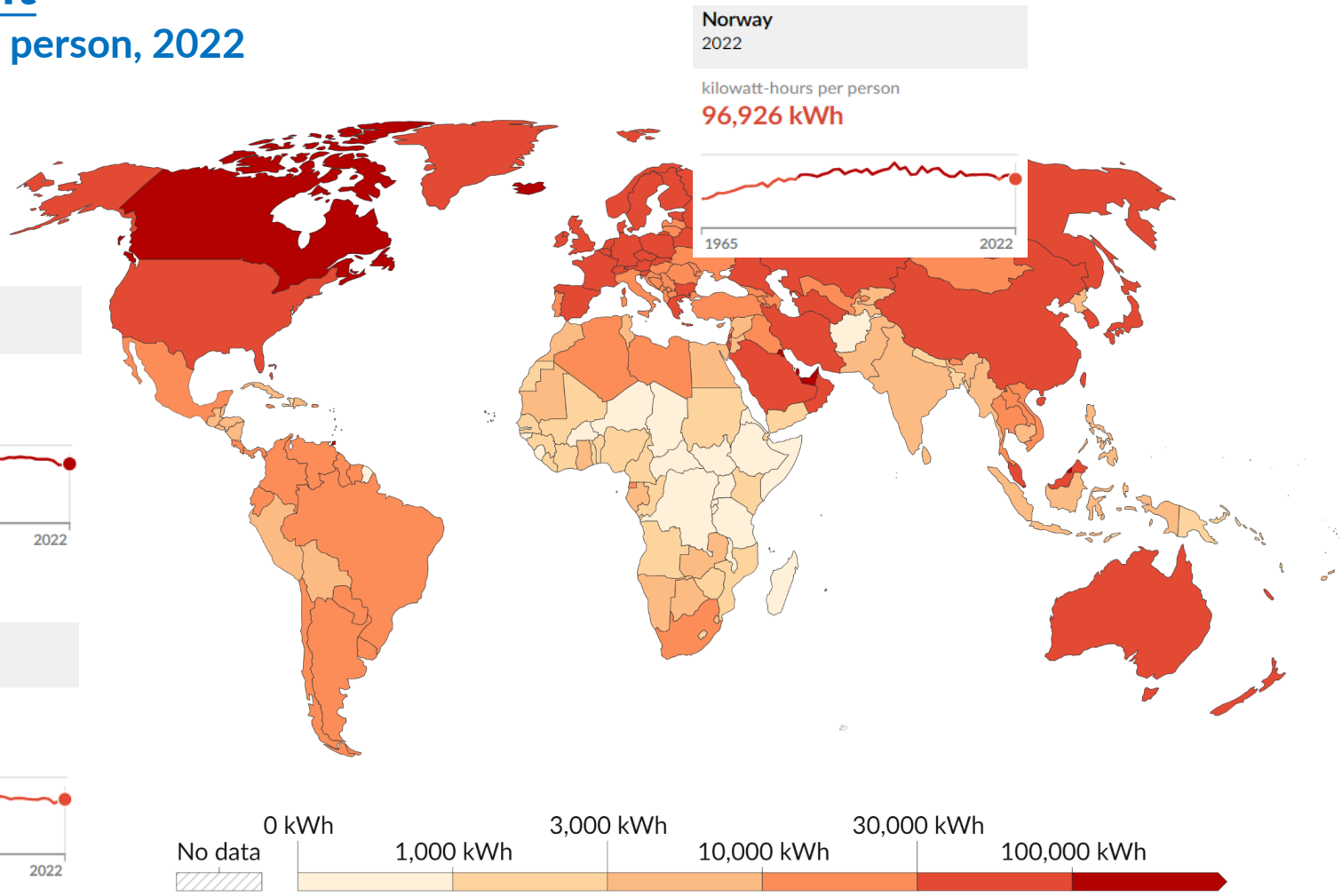
In case of an unexcused absence, 0.5 mark for each absence may be deducted from the final grade.

- A **DN grade** may be immediately reported for ***NINE (9)*** *unexcused absences*.
- A **DN grade** may be immediately reported if *both unexcused and excused absences reach* ***FIFTEEN (15)*** *absences*.

Introduction

Data Insight

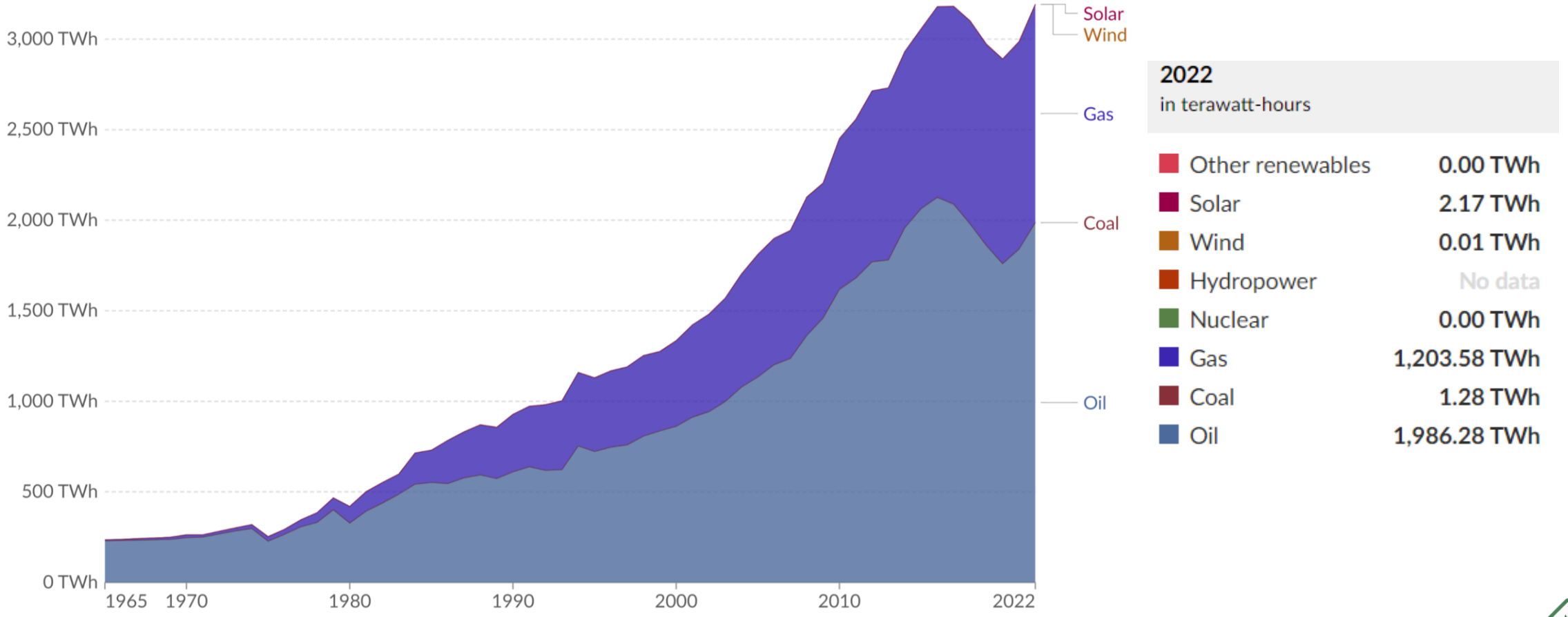
Energy use per person, 2022



Introduction

Data Insight

Energy consumption by source, Saudi Arabia

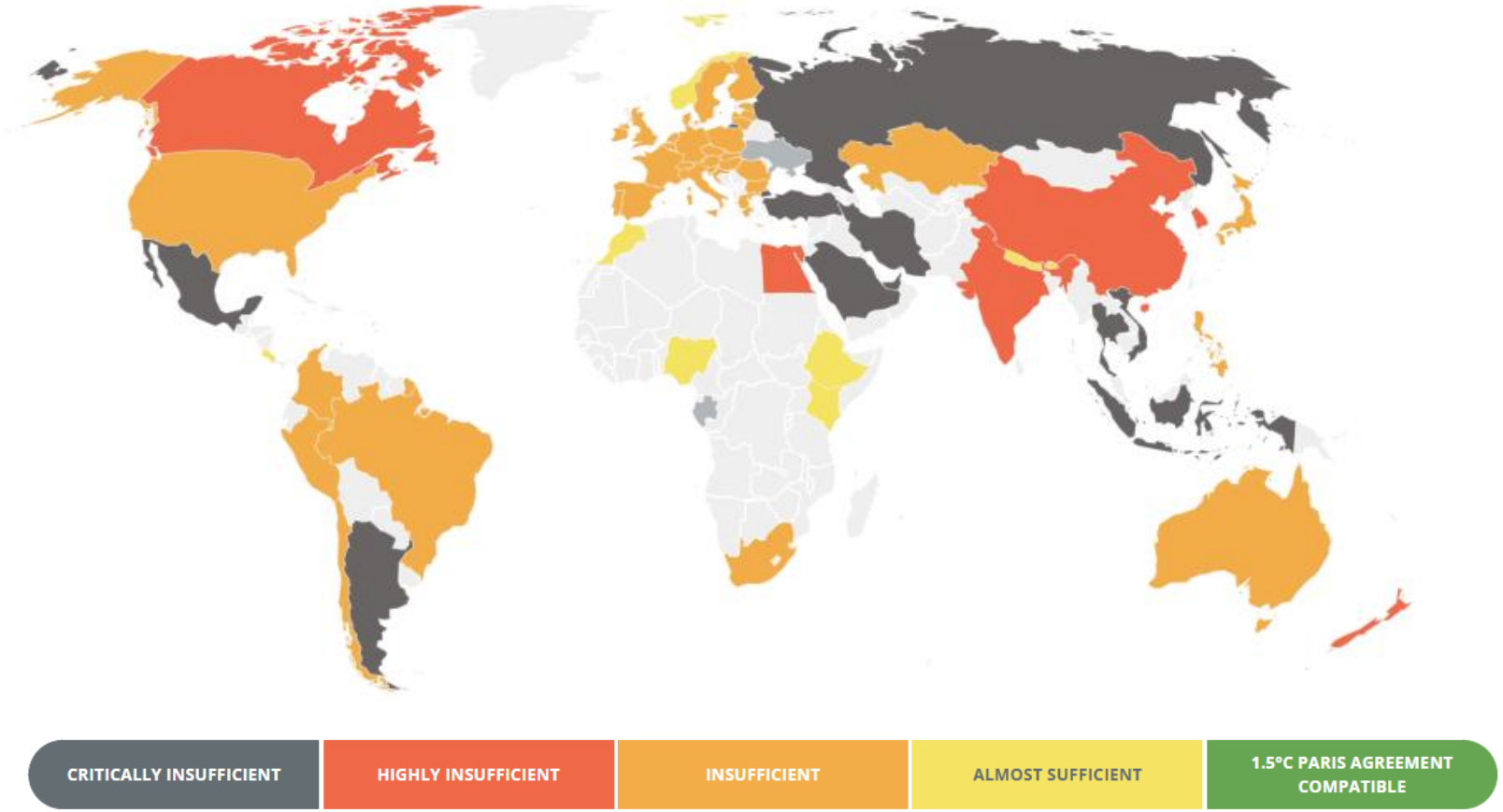


Introduction

Data Insight

Climate Action Tracker (CAT)

Climate Action Tracker

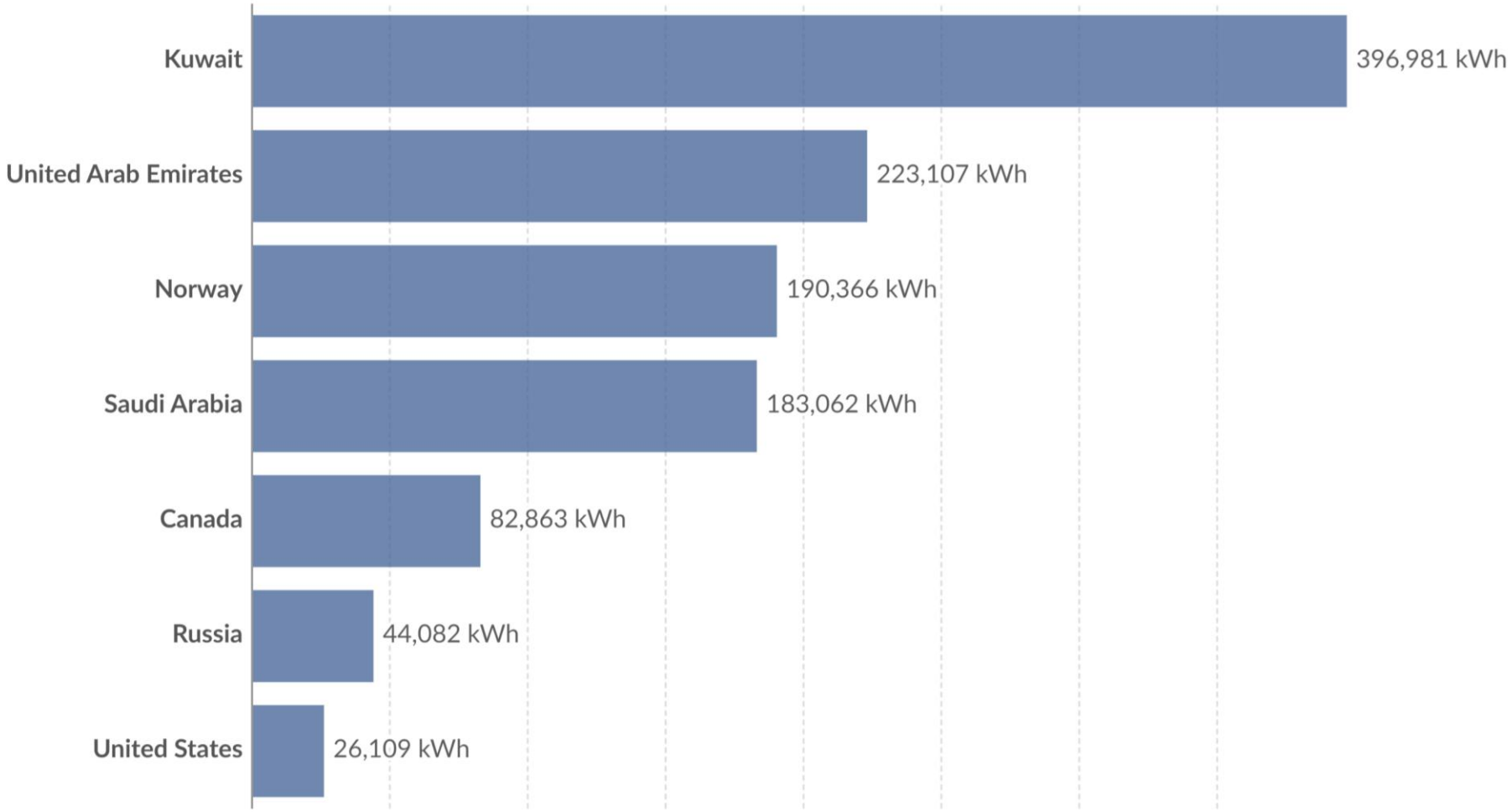


https://climateactiontracker.org/

Introduction

Data Insight

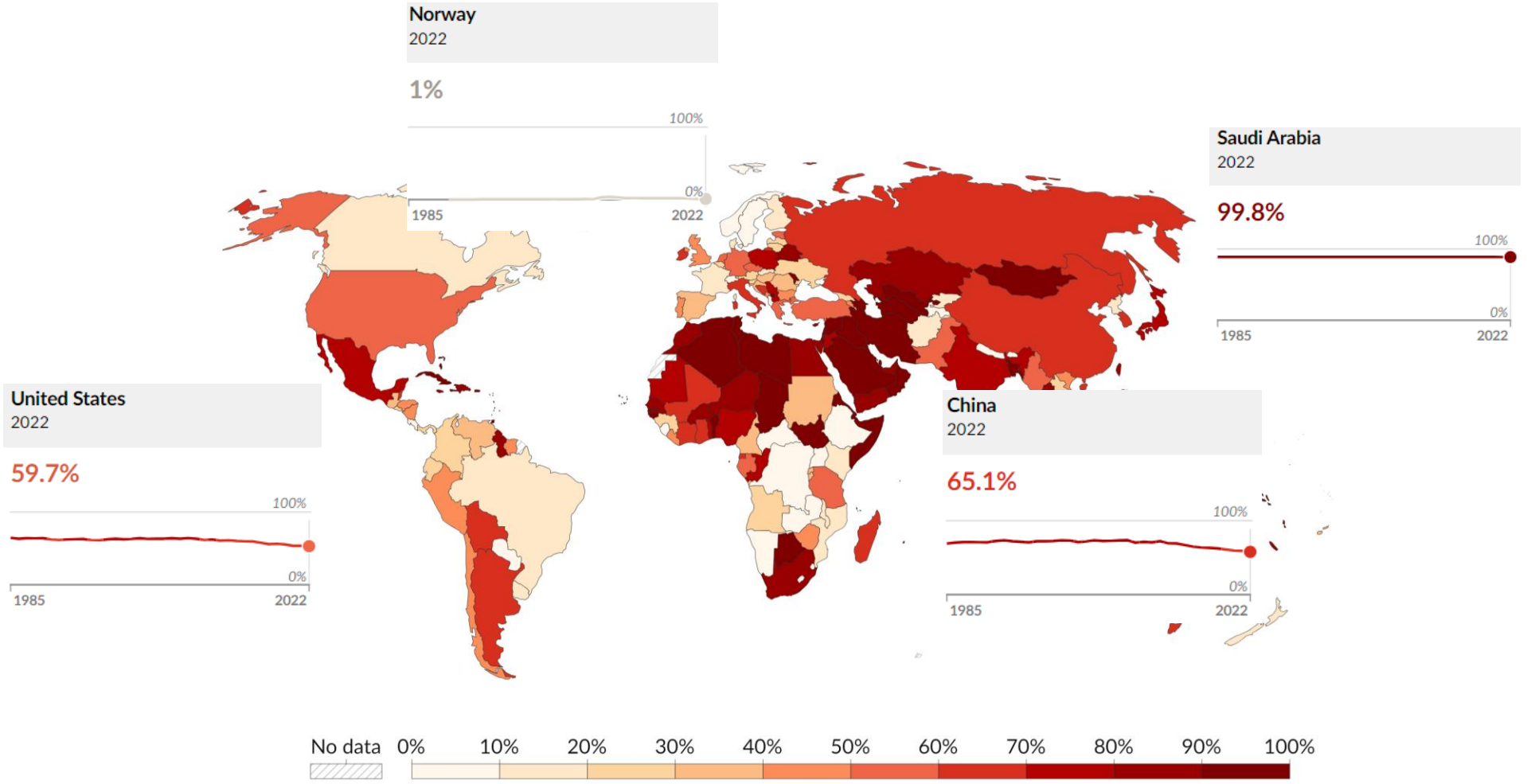
Oil production per capita, 2022



Introduction

Data Insight

Share of electricity production from fossil fuels, 2022

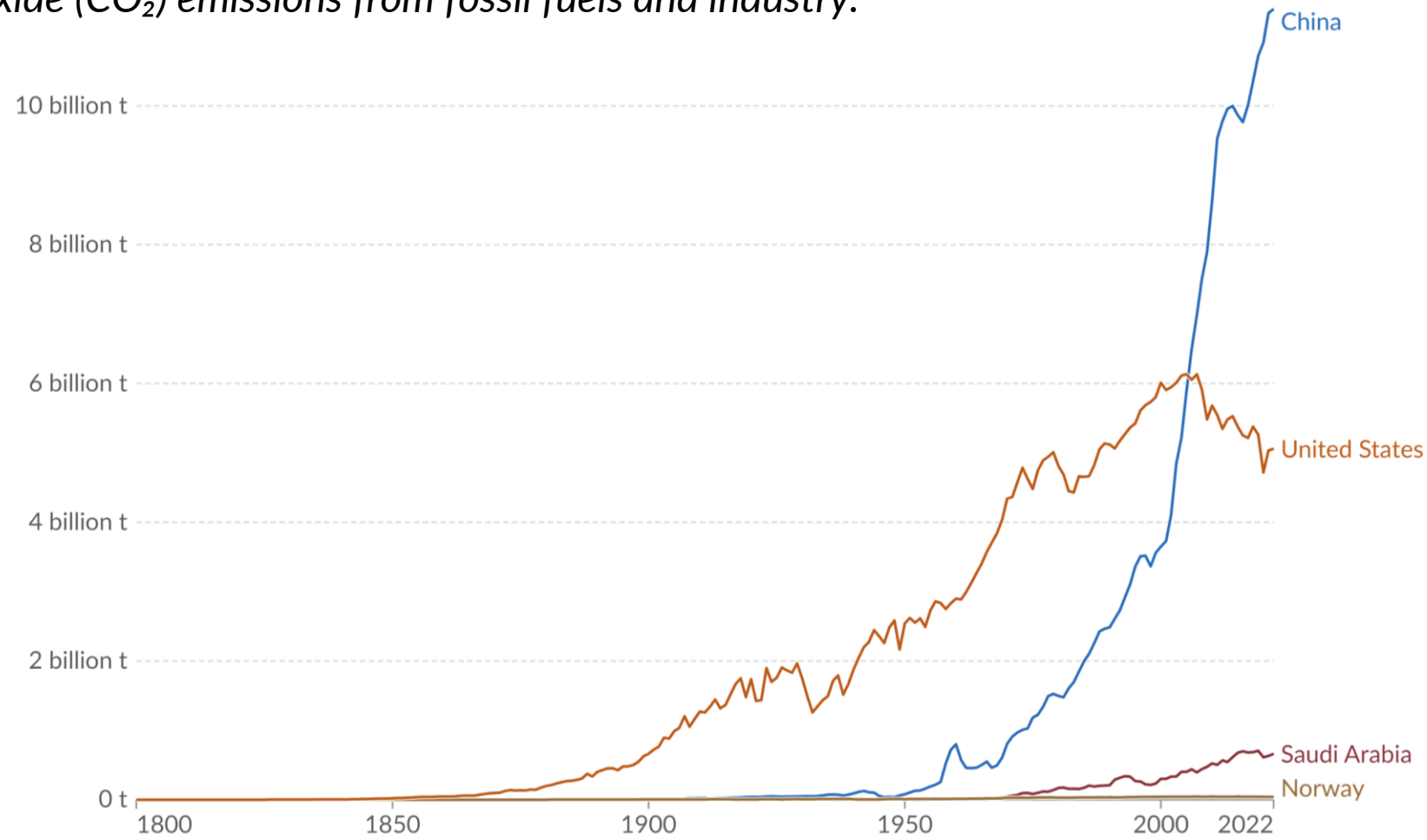


Introduction

Data Insight

Annual CO_2 emissions

Carbon dioxide (CO_2) emissions from fossil fuels and industry.



Introduction

Data Insight

Sustainable Development Goals (SDGs)



The global indicator framework includes 231 unique indicators.





Introduction

Data Insight

Saudi Green Initiative (SGI)

Rank	Country	Score
7	Norway	82.00
94	Saudi Arabia	67.69

Saudi Crown Prince Mohammed bin Salman announced Saudi Arabia's net zero target for 2060 at the first Saudi Green Initiative Forum in October 2021

https://www.vision2030.gov.sa/en/projects/saudi-green-initiative/

https://unstats.un.org/sdgs/metadata/

H.W.

Write a report about the objectives of Saudi Vision 2030 and connect it with the UN sustainable development goals

SAUDI GREEN INITIATIVE

Introduction

Data Insight

Objective	SDG target	Reason	Reference
Reduce carbon emissions by 278 mtpa by 2030	Target 13.2 **Indicator 13.2.2:** Total greenhouse gas emissions per year	Carbon mitigation policies encompass a set of actions and approaches designed to diminish the release of carbon emissions. These policies typically involve the transition towards renewable energy sources, enhancements in energy efficiency, the implementation of carbon pricing strategies, and the promotion of sustainable practices. The reduction of greenhouse gas emissions is a direct outcome of effective carbon mitigation policies. By reducing carbon emissions, these policies contribute to lowering the concentration of greenhouse gases in the atmosphere, which in turn helps mitigate the effects of climate change.	(Mathijs Harmsen et al., 2023)

Mathijs Harmsen, Charlotte Tabak, Lena Höglund-Isaksson, Florian Humpenöder, Pallav Purohit and Detlef van Vuuren “Uncertainty in non-CO_2 greenhouse gas mitigation contributes to ambiguity in global climate policy feasibility” Nature Communications | (2023) 14:2949

Thank you for your attention!

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