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PhD Conference: Sustainable environmental politics and economy

Local Involvement in the Energy Transition

Options for Financial Participation of Stakeholders

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This presentation is based on joint research activities with Prof. Dr. Thorsten Beckers, Albert Hoffrichter, Daniel Weber, Johannes Heurich and Nils Bieschke (all WIP) as well as legal researchers Simon Schäfer-Stradowsky and Benjamin Boldt (both IKEM). The presented (intermediary) results derive from the project "DZ-ES" funded by the BMBF.

Agenda

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Current situation and research questions regarding RES projects (PV and especially onshore wind) (1/3)

- Germany has very ambitious RES targets and plans to deploy especially onshore wind farms and photovoltaic (PV) power plants
- Local opposition against new RES projects (mainly wind) due to negative external effects (disamenities) and other reasons (cf. Becker et al. 2015), this may lead to an increase of costs
- Lack of specific rules regarding the coordination between property owners and investors may also lead to an increase of costs
- Questionable distribution of rents between locally affected people (residents), investors and property owners as well as consumers
- Currently in Germany virtually no specific mandatory policies are in place to tackle above-mentioned problems, however the implementation of such is discussed:
  - Such policies are already applied in other energy sectors (like the mining sector) and also in other countries (e.g. Denmark)
  - The implementation is discussed on federal state level in Germany (Mecklenburg-Vorpommern)
  - A variety of voluntary instruments for the financial participation of affected people and coordination of property owners has been developed by investors/project developers

Current situation and research questions regarding RES projects (PV and especially onshore wind) (2/3)

BACK UP

(Potential) Negative external effects of wind turbines:

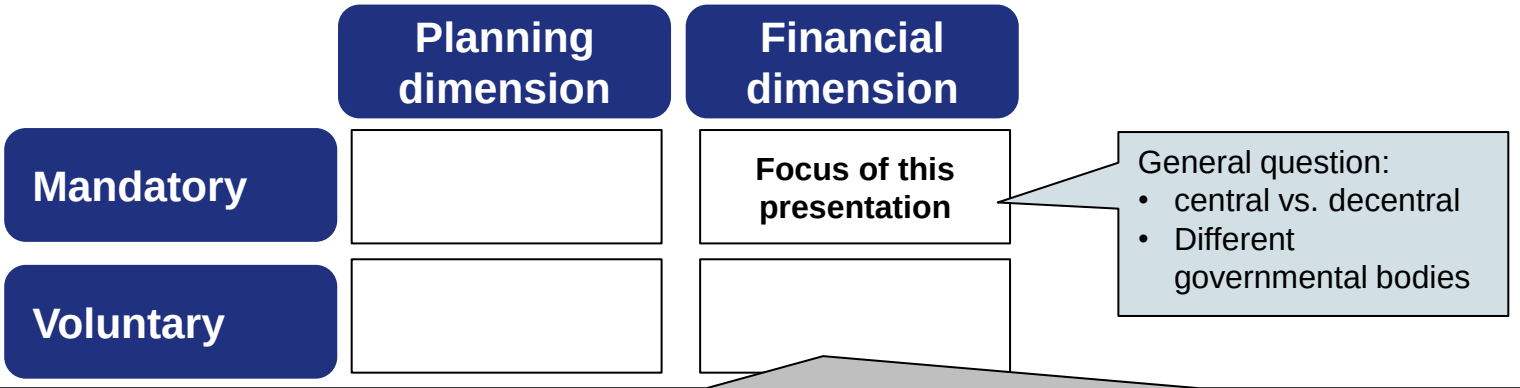
Negative external effect	Evidence of Existence	Examples of Literature / Comment
General disamenity	✓	Krekel/Zerrahn 2015
Not-in-my-backyard (NIMBY)	?	Wolsink 2005
Noise nuisance	✓	Huebner/Pohl 2015, Pedersen et al. 2009
Loss of property value	?	Jensen et al. 2014, Atkinson-Palombo/Hoen 2014
Loss of land	✓	Definitively exists, but owners of suitable land are usually (over)compensated
Disadvantages for nature (e.g. death of birds, bats)	✓	Lehnert et al. 2014
Negative effects on tourism	x	Huebner/Pohl 2014

Current situation and research questions regarding RES projects (PV and especially onshore wind) (3/3)

Research questions

- In which ways and to what extent can a higher degree of local or public financial participation in RES projects help to overcome above-mentioned problems?
- Which instruments exist to achieve local or public financial participation?
- How could they be implemented?
- How to reduce coordination costs?

Classification of instruments for participation

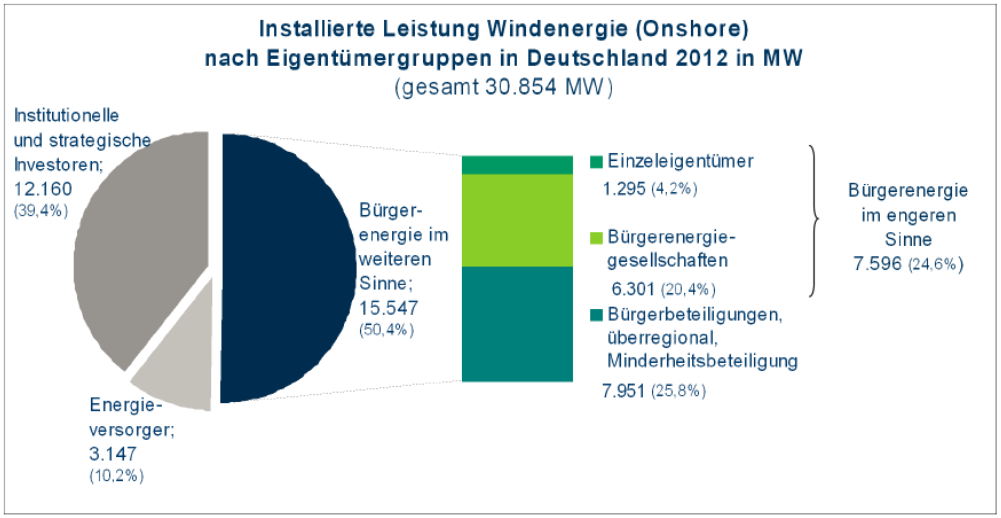


There are various instruments for financial particpation and coordination rules applied voluntarily:
- Examples for financial participation: Contribution of capital (external equity, loans), donations to public institutions
- Examples for coordination rules: Pooling contracts with property owners; payments for land not used

Examples for voluntary financial participation: Contribution of capital (internal/external equity, loans)

BACK UP

Contribution of capital:



trend:research GmbH (2013): *Definition und Marktanalyse von Bürgerenergie in Deutschland*

Donations to the public:

Senftenberg 30. Oktober 2014, 02:56 Uhr Vorlesen | Drucken | Kommentare (0)

In Schipkau gibt es Kohle für den Wind

Anträge für Auszahlung des Bürgerbonus am Wochenende in allen Briefkästen

SCHIPKAU Schipkau ist am Ziel. Der Bürgerbonus wird ausgezahlt. Gemeindeväter und Investor lassen die 6900 Einwohner am Windgeschäft vor ihren Haustüren ordentlich mitverdienen. Schipkau liegt damit landesweit hart am Wind. In ganz Brandenburg gibt es nichts Vergleichbares.

Lausitzer Rundschau (2014): *In Schipkau gibt es Kohle für den Wind*

Methodological approach and system of objectives

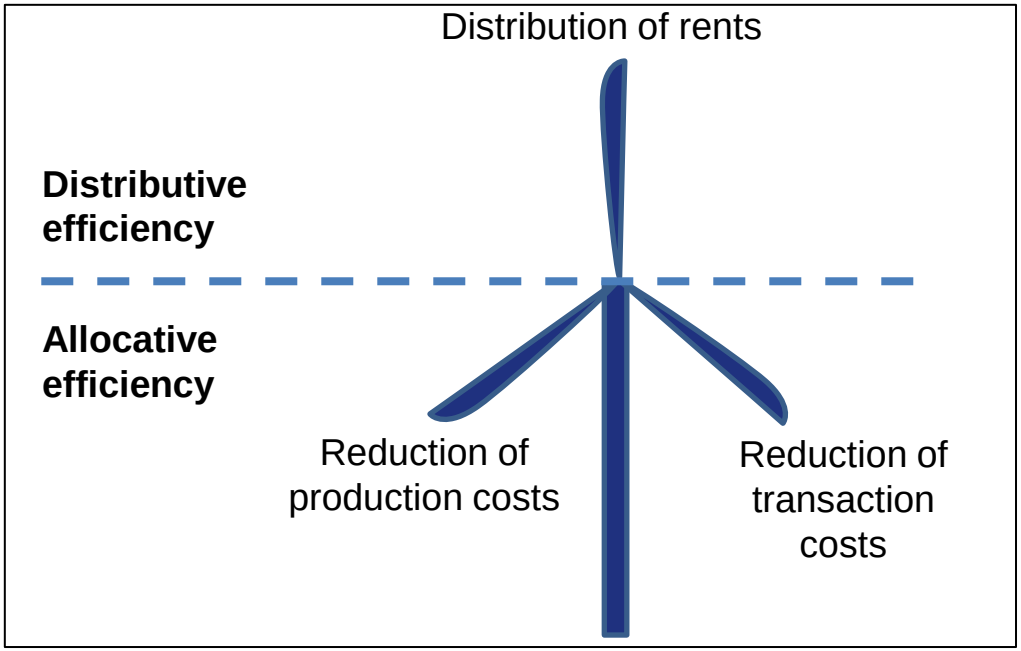
Methodological approach

- New Institutional Economics (in addition the findings of legal, engineering and political sciences)
  - Dealing with the analysis of institutional mechanisms and their impact on the coordination of transactions and/or coordination of actors, by considering the characteristics of transactions, actors and markets as well as the institutional setting
  - Special focus on the transaction cost theory (cf. Williamson 1990)
- (Welfare Economics, Industrial Organization)

System of objectives

- Effectivity (achievement of RES targets)
- Cost efficiency
  - Consumer perspective
  - Welfare perspective

→ Distributive and allocative dimensions



Agenda

Relevant Characteristics of Markets, Transactions and Actors
Technical system (onshore wind and PV)

Technical system of intermittent RES (onshore wind and PV)

- Compared to conventional power plants: Smaller projects (less investment costs)
- Particularly high capital intensity (high specific investment costs, low operation costs)

PV installations

- Relatively low risk technology, reliable forecasts on energy yield
- Small negative externalities
- Types:
  - Ground-mounted PV installations: Many property owners/public entities involved; project duration: 1-2 years
  - Roof-top PV installations: Mostly single property owner; project duration: several weeks

Onshore wind energy projects

- Higher risks concerning project development and construction as well as production (wind yield)
- Relatively high negative externalities
- Many property owners and public entities involved
- Project duration: 2-5 years

Relevant Characteristics of Markets, Transactions and Ac

Capacity mechanism for refinancing RES-projects

BACK UP

Possibilities to refinance investments in RES capacities

- Energy-only market ("EOM") → Not advisable for intermittent RES capacities
- Capacity mechanisms:
  - Basics:
    - Capacity mechanisms in order to refinance investments in renewable energy capacities and thus reducing production and transaction costs (cf. Beckers/Hoffrichter 2014)
    - Objective: Reducing production and transaction costs, in particular capital costs
  - Design options:
    - Energy or capacity
    - Full cost-covering or partial cost-covering
    - Special case: quota system/certificates (→ not advisable for intermittent RES)
  - Types: Feed-in tariff (FIT); market premium (FIP; ex ante, ex post)

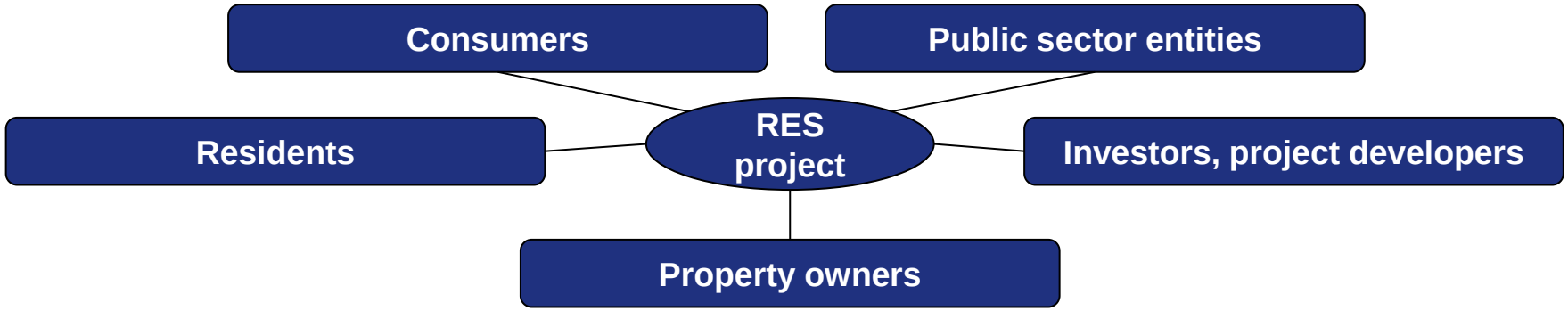
Current capacity mechanism in Germany for RES

- Modified FIT (sliding market premium) ensuring predictable revenues - with possible excess return
- Auction system for ground-mounted PV installations in place, implementation for wind is being discussed

Relevant Characteristics of Markets, Transactions and Actors

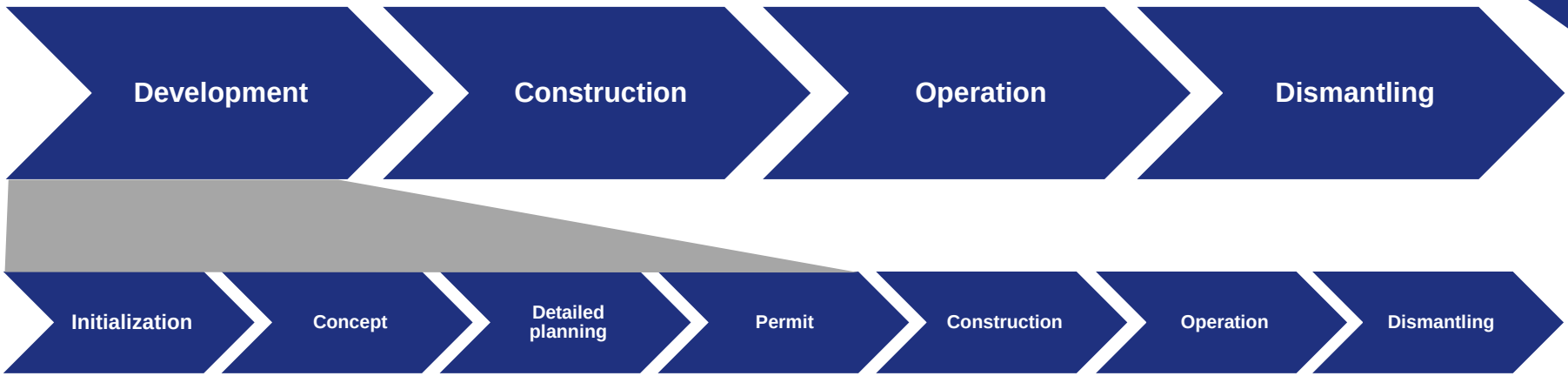
Stakeholders and stages of RES-projects

Stakeholders considered in the analysis:



Overview over the stages of a wind energy project:

BACK UP



Relevant Characteristics of Markets, Transactions and Ac

Overview over German spatial planning system

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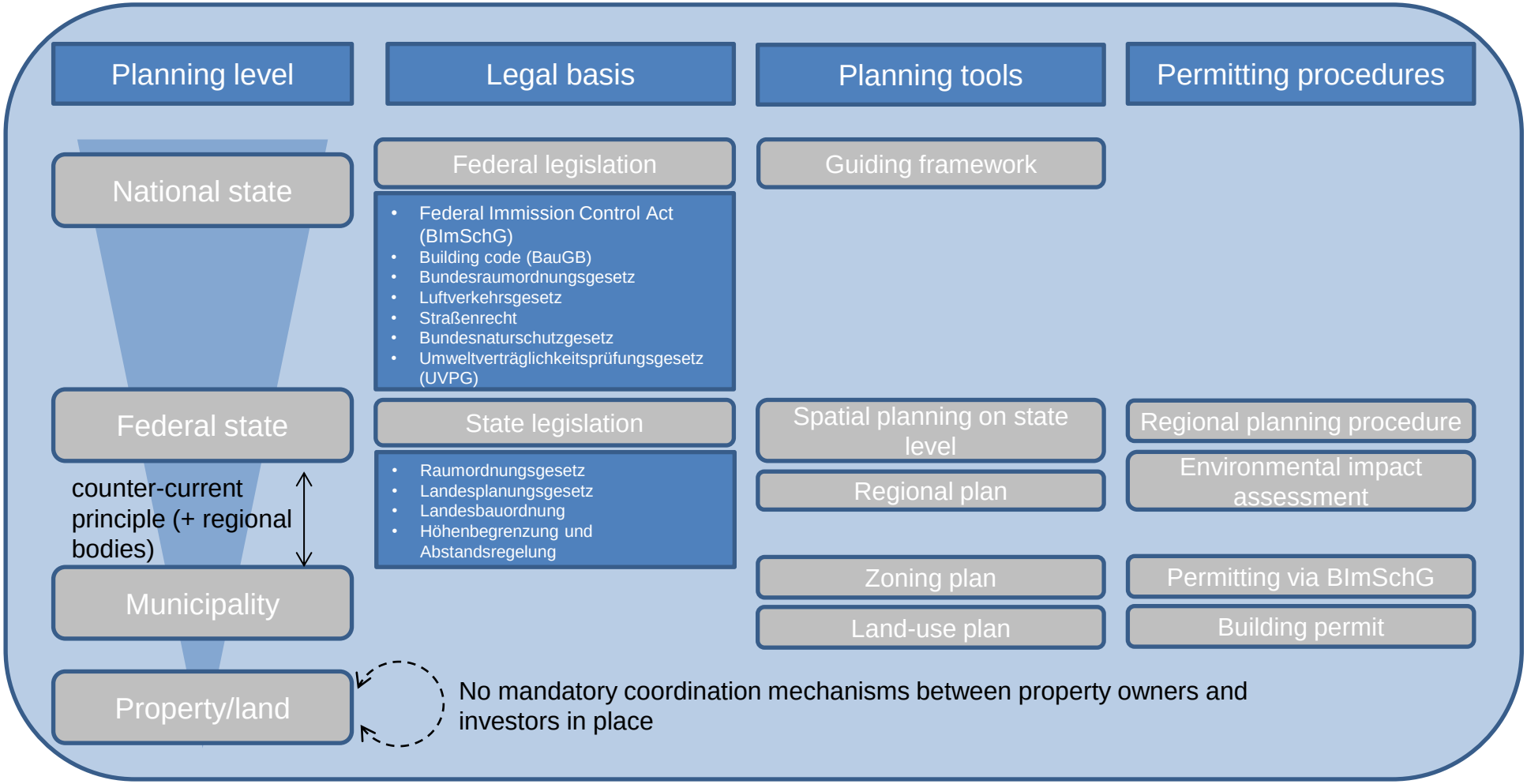


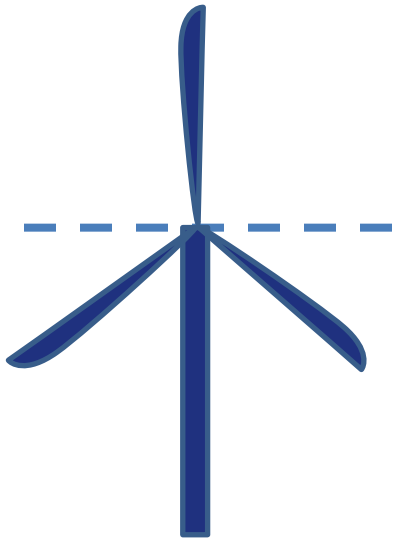
Most of the negative external effects of wind turbines (for residents and/or nature) are taken into consideration (to a certain extent) in the spatial planning process (zoning plans) and permitting process (via BImSchG)

Agenda

1) Introduction
   - 1.1) Current Situation and Research Questions
   - 1.2) Methodological Approach and System of Objectives
2) Technical System and Institutional Setting in Germany
3) Options for Financial Participation
   - 3.1) Motives for Financial Participation and General Overview of Options
   - 3.2) Overview of Options for Financial Participation
   - 3.3) Analysis of Financial Participation via Contribution of Capital
4) National and International Examples
5) Conclusion and Outlook

Options for Financial Participation
Motives for Financial Participation

Potential distributive motives



Potential allocative motives

- Compensation for disadvantages caused by local externalities
- Limitation of rents (especially for property owners)
- Allocation of rights to exploit the energy from natural resources (if intended political objective)

Interdependencies between distributive and allocative measures

- Addressing issues of property owners‘ market power as well as coordination issues between property owners
- Addressing coordination issues between property owners and investors/project developers

Options for Financial Participation
General Overview of Design Options

Design elements for financial participation

Type of participation:
- Contribution of capital
  - Right or Option
  - Public claim (concessions)
  - Public property as default
- Direct financial payments (or comparable benefits)
  - Direct payments
  - Subsidized loans/funds

Level of participation (depending on):
- Success of the project
  - Electricity yield
  - Revenues, profit
- Negative externalities, e.g.
  - Noise and visual nuisance
  - Loss of land
  - Generic: e.g. size of turbine

Temporal design of participation:
- Stage of project
- Lump-sum payment vs periodic

Entitled beneficiaries:
- Residents
- Public entities
- Property owners

Interdependencies between the design elements themselves, the system of spatial planning in a multi-level governance and the refinancing system to be considered

Disappropriation + compensation

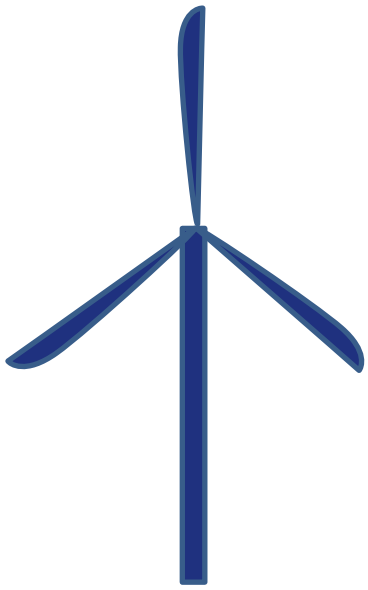
Payment limitations

Coordination rules

Possible rules for the coordination of the use of land

Options for Financial Participation

Overview of Motives, Options and Stakeholders



Potential distributive motives

Potential allocative motives

Motives

- **Allocation of exploiting rights**
- **Compensation for disadvantages**
- **Limitation of rents**
- **Reduction of market power issues (property owners)**
- **Reduction of coordination problems**
  - **between property owners**
  - **between property owners and investors**

Design elements

- Contribution of capital
  - Option for the contribution of capital
  - Concessions
  - Only public property possible
- Direct financial payments (or comparable benefits)

- Level depending on
  - Success of the project
  - Negative externalities

- Temporal design of participation

- Disappropriation + compensation
- Payment limitations
- Coordination rules

Stakeholders/ Beneficiaries

- **Consumers (NfD)**
- **Public sector entities**
  - National state
  - Federal state
  - Regional entity
  - Local municipality
- **Residents**
- **Property owners**
- **Investors**

Options for Financial Participation

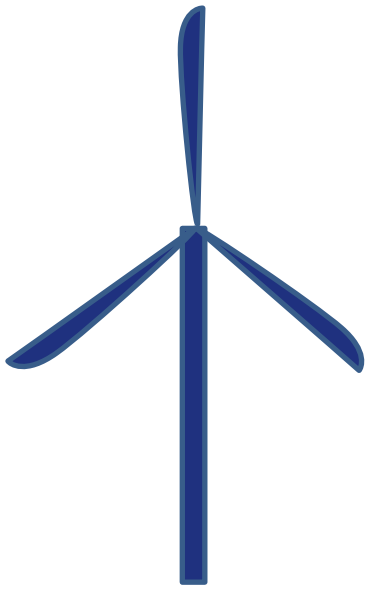
Analysis of Financial Participation via Contribution of Capital

	Equity		Debt	
	Internal Equity	**External Equity**	**Loan**	**Bond**
Characteristics	• (Initial) Sponsor of the project • Bearing of high risks • Requires high knowledge about the technology and the possibility to monitor	• Contribution of capital to an already existing project • Bearing of risks • Requires knowledge about the technology and the possibility to monitor	• Contribution of capital to an already existing project • Bearing of lower risks • Requires lower level of knowledge and a lower possibility to monitor	
Suitability	• For investors with low risk aversion (public or institutional) • For consumers in smaller projects, if uncomplex support scheme (e.g. FIT) + “low-tech” technology (e.g. PV)	• Suitable for investors with higher risk aversion • Transaction costs to be considered when involving many (small) investors	• Suitable for investors with very high risk aversion • Transaction costs to be considered when involving many (small) investors	

Effects on acceptance	• Perhaps higher acceptance if project is owned by public entity (and/or residents)
	• Problems:
	  • Determination of price/value of project
	  • Principal-agent-problems between sponsor and external investors
		• Good reason for voluntarily offering financial participation in order to reduce local opposition; could be effective if these offers are comprehensible for the target group and feature higher rates of return than comparable investments
		• Too low rates of return, uneven distribution of rents, non-transparent options to participate (e.g. hybrids of equity/debt) and/or lack of capital to invest may even lower acceptance (Cf. chapter 9 of Beckers et al. 2014)		

Options for Financial Participation

Possibilities for instruments in Germany (green-field approach)



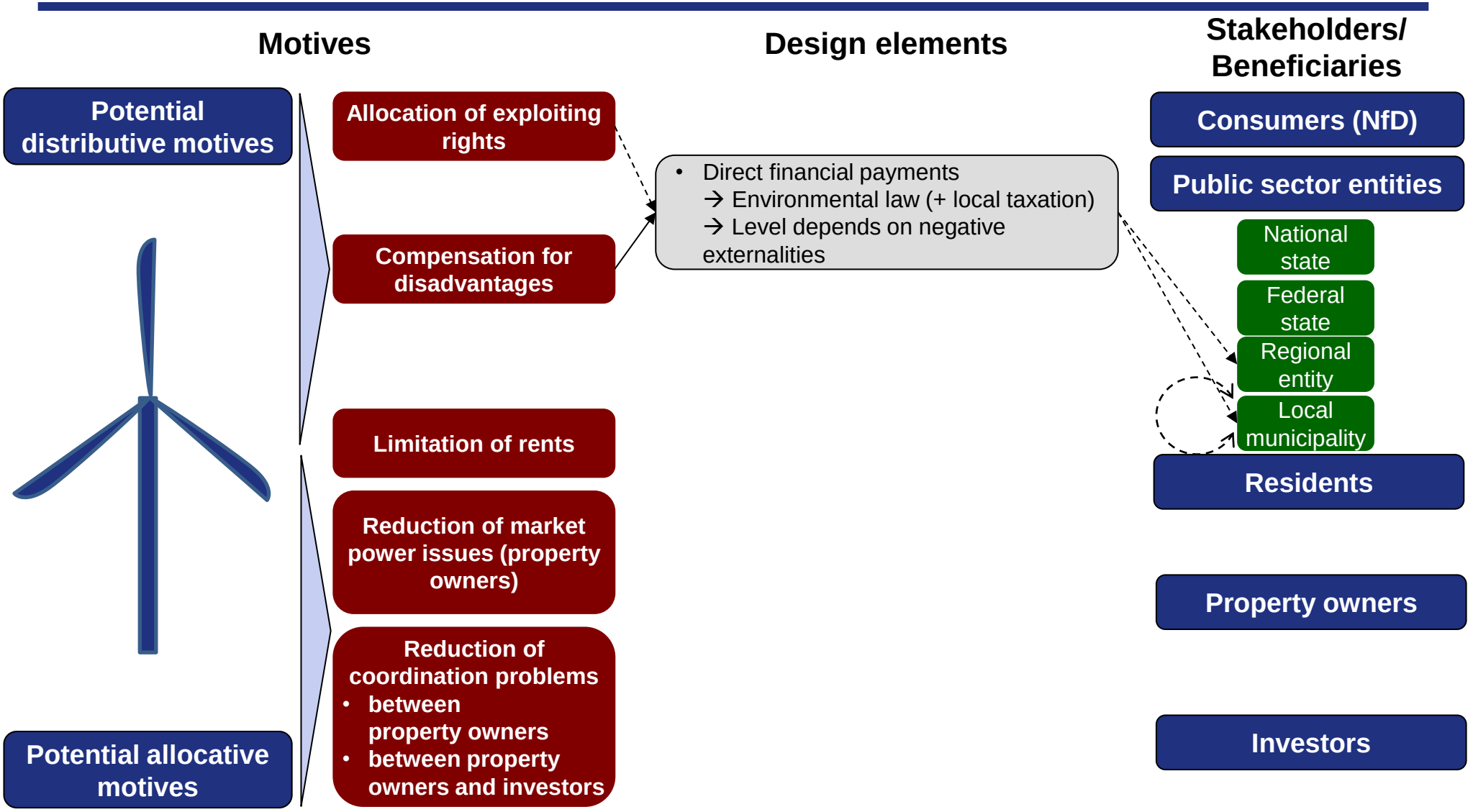
Motives	Design elements	Stakeholders/ Beneficiaries
Potential distributive motives		
Allocation of exploiting rights	• Concessions for onshore wind • Option for the contribution of capital (depending on revenues	**Consumers (NfD)** **Public sector entities**
Compensation for disadvantages	• Non-financial benefits (“recreational sites”), level depends on externalities • Direct financial payment (“loss of value”), level depends on externalities	National state Federal state Regional entity Local municipality **Residents**
Limitation of rents		
Reduction of market power issues (property owners)		**Property owners**
Reduction of coordination problems • **between property owners** • **between property owners and investors**	Payment limitations and coordination rules	**Investors**
Potential allocative motives		

Agenda

Note: Superficial portrayal!

National and International Examples

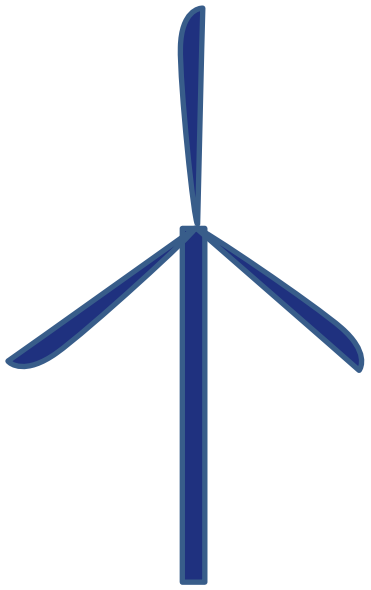
Mandatory rules for Financial Participation in RES projects in Germany



Note: Superficial portrayal!

National and International Examples

Mandatory rules in German Mining Law



Potential distributive motives

Potential allocative motives

Motives

- **Allocation of exploiting rights**
- **Compensation for disadvantages**
- **Limitation of rents**
- **Reduction of market power issues (property owners)**
- **Reduction of coordination problems**
  - **between property owners**
  - **between property owners and investors**

Design elements

- Direct financial payments
  → Level depends on revenues and used land
- Direct financial payments (and comparable benefits)
  → Level depends on negative externalities and revenues
- Disappropriation + compensation

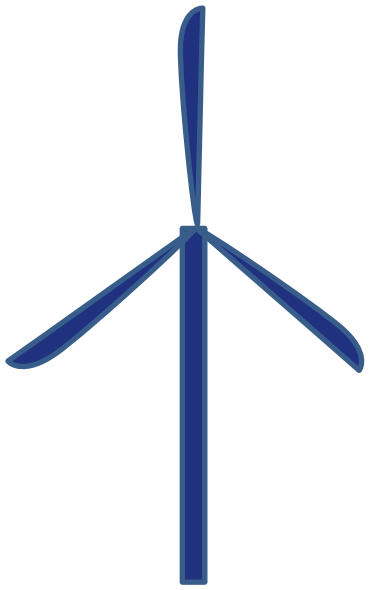
Stakeholders/ Beneficiaries

- **Consumers (NfD)**
- **Public sector entities**
  - National state
  - Federal state
  - Regional entity
  - Local municipality
- **Residents**
- **Property owners**
- **Investors**

Note: Superficial portrayal!

National and International Examples

Mandatory rules in Danish Renewable Energy Act



Potential distributive motives

Potential allocative motives

Motives

- **Allocation of exploiting rights**
- **Compensation for disadvantages**
- **Limitation of rents**
- **Reduction of market power issues (property owners)**
- **Reduction of coordination problems**
  - **between property owners**
  - **between property owners and investors**

Design elements

- Concessions for offshore wind and water (not onshore wind)
- Option for contribution of capital, price of shares depends on revenues
- Non-financial benefits (“recreational sites”), level depends on externalities
- Subsidized loans (“guarantee fund” for project development)
- Direct financial payment (“loss of value”), level depends on externalities

Stakeholders/ Beneficiaries

- **Consumers (NfD)**
- **Public sector entities**
  - National state
  - Federal state
  - Regional entity
  - Local municipality
- **Residents**
- **Property owners**
- **Investors**

Agenda

Conclusion

- **There exists a potential to reduce overall costs of the deployment of RES projects by implementing instruments for financial participation and coordination rules.**

- **Distribution of rents could be considered as “unfair”. There are many reasons for financial participation of residents and public entities from a distributive perspective.**

- **There exist several forms of financial participation and coordination rules with various design features. Considering the characteristics of RES projects as well as of stakeholders the potential suitability of these forms differs heavily. For example a financial participation of residents via contribution of capital is not always the best option due to their risk aversion and the problems of value determination. Other options like direct payments may be very effective as well.**

Outlook

- **Detailed evaluation of existing instruments in other sectors on a national level and in RES-projects on an international level from a legal and economic perspective.**

- **Detailed analysis of above-mentioned options of financial participation considering possible refinancing mechanisms and the spatial planning system in a multi-level governance.**

- **Evaluation of the two empirical surveys in order to investigate the preferences of German citizens in the context of ownership and compensation for wind energy projects - on a national level and for residents living close to wind turbines.**

Contact

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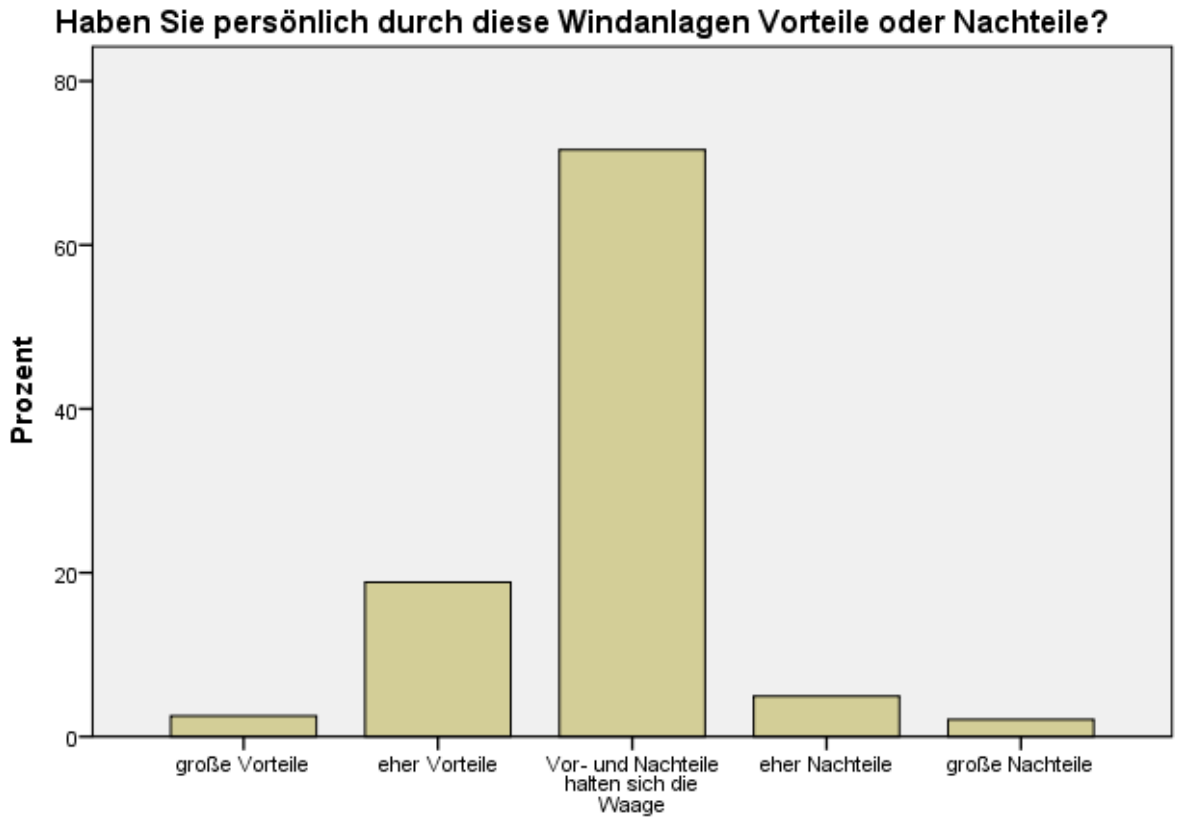
Experienced advantages and/or disadvantages of consumers regarding onshore wind turbines

BACK UP

- **Residents do rather see advantages in the construction of onshore wind turbine; no real perception of disadvantages**



Experienced advantages and/or disadvantages of consumers regarding onshore wind turbines

BACK UP

- **Highest disamenity for residents are caused by issues regarding aesthetics/viewshed**

Useful/Referenced Literature

Slide 4:

- Becker, Sören; Bues, Andrea; Naumann; Matthias (2014): *Die Analyse lokaler energiepolitischer Konflikte und das Entstehen neuer Organisationsformen. Theoretische Zugänge und aktuelle Herausforderungen*

Slide 5:

- Krekel, Christian; Zerrahn, Alexander (2015): *Sowing the Wind and Reaping the Whirlwind? - The Effect of Wind Turbines on Residential Well-Being*
- Wolsink, Maarten (2005): *Wind power implementation: The nature of public attitudes: Equity and fairness instead of „backyard motives“*
- Devine-Wright, Patrick (2005): *Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy*
- Hübner, Gundula; Pohl, Johannes (Fachagentur Windenergie an Land) (2015): *Mehr Abstand – mehr Akzeptanz? Ein umweltpsychologischer Studienvergleich*
- Pedersen, Eja; van den Berg, Frits; Bakker, Roel; Bouma, Jelte (2009): *Response to noise from modern wind farms in The Netherlands*
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- Hübner, Gundula; Pohl, Johannes (2014): *Akzeptanz der Offshore-Windenergienutzung*

Useful/Referenced Literature

Slide 7:

- trend:research GmbH (2013): *Definition und Marktanalyse von Bürgerenergie in Deutschland*
- Yildiz, Özgür (2014): *Financing renewable energy infrastructures via financial citizen participation – The case of Germany*
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Slide 8:

- Williamson, Oliver E. (1985): *The economic institutions of capitalism : firms, markets, relational contracting*

Slide10:

- Bundesministerium für Wirtschaft und Energie (BMWi) (2015): *Marktanalyse Photovoltaik-Dachanlagen*
- BMWi (2015): *Marktanalyse Windenergie an Land*
- Leipziger Institut für Energie GmbH (2015): *Marktanalyse Windenergie an Land*
- Klessmann, Corinna; Wigand, Fabian; Gephart, Malte; von Blücher, Felix; Kelm, Tobias; Jachmann, Henning; Ehrhart, Karl-Martin; Haufe, Marie-Christin (2014) *Ausgestaltung des Pilotausschreibungssystems für Photovoltaik-Freiflächenanlagen*
- Pietrowicz, Marike; Quentin, Jürgen (2015): *Dauer und Kosten des Planungs- und Genehmigungsprozesses von Windenergieanlagen an Land*
- Rehfeldt, Knud; Wallasch, Anna-Kathrin; Lüers, Silke (2013): *Kostensituation der Windenergie an Land in Deutschland*

Excerpt of Useful Literature/Referenced Literature

Slide 11

- Beckers, Thorsten; Hoffrichter, Albert (2014): *Eine (institutionen-)ökonomische Analyse grundsätzlicher und aktueller Fragen bezüglich des institutionellen Stromsektordesigns im Bereich der Erzeugung*
- Held, Anne; Ragwitz, Mario; Gephart, Malte; de Visser, Erika; Klessmann, Corinna (2014): *Design features of support schemes for renewable electricity*
- Tisdale, Matthew; Grau, Thilo; Neuhoff, Karsten (2014): *Impact of Renewable Energy Act Reform on Wind Project Finance*

Slide 18:

- Beckers, Thorsten; Bieschke, Nils; Lenz, Ann-Katrin; Heurich, Johannes; Kühling, Jürgen; Hertel, Wolfram; Schäfer, Dorothea (2014): *Alternative Modelle für die Organisation und die Finanzierung des Ausbaus der Stromübertragungsnetze in Deutschland – Eine (institutionen-)ökonomische Analyse unter Einbezug juristischer und technisch-systemischer Expertise*
- Warren, Charles R.; McFadyen (2008): Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland

Slide 21:

- Germany, Federal Immission Control Act (BImSchG)

Slide 22:

- Germany, Bundesberggesetz (BBergG) (2013)

Slide 23:

- Denmark, Promotion of Renewable Energy Act (2008)