

# Berlin's Pathway to Climate Neutrality

## Policies, Scenarios and Measures



Climate Connaction  
Youth Climate Fellowship Programme  
(@ Progressives Zentrum)  
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- **Head of the Department „Sustainable Energy Management and Climate Protection“ at the Institut für ökologische Wirtschaftsforschung / Institute for Ecological Economy Research IÖW (GmbH, non-profit), Berlin**

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- Research and policy advice for sustainable business since 1985
- over 70 employees from economic and social sciences, engineering and natural sciences
- Many years of experience in the analysis, development and evaluation of innovations and markets as well as political instruments and climate protection strategies
- Independent: Shareholders are active and former long-term employees
- 100% financed by third-party funded projects; predominantly public clients
- [www.ioew.de](http://www.ioew.de) / [Prof. Hirschl IÖW](#)

- **Head of the Department „Management of Regional Energy Supply Systems“ at the Brandenburg University of Technology (BTU) Cottbus-Senftenberg (Lausitz)**

**b-tu**

- Teaching and research
- <https://www.b-tu.de/fg-energy-supply-structures> / [Prof. Hirschl BTU](#)

- **Selected functions**

- Spokesperson of the [Berlin Climate Protection Council](#) (since 2017)
- Collaboration in the [Energy Systems of the Future \(ESYS\)](#) project of three German science academies
- Project manager of many inter- and transdisciplinary research and consulting projects, including the study "[Making Berlin Paris-compliant](#)" and the development of the Berlin Energy and Climate Protection Programme commissioned by the State of Berlin as well as the [study on the development of the first Brandenburg Climate Plan](#) commissioned by the State of Brandenburg

# Overview

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- **Introduction**
  - Why climate neutrality?
    - From science to politics and multi-level-governance
  - Why cities matter
- **The Berlin Case**
  - Status Quo, developments and trends
  - Climate policy – milestones and targets
  - Scenarios and measures
- **Urban climate neutrality in conflict with other goals**
- **Conclusion**

# Introduction

# Why climate neutrality?

## To avoid an ecological catastrophe



**Ecological disasters already occurring regionally today due to an increase in (increasingly severe) extreme weather events**

Heavy rain and sealing lead to sharp increase in damage in Berlin

"If we don't do enough prevention, there is a danger that the risk will no longer be insurable in parts by the private sector, as in Florida or Australia." Jörg Asmussen

Chief Executive Officer GDV - German Insurance Association, 10.07.23 Contribution rbb24

**Summer 2022: hottest summer in Europe by then, more than 60,000 heat-related deaths**

**Summer 2023: another heat record**

Source: ISGlobal 2023/  
WMO 2023

Image by [Tumis](#) from Pixabay

# Climate neutrality has been the new climate policy goal since the Paris Climate Agreement



- With the help of **climate neutrality**, which is **to be achieved in the second half of the century**, the **main goal of the Paris Climate Agreement** of 2015 is to be achieved:
  - to limit the temperature increase to well below 2°C, if possible at a maximum of 1.5°C compared to pre-industrial levels, in order to prevent serious consequences of man-made climate change.
- **What does climate neutrality mean?**
  - Human activities do not cause a (negative) net effect on the planet's climate system
    - Climate-impacting emissions (mainly combustion of fossil fuels)
    - Carbon Dioxide Removal measures (removing greenhouse gases from the atmospheric cycle through natural or technical sinks)
    - regional or local biogeophysical measures / effects (e.g. change in surface albedo).
- **Decisive subcategory: Greenhouse gas neutrality**
  - Balance between greenhouse gas emissions and their uptake from the atmosphere in so-called sinks.
- **Greatest significance: CO<sub>2</sub> neutrality**
  - Aims decisively at the strategy of decarbonisation (meaning: defossilisation)

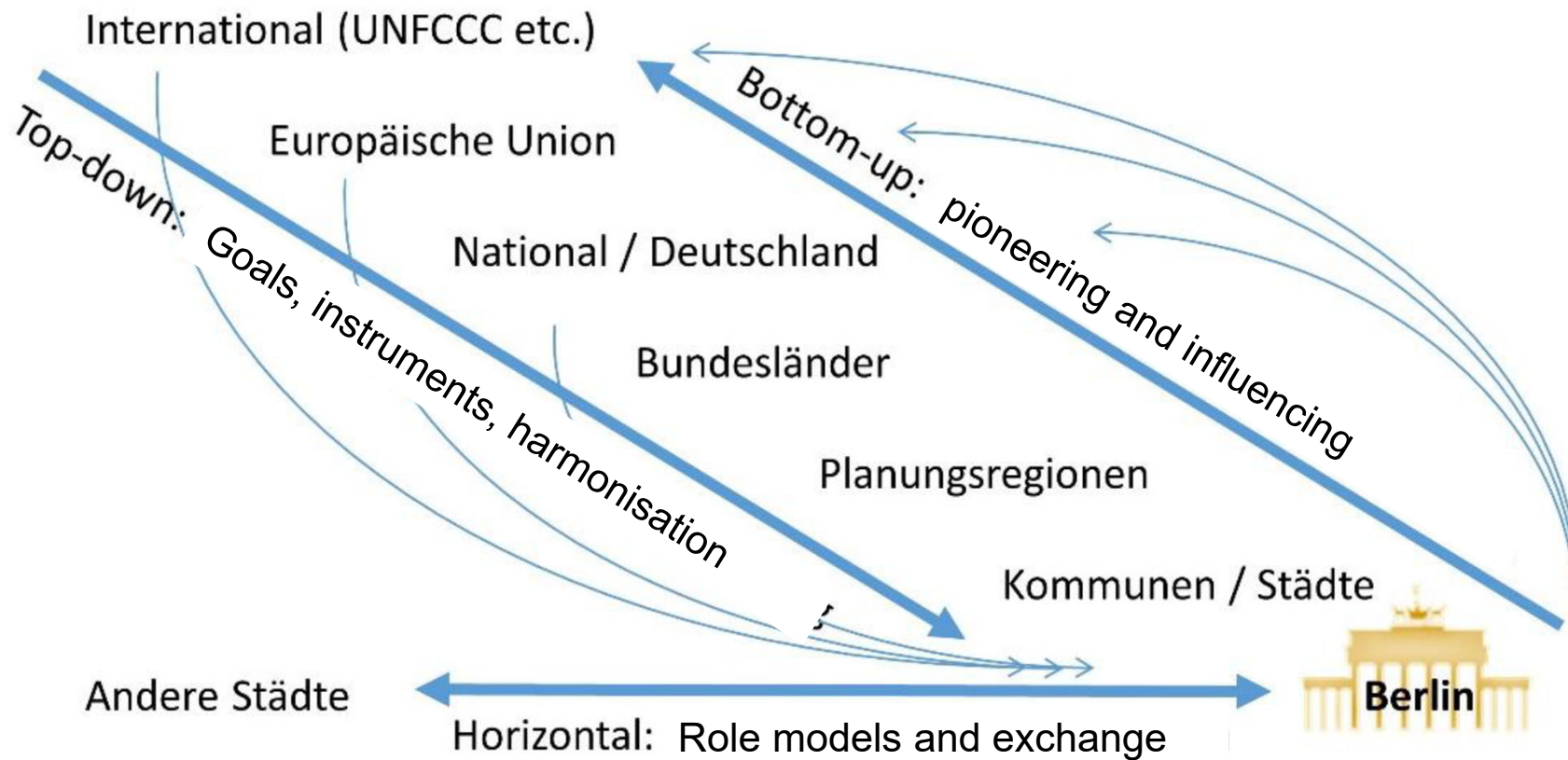
# Climate neutrality politically and legally binding!

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- **International Law (UNFCCC)**
  - Paris Climate Agreement 2015: actually ratified by 195 contracting parties, including Germany and the European Union.
  - All parties agreed to reduce their greenhouse gas emissions and to develop and implement national climate protection plans ("nationally determined contributions", NDCs) - but they are not obliged to comply / fulfil their targets (or the Paris targets such as climate neutrality)
- **EU law: Green Deal (since 2019)**
  - Climate Protection Act 2021: at least -55% net greenhouse gas emissions by 2030
  - Legislative package "Fit for 55"
- **Federal law in Germany**
  - Climate Protection Act (KSG) 2019 / 2021
- **Decision of the German Federal Constitutional Court in 2021 (lawsuit against KSG 2019)**
  - decision supports the effectiveness of political instruments and demands them (to preserve the freedom of future generations)
- **Federal state law (in Berlin: Senate policy)**
  - State energy and/or climate protection laws (in Berlin: EWG Bln)
- **Municipal resolutions, goals, programmes**
  - Political targets, funding and regulations
  - However, climate protection is currently (still) not a compulsory municipal task

# Climate Policy & Climate Neutrality in the Multi-level Governance System



- **The new requirement "climate neutrality" must be integrated into all climate policy laws, goals, programmes, ordinances, regulations, etc. – at any level**



# Climate neutrality cannot be achieved without the cities



- **Key indicators of cities (today, worldwide)**
  - >50% of the world's population lives in cities (trend: >70%)
  - roughly 80% of the global GDP is associated with urban regions.
  - leads to almost 70% of the world's energy consumption and around 80% of global greenhouse gas emissions
- **Paris Climate Agreement 2015: first global agreement on climate protection**
  - actually ratified by 195 contracting parties, including Germany and the European Union.
  - All parties agreed to reduce their greenhouse gas emissions and to develop and implement national climate protection plans ("nationally determined contributions", NDCs) - but they are not obliged to comply / fulfil their targets (or the Paris targets such as climate neutrality)
- **Municipalities and Cities are indirectly addressed within the Agreement** among the 'important stakeholders' who, as 'non-contractual partners', are also intended to comply with and support the Paris Goals
- In many countries, **cities are supported and promoted by the state level in the preparation of climate protection plans**
- **Cities also depend on national framework conditions and laws.** This also applies to city states / federal states such as Berlin.
- In order to **derive political target values** for the reduction of greenhouse gas emissions **from the global emissions budget** for states or sub-state entities (cities and municipalities), an **internationally standardised calculation** is needed.
  - Calculations based on population, economic power, historical or current emission shares sometimes produce very different results. For this reason, most states and municipalities set (usually scenario-based) reduction target values that lead to a defined state of climate neutrality.

# Excursus: Finally tackle the climate crisis decisively at all levels!

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- Dealing with financial / economic / euro (debt) crisis, also Corona crisis
  - "Whatever it takes" - M. Draghi 2012, ECB
- Dealing with Russ. War of aggression against Ukraine
  - "Turn of the times" („Zeitenwende“)  
O. Scholz 2022
- Dealing with the climate crisis is not done at nearly this level - although on the one hand it poses a greater threat and on the other hand many countermeasures are economical (designable)
  - Determination and confidence required in political action!

# Berlin

# Berlin



- capital and largest city of Germany by both area and population, EU's most populous city (>3.85 million inhabitants)
- One of Germany's sixteen constituent (federal) states - with own legislation, house of representatives, government (senate), Central Administration with Senate Departments, responsible for Berlin-wide affairs
- surrounded by the State of Brandenburg; the Berlin-Brandenburg capital region has around 6.2 million inhabitants
- 12 borough/district administrations (= municipalities), responsible for local borough affairs, consists of a borough assembly (BVV) and a borough office
- Rivers: Dahme (south-east) flows into Spree, Spree into the Havel (west-north), a tributary of the Elbe)

– Green City: about one-third of the city's area is composed of forests, parks, gardens, rivers, canals, and lakes

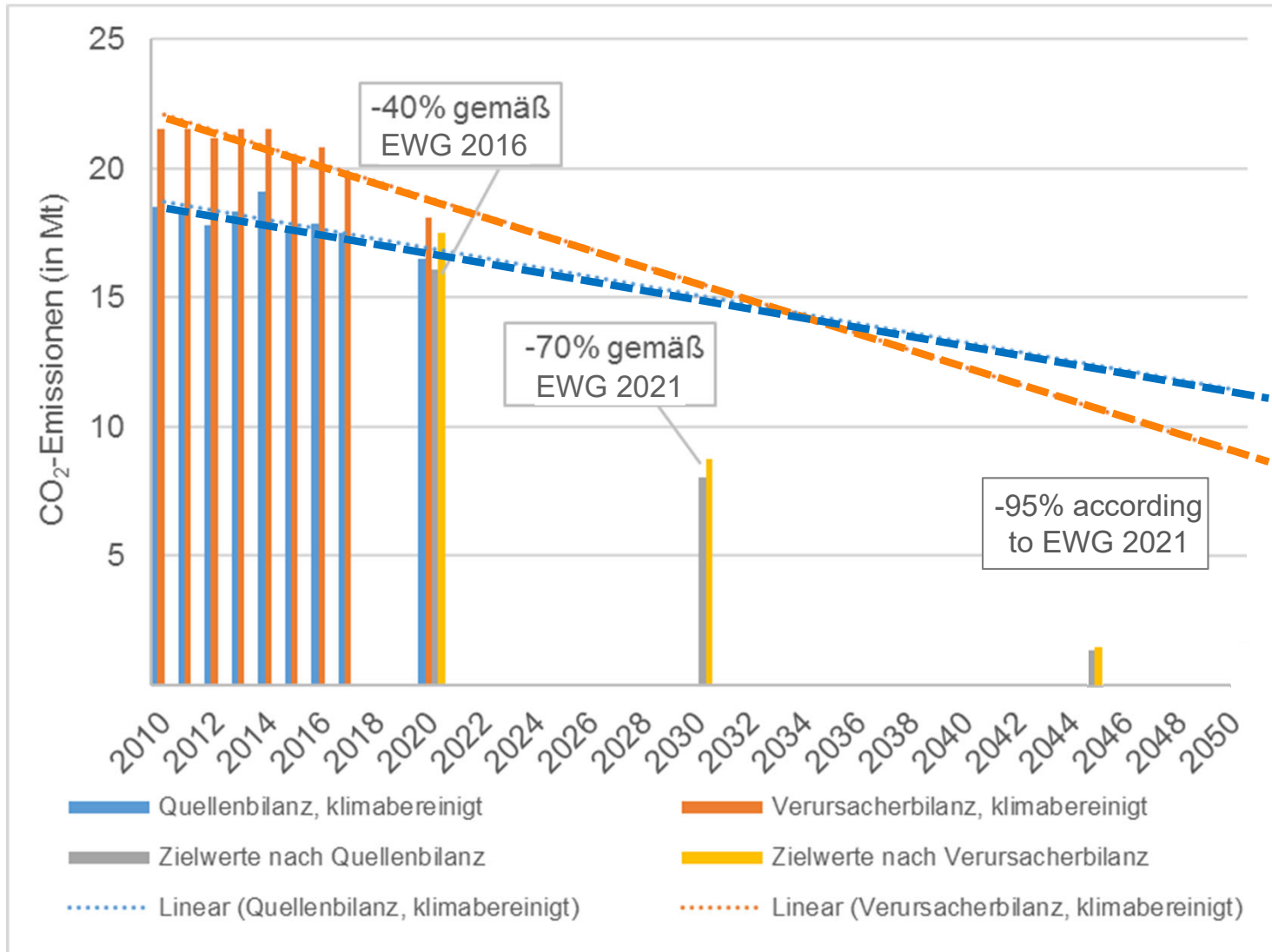
– Tenant city: more than 80% of the inhabitants live in rented accommodation.

# Climate policy milestones in/for the City of Berlin



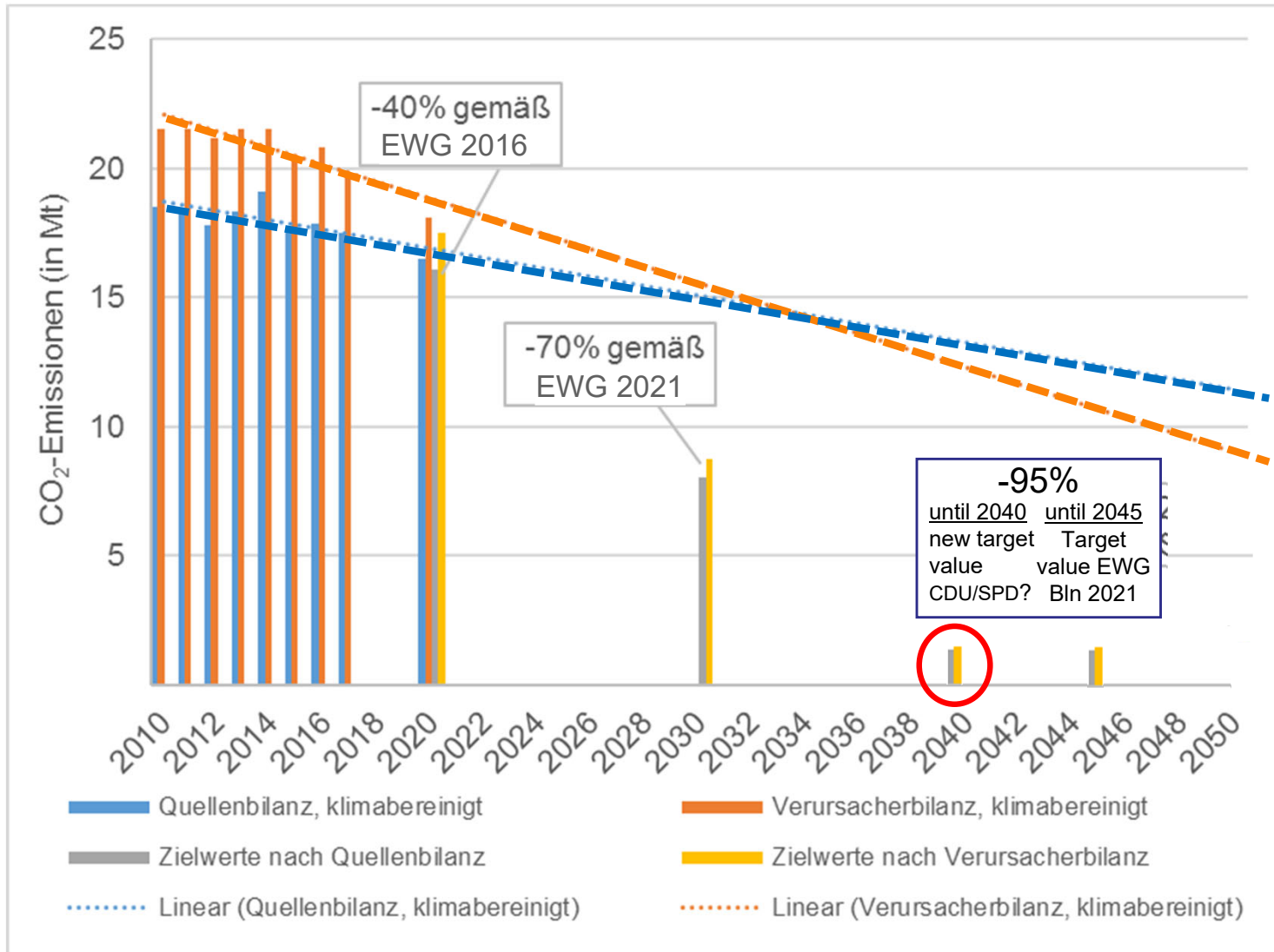
- 1990: Berlin Energy Saving Act and state energy programmes (until 2010)
- 2011: SPD/CDU coalition agreement: climate neutrality as a target for the first time (at that time: -85% CO<sub>2</sub> by 2050, based on 2°C target value)
- 2012-2015: basic, participatory scenario studies and expert opinions for the preparation of laws and programmes
- 2016: First Berlin Energy Transition Act (-95% by 2050)
- 2016-2021: Government consisting of SPD, DIE LINKE, BÜNDNIS90/DIE GRÜNEN
- 2017: First Berlin Energy and Climate Protection Programme
- Since 2017: accompanying Climate Protection Council (stakeholder body, purely advisory function)
- 2019: Recognition of a "climate emergency", decision on supplementary measures
- 2021: Amendment: Berlin Climate Protection and Energy Transition Act brings ambitious targets: -70% CO<sub>2</sub>-Emissions by 2030, -90% by 2040, -95% by 2045
- 2022: representative climate citizens' council develops catalogue of measures, these are largely taken into account in actual climate programme revision
- 2023:
  - Referendum "Climate Neutral Berlin 2030" failed
  - Repeated election: Green and left parties lose with ecological issues, CDU wins with issues such as car-based mobility and security.
  - Current government: CDU/SPD. First climate relevant decisions of new government:
    - supplementary fund for climate protection (5 billion euros)
    - previous decisions on the mobility transition are partly reviewed and withdrawn

# Where are we today? CO<sub>2</sub> -emissions development still far from climate neutrality path



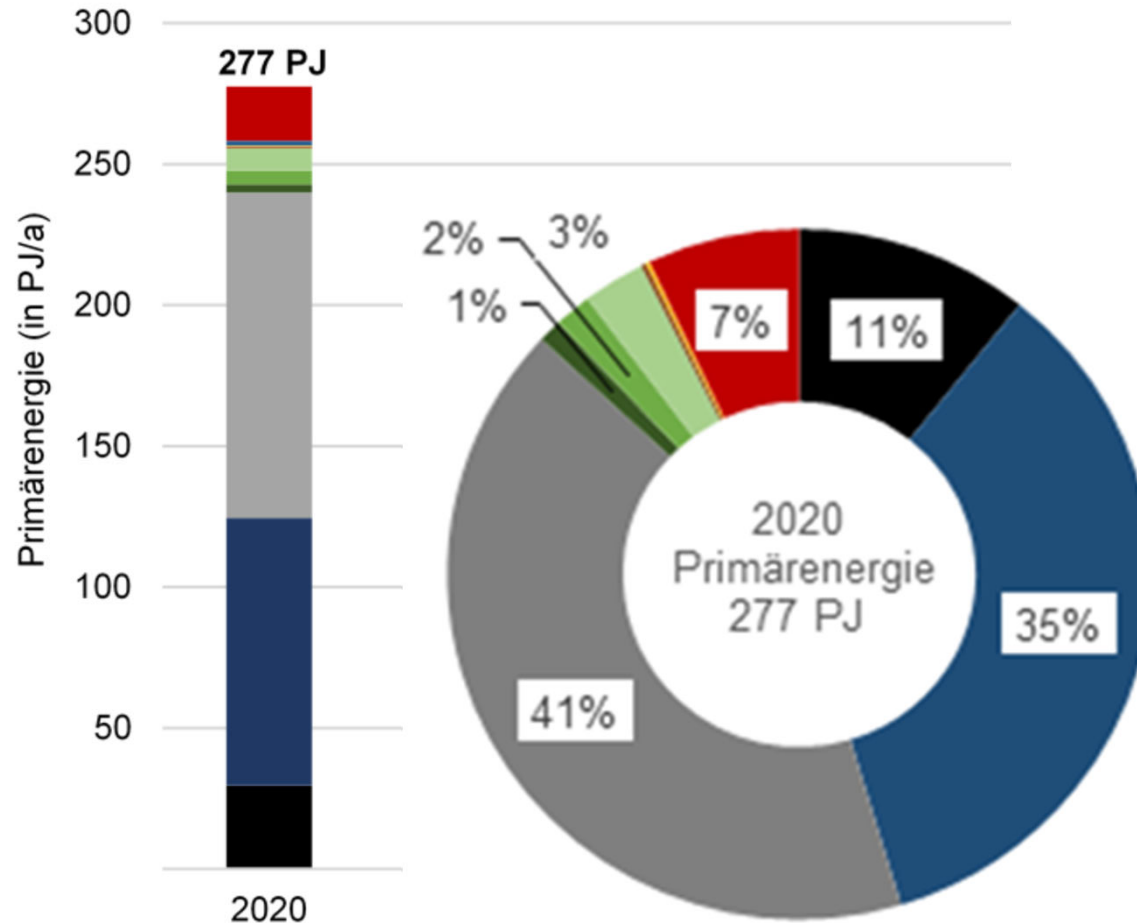
- Simplified trend projection from the available data shows a clear failure to reach the target => Change is needed!
- Legal target value EWG BIn 2021: -95% until 2045

# Where are we today? CO<sub>2</sub> -emissions development still far from climate neutrality path



- Coalition agreement CDU/SPD Berlin 2023: "To combat man-made climate change, we are consistently aligning our climate protection policy with the 1.5 degree target in order to achieve the goal of climate neutrality in Berlin **well before 2045**. To this end, new emission reduction targets will be anchored in Berlin's Climate Protection and Energy Transition Act."

# The challenge is great: primary energy source mix 2020



⇒ Still approx.  
90%  
(!!!)  
fossil primary  
energy

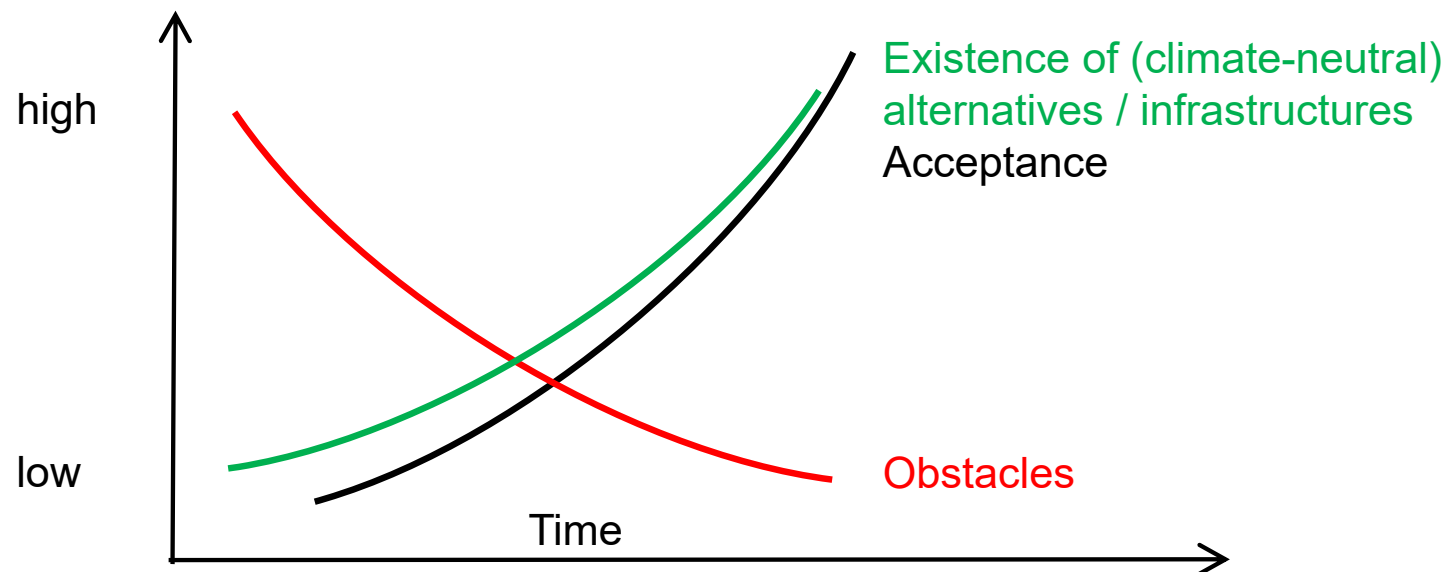
- Coal
- Waste incineration
- Environmental heat
- Hydrogen
- Surplus electricity
- Mineral oil products
- Biofuels
- Wind power
- E-fuels
- Mixed gas
- Biomass
- Solar energy
- Electricity



# Scenario building methodology: restriction-based approach

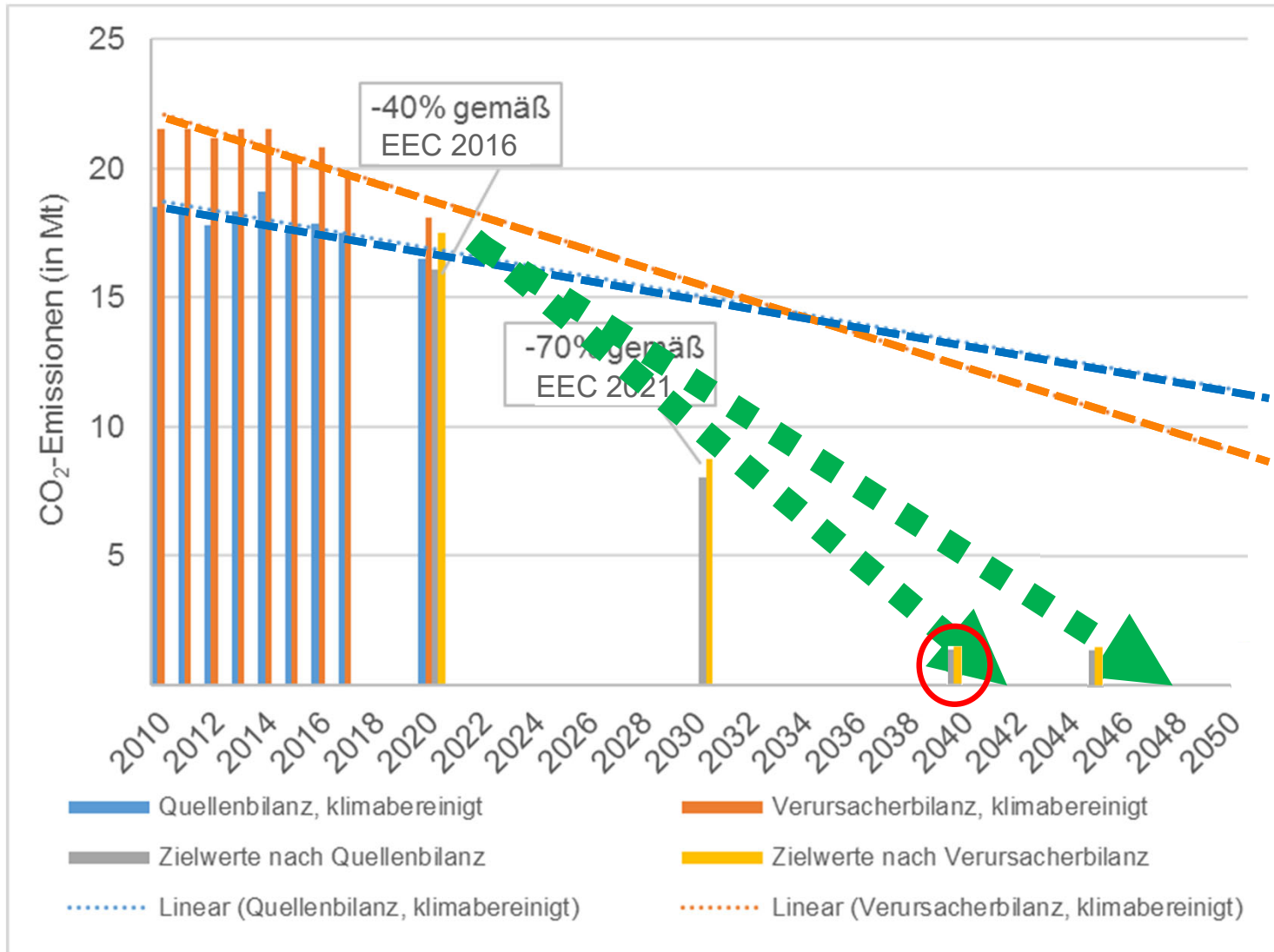


- **Long-term scenario ("2050"): What could a climate-neutral Berlin look like in around 30 years - more or less WITHOUT restrictions? (KnB 2050)**
- **Scenario 2030: What is the maximum that can be brought forward from the long-term scenario - and what cannot if, despite great ambition, restrictions / limiting factors (obstacles and conflicting goals) are taken into account?**
  - e.g. protection of milieu and tenants, investment and modernisation cycles, lack of personnel (skilled workers, administration), approval periods, availability of green hydrogen/pipelines, solutions for the protection of historical monuments, ...
  - Consideration of lag effects in demand and supply changes



*Simplified scheme  
of the development  
of restrictions*  
Source: own graphic

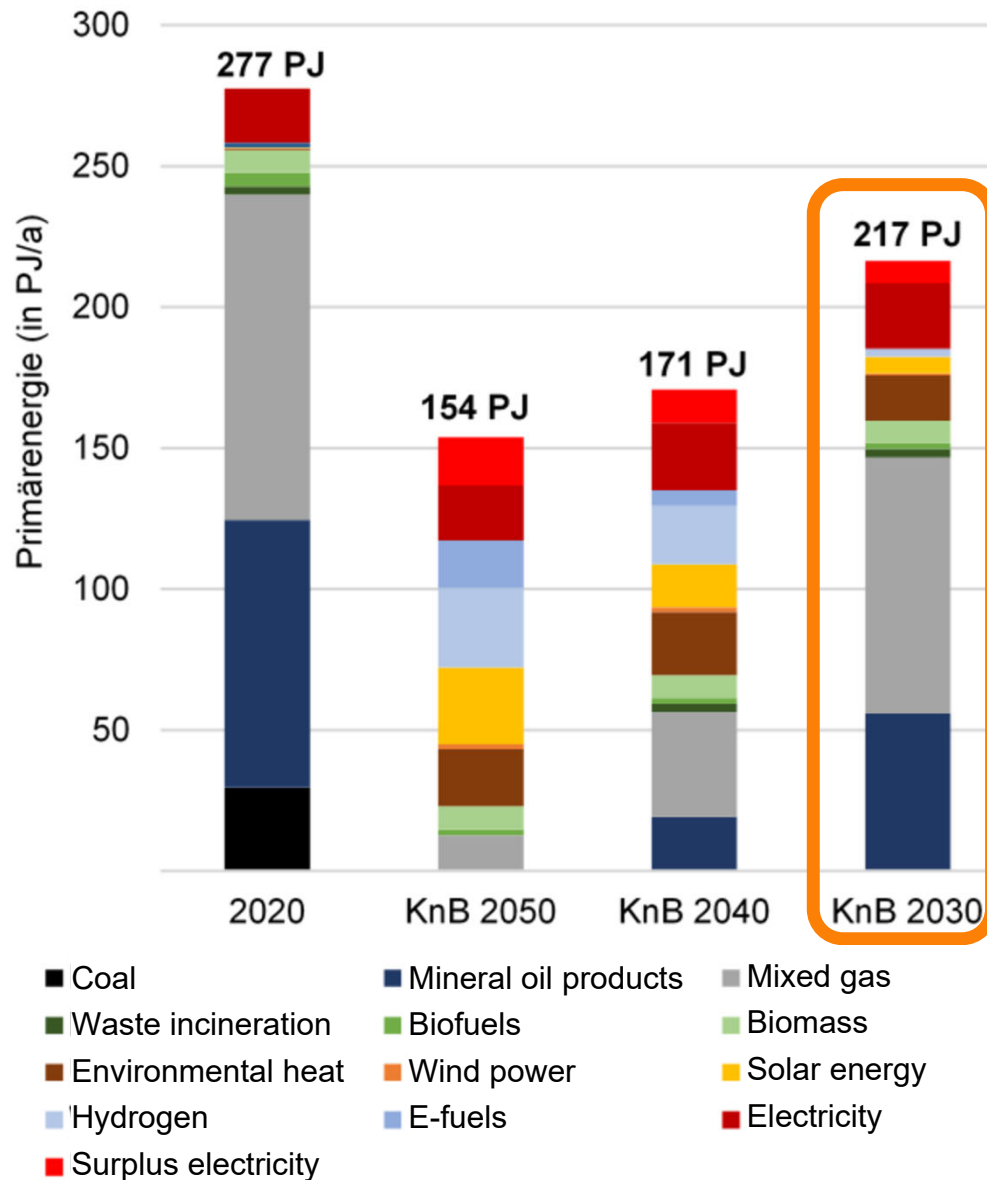
# Where are we today? CO<sub>2</sub> -emissions development still far from climate neutrality path



**Result of the study "Making Berlin Paris Compliant":**

**We can (only) become climate neutral at the earliest "in the 2040s" with very great efforts in all sectors at national and local level**

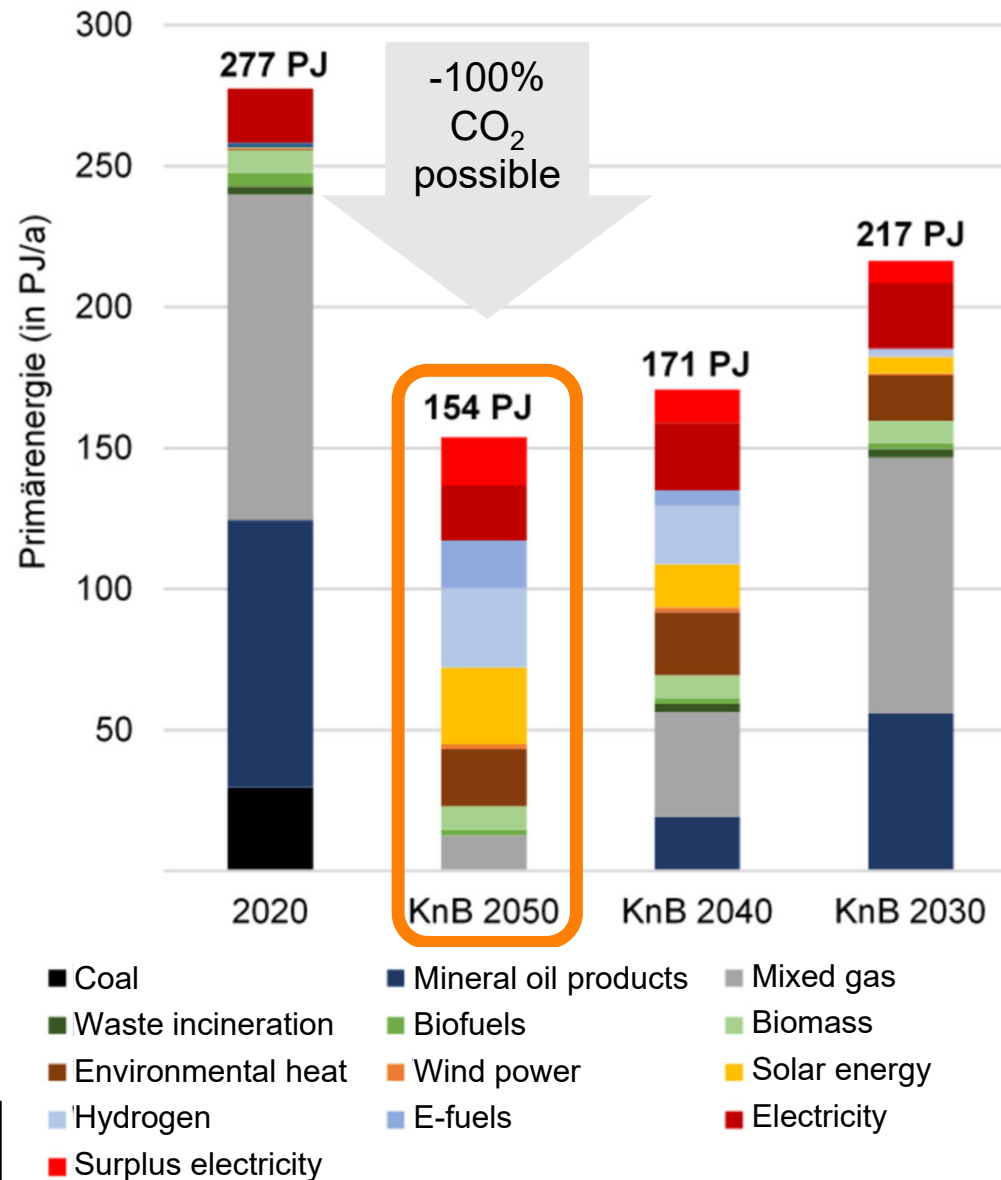
# Results of the scenarios: Primary energy source development and selected assumptions for scenario 2030



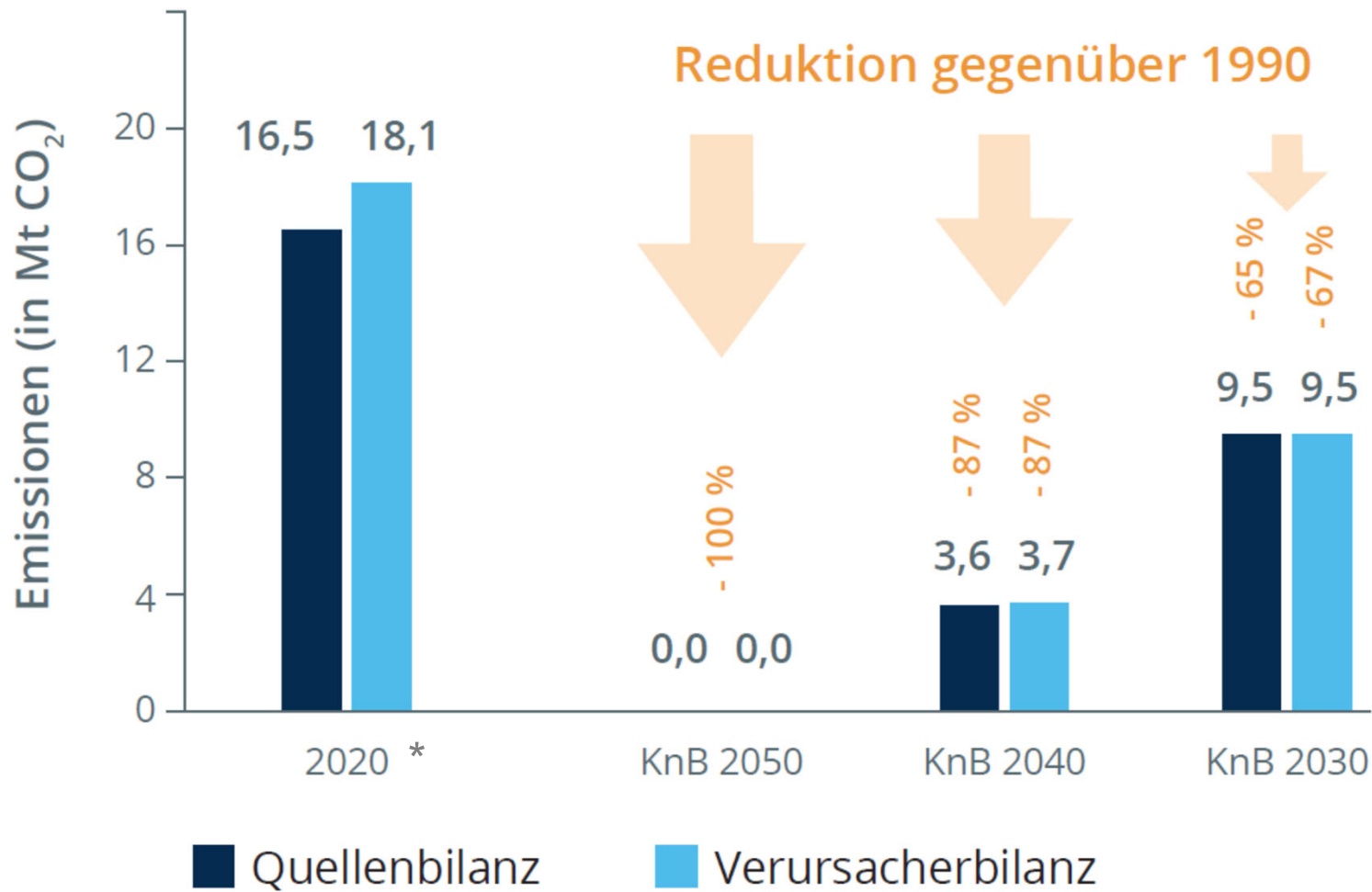
## Important characteristics of the 2030 scenario

- Half of the long-term savings potential could be raised by then!
  - But: slow ramp-up effects, partly due to lack of skilled workers
- More than half of the energy sources will still be fossil, oil and gas boilers still in the stock
- But: Strengthening environmental transport and reducing car traffic by 30% compared to 2020.
- End of (nationwide!) coal-fired power generation
- Launch of the hydrogen economy
- ...

# Results of the scenarios: Primary energy source development - focus on climate-neutral scenario



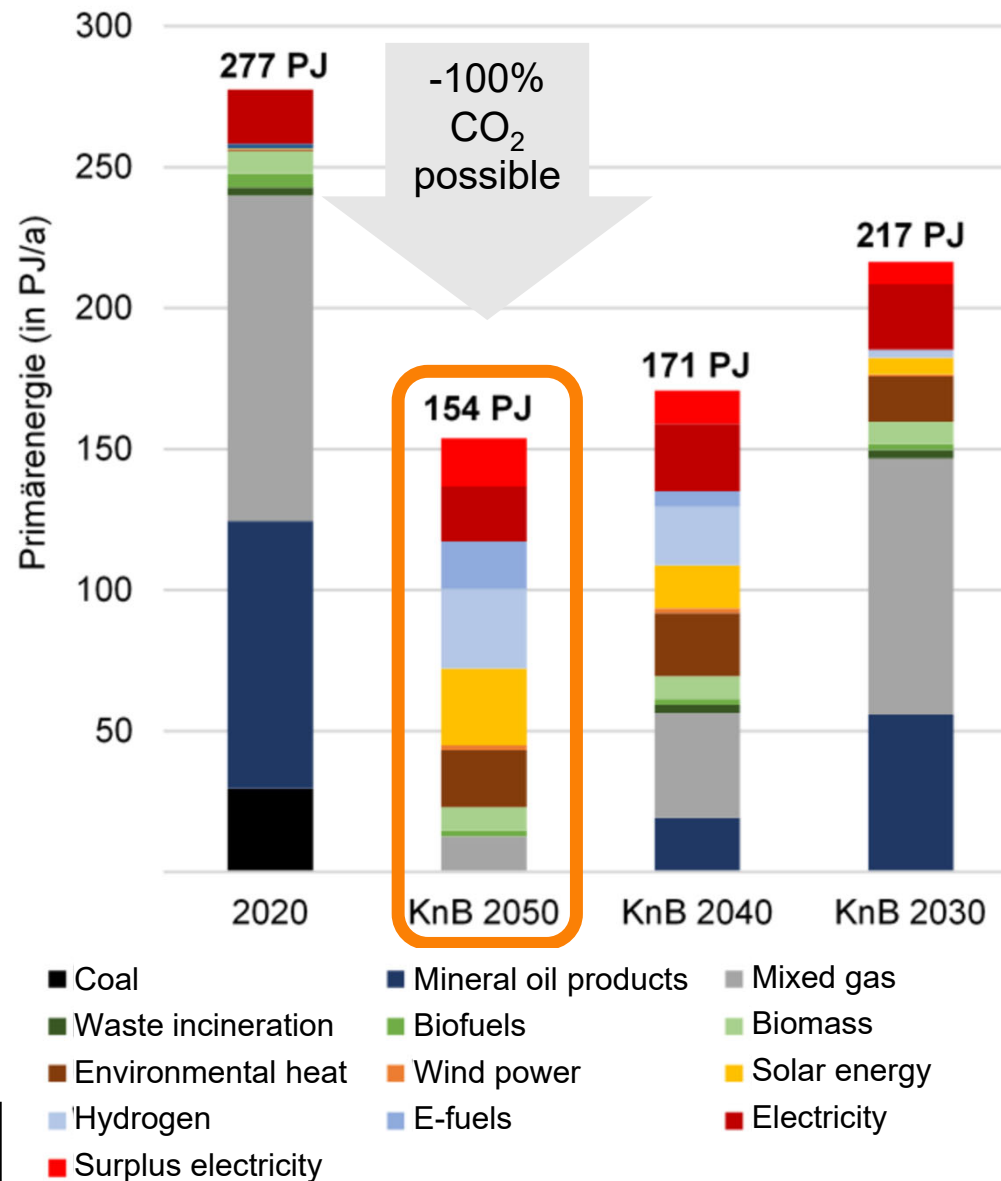
# Scenarios for a Climate Neutral Berlin (KnB) Results: CO emissions<sub>2</sub>



\* 2020 values without Corona special effects

- Reduction by 2030 in 8 years roughly corresponds to the reduction of the last 30 years
- Reduction in 2030 only achievable with nationwide coal phase-out
- Climate neutrality in 2030 and 2040 would only be achievable with (enormous) offsets and additional sinks

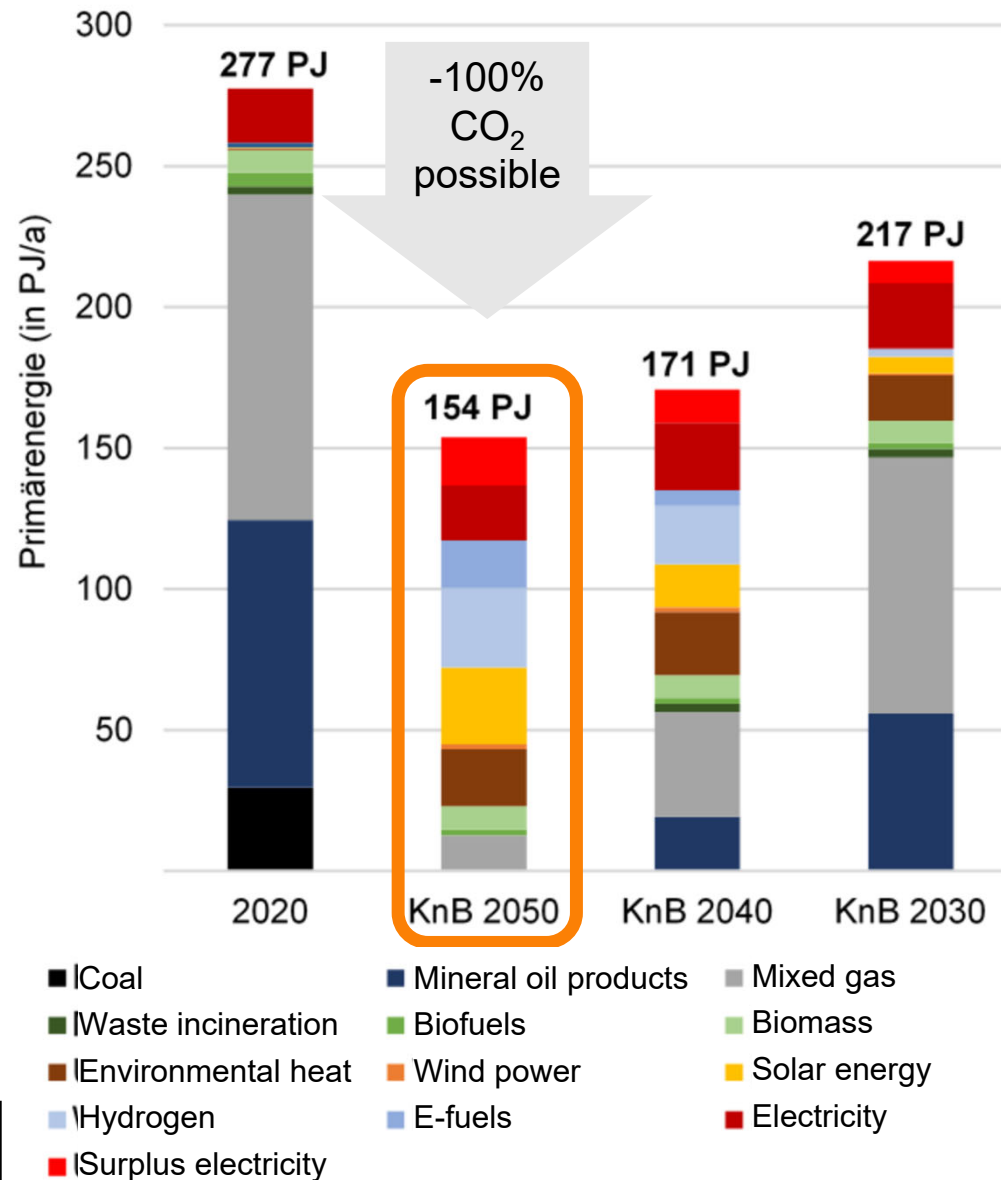
# Results of the scenarios: Primary energy source development - focus on climate-neutral scenario



## Important characteristics of the long-term scenario - now to be achieved by 2040/2045

- **Energy consumption** needs to be almost halved
- **Electricity** will be the central energy source
- **Solar energy, environmental and waste heat** will become central urban energy sources, geothermal energy will be used consistently in a way that conserves drinking water
- **Decentralised heat transition:**
  - Heat pumps for buildings and neighbourhoods - can also be used in existing buildings in many cases!
  - Energetic refurbishment **MUST** be increased - socially acceptable, with subsidies from the federal government and Berlin
- **Transport turnaround:** Priority on environmental connectivity & electrification

# Results of the scenarios: Primary energy source development - focus on climate-neutral scenario



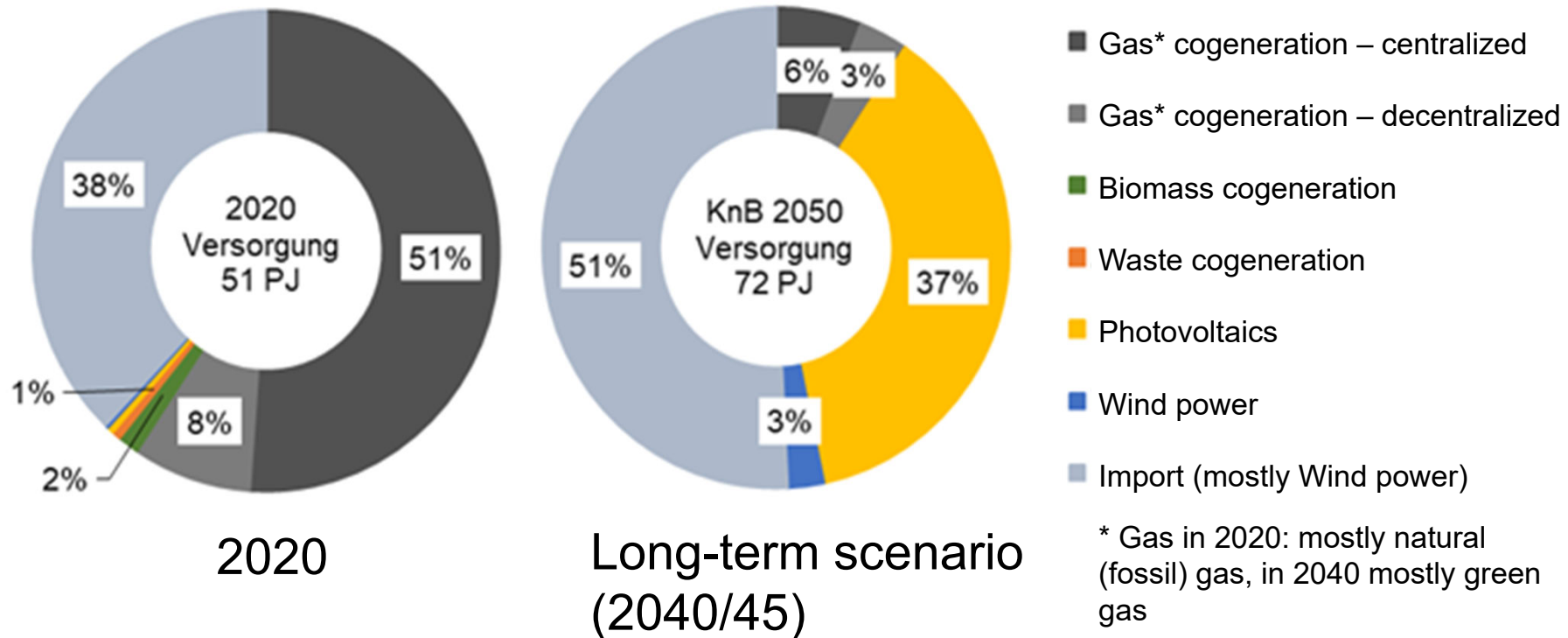
## Important characteristics of the long-term scenario - now to be achieved by 2040/2045

- **Heating grids will** play a more important role than gas grids in future
- Transformation of **district heating**: more large heat pumps and P2H; minimise H<sub>2</sub> residual demand
- **Hydrogen and green fuels** can and should be produced in a city like Berlin (electrolysis, pyrolysis/plasmalysis)
  - Short distances to customers, waste heat utilisation, existing power plant locations
  - Focus on H<sub>2</sub> -supply for power plants, industry, (air) traffic, only a few buildings / neighbourhoods
- **No waste incineration and no fossil fuels in the long term**

# Electricity supply of the future in Berlin: Boost PV in Berlin and wind power in Brandenburg!

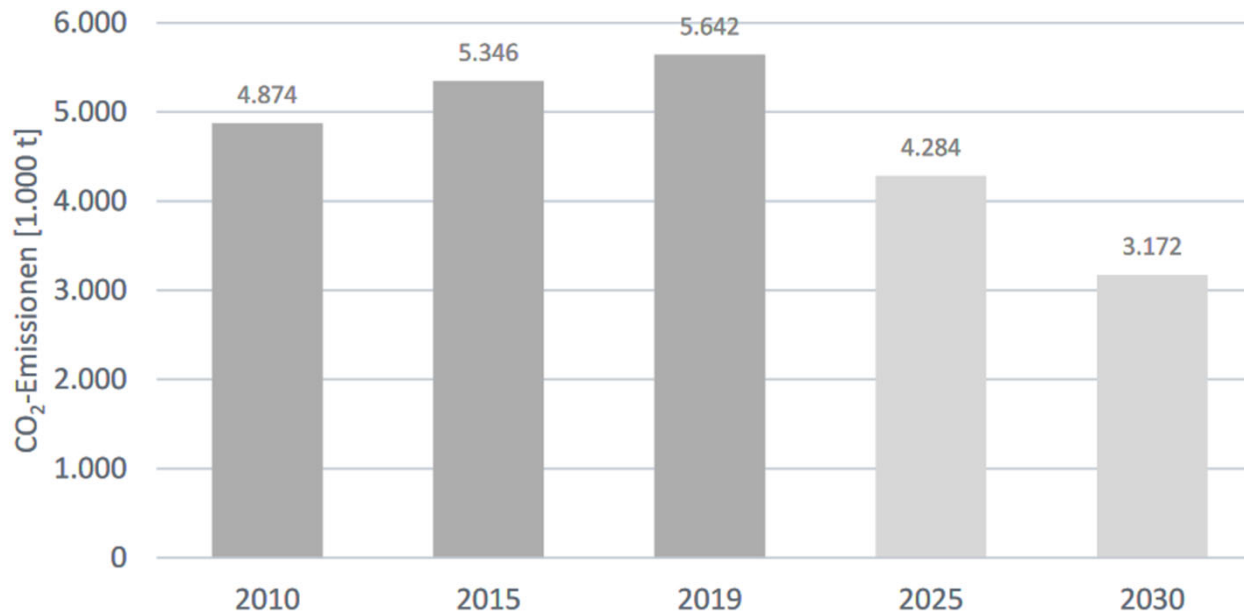


Solar turnaround in Berlin: around factor 50 needed by 2040!





# Focus Transport / Mobility: Break emissions trend, strengthen modal split trend



**Mobility shift is needed:** target values change in modal split (Hirschl et al. 2021)

- **2030:** -30% car, +30% bike +8% public transport
- **2040/45:** -60% car +40% bike +23% public transport

- **Technological shift is needed: electrification** must become dominant strategy; hydrogen & e-fuels play minor role
  - Hirschl et al. 2021 assume (consistent to most (meta-)studies on this topic) that **H<sub>2</sub> & E-Fuels will not be sufficiently available** for the passenger car sector (and also not for heating) in the medium and long term (but primarily for power plants, industry, heavy goods vehicles and air traffic), due to low efficiency & high costs
- **Address obstacles (electrification and mobility shift)**
  - strategy for efficient use of land, electrification, co-benefits and conflict avoidance: using&building **parking garages** in (sub)urban areas

# Urban climate neutrality in conflict with other socio-ecological goals

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- **Climate protection AND climate adaptation required**
  - Berlin - like many other metropolises - is strongly affected by climate change, especially by extreme weather events (heavy rain, heat)
  - Important adaptation measures: Sponge city concept, unsealing, strengthening blue and green infrastructures, ...
  - Aim for integrated/hybrid solutions, e.g. photovoltaics and green roofs, parking garages instead of parking strips on roads (this concept allows for green strips, but also for easier bus lanes and cycle paths),
- **Conflicts with social compatibility**
  - As a rule, it is about the un/fair distribution of costs, benefits and funding
  - Example tenant-landlord dilemma, particularly significant in the tenant city of Berlin.
    - Solution approach. Sufficient subsidies for landlords for climate-neutral measures, reduced levies for tenants, subsidies for low-income households, mandatory refurbishment of the worst buildings
  - Current: Collapse of residential construction due to inflation, material bottlenecks, interest rate increases and shortage of skilled workers - complicates climate neutrality in new construction (costs) and prevents (climate neutral) refurbishment
    - Solution Rent brakes, promotion of social and non-profit housing construction

# Urban climate neutrality in conflict with other socio-ecological goals

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- **Conflicts of the mobility transition (scarce road space)**
  - Expansion of environmental transport (public transport, cycling and walking) requires space; as a rule, this space must be taken away from car traffic.
  - Solution: neighbourhood car parks
- **Conflicts "underground" / with environmental and health protection**
  - Example of geothermal energy / underground storage: drilling and storage use vs. other infrastructural uses underground vs. protection of groundwater and drinking water
  - Solution approach: define, identify and communicate low-conflict areas, develop standards for case-by-case assessments and decisions, pilot projects and best practices for various use cases and technologies.
- **Conflicts with monument protection**
  - Monument protection also serves resource conservation, climate protection and adaptation serves the preservation of the monument; measures are nevertheless often more expensive
  - Solution approach: allow climate protection, further develop and disseminate adapted solutions (e.g. interior insulation, wooden windows etc.)

## Conclusion: Key factor climate governance

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- Berlin has already significantly reduced its emissions, but has so far mainly reaped "low-hanging fruits". From now on, climate policy must be accelerated: -70% by 2030 is very ambitious!
- Getting on the climate neutrality path is only possible with ALL senate administrations, sectors & districts.
- We need sectoral targets that are anchored and monitored in all Senate administrations - coordinated by the Climate Senate, which supports target conflicts and
- Take districts with you, provide them with money and staff - and commit them
- Intensify cooperation with Brandenburg (wind energy, housing and mobility, ...), dovetailing in the implementation of all relevant plans and strategies
- Continue to intensively involve citizens and stakeholders & communicate previous participation more strongly (e.g. results of Climate Citizens' Council).

Thank you very much.

Prof. Dr Bernd Hirschl  
IÖW - Institute for Ecological  
Economy Research, Berlin  
and BTU Cottbus-Senftenberg

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# Current studies of the IÖW for Berlin and Brandenburg (selection)



- **Making Berlin Paris-compliant**
  - [Study commissioned by the State of Berlin / SenUVK](#)
- **Heating strategy for Berlin**
  - [Study commissioned by the State of Berlin / SenUVK](#)
- **Projects within the framework of the Ecornet project "[Berlin in Transition](#)"**
  - funded by Land Berlin/ RB, Senate Chancellery - Science and Research
  - Individual projects
    - [Social-ecological aspects of the heat transition](#)
    - [StromNachbarn - Tenants' electricity perspectives in Berlin](#)
    - Alternative Economics in Berlin
- **Use of the Berlin natural gas storage facility for methanation and H2 storage**
  - [Study](#) funded by the BMWi
- **[Climate Plan Brandenburg](#)**
  - [Study](#) commissioned by the State of Brandenburg / MLUK
- **See also: [www.ioew.de](http://www.ioew.de) and <http://www.b-tu.de/fg-energieversorgungsstrukturen/>**