Climate Change Calculated

What Can Be Done?
E-Mobility

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Introduction

- I am against identity politics that label "us" as good and "others" as bad.
- Climate protection requires **everyone's participation**.
- Therefore, I present straightforward numbers and facts.
- What counts are ideas, regardless of the persons they are coming from.

The Problem: Global CO_2 Emissions

- Global CO_2 emissions have reached another **record high** of 41.6 billion tonnes in 2024. [2]
- Consequences are calculated in my "Climate Change Claculated" series [1]:
  - Rising global temperatures (Episode 2).
  - Sea-level rise (Episode 3).

Goal: Reduce CO_2 Emissions

- Aim to reduce CO_2 output to or below **1950s levels**.
- For an in-depth analysis, see my Climate Change Calculated, Episode 1.

CO_2 Pricing Approach

- Implement CO_2 pricing similar to **wastewater treatment fees**.
- Direct air carbon capture costs between $\$\mathbf{134}$ and $\$\mathbf{432}$ per tonne, depending on the source. [3]
- Capturing CO_2 directly from the air is more expensive; thus, avoidance is preferable.
- Demand for such technologies is growing due to legal requirements, leading to further development. [4]

Current CO_2 Prices in the EU

- EU carbon permit prices have decreased by approximately 22.46% since the beginning of 2024, standing at around **€62.50** per tonne. [5]
- To reflect true environmental costs, a price of roughly **€230** per tonne **more** is needed.
- This adjustment would increase gasoline prices, promoting fairness and encouraging emission reductions.

CO_2 Price as a "Damage Tax"

- Applying the "polluter pays" principle to fossil fuels.
- Comparable to water usage and **wastewater treatment fees**.
- Encourages the adoption of cleaner technologies and practices.

Technologies Benefiting from CO_2 Pricing

- **Electric Vehicles** (EVs).
- Renewable Energy Sources.
- Heat Pumps.
- These technologies become more competitive as CO_2 pricing reflects the true cost of emissions.

Electric Vehicles: A "Low Hanging Fruit"

- EVs offer an **immediate opportunity** to reduce emissions.
- Transitioning to EVs **as soon as possible** can significantly lower CO_2 output.
- Manufacturing and operational emissions are **lower compared to internal combustion engine vehicles over their lifespan**.

The Software-Defined Automobile

- Tesla leads in reimagining cars as software-defined vehicles.
- Definition: Significant properties are determined and controlled by **software**, which makes the cars more versatile and adaptable.
- Features include internet connectivity and a browser on a large screen, transforming the car into a mobile office with cloud services.

Over-the-Air Updates

- Updates provide new or improved features **without visiting a service center**.
- Tesla has offered over-the-air updates since around 2012; many other manufacturers are still catching up.
- Users can choose when to install updates, such as in the evening after arriving home.
- Recent updates include:
  - Enhanced autopilot capabilities.
  - Improved display interfaces.
  - Navigation system enhancements.
  - Weather radar integration in navigation.
- For detailed information, visit `https://www.notateslaapp.com/`.

E-Mobility Simplifies Transportation

- Lower costs per 100 km.
- Higher efficiency.
- Tax savings.
- Reduced maintenance requirements.

Personal Experience with EVs

- After 6 years and 200,000 km, my Tesla remains the best car I've owned.
- Economical and convenient operation:
  - Home charging using a **standard outlet** or during shopping trips, typically up to 90%, depending on battery type.
  - Charger integration in the Tesla navigation system, or with navigation apps like "A Better Routeplanner" for long-distance travel.
  - **Combining** rest breaks with Supercharger stops during long trips.
  - Home charging ensures a **fully charged** vehicle at any time.

Personal Experience with EVs

- I have a 75 kWh battery
- Energy consumption on average roughly 16 kWh/100km
- Daily commute roughly 100km
- At a normal home power outlet of about 3 KW this takes about 16 kWh / 3kW $=$ 5.3 hours over night to recharge.
- On long distance, keeping the battery between 10% and 90% charge, this means a range of about 380km.
- Recharging the used 60kWh at a supercharger with about 120 kW takes about 30 minutes.
- If desired the charging can be ended at any time before this.

Battery Longevity

- No noticeable battery degradation after extensive use.
- Tesla cells are designed for 2,000 cycles and a calendar life of up to 30 years.
- Studies show that after 2,000 equivalent full cycles, batteries retain over 80% capacity. [6]
- After 20 years, batteries maintain around 90% capacity (State-of-Health) at medium charging levels, if the charge level is kept between around 10% and 90%.

Price Parity: EVs vs. Internal Combustion Vehicles

- EVs are expected to reach **price parity** with internal combustion engine vehicles by **mid-decade**.
- Falling battery prices contribute significantly to this trend. [7]
- This development will make EVs more accessible to a broader consumer base.

Considerations When Buying a Used EV

- Good resources and evaluation of different used cars: [8]

Conclusion

- E-mobility presents a **practical and effective** solution for reducing CO_2 emissions.
- Electric vehicles offer numerous benefits, including **lower operational costs and reduced environmental impact**.
- With advancing technology and expanding infrastructure, transitioning to electric mobility is **becoming increasingly accessible and advantageous**.

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