

PROMOTING COMMUNITY IN THE CONTEXT OF SUSTAINABLE
DEVELOPMENT @Kolping University of Applied Sciences:

EVALUATING CONCEPTS OF LOCAL HEAT SUPPLY SYSTEMS USING SUSTAINABILITY INDICATORS

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Grafik: WERNERWERKE GbR, Berlin.

Förderkennzeichen: 03EN3007

kowa

...die Wärmewende im Quartier gestalten

Agenda

Project KoWa

Sample concepts

Sustainability assessment

Project KoWa

Municipal heat transition

KoWa: Goals, methodology and partners

Goals

- **Participants and challenges** in typical municipal situations
- **Analysis and development:** high-integrated, municipal, local heat supply systems
- **Evaluation: technological, economic, legal and social requirements**
- Transferable project development and implementation guides
(Basis: local concepts)

Team

Practice and science:

- Energy technology and economy
- Technical planning and implementation
- Public and private energy law
- social science and sustainability

Cluster





Grafik: WERNERWERKE GbR, Berlin.

Sample concepts

Short description of the sample concepts for KoWa-City

Ideal-typical heat supply solutions for KoWa-Stadt (fictitious example)

Compact Gas condensing, single firing
<ul style="list-style-type: none">- Gas condensing value (individual firing), in small apartment buildings, state of the art: 1 boiler- GEMIS-Process: Gas-Heizung-Brennwert-DE-2020 (gas-heating-condensing-DE-2020)
Gas operating heating grid
<ul style="list-style-type: none">- Grid set up in already sealed settlement area- Redundant design with 2nd boiler- GEMIS-Process: Netz\Nahwärme-Gas-BHKW-DE-2015/en (grid\local-heat-mix-gas-ICE-DE-2015/en)
70% Solar thermal system + 30% Gas
<ul style="list-style-type: none">- Grid with 70% Solar thermal plus 30% natural Gas- ST systems on large roof areas, pit store- GEMIS-Process: Netz\Wärme-de-KoWa-70ST-30Gas
100% Pellets
<ul style="list-style-type: none">- 100% Pellets from residues- For small apartment building, state of the art: 1 boiler- GEMIS-Process: Holz-Pellet-Holz-wirtsch.-Heizung-10 kW-DE-2020 (Endenergie) (wood-pellet-wood-industry-heating-10 kW-DE-2020 (end energy))
Future grid
<ul style="list-style-type: none">- 25% ST + 60% alternative heat source/ waste heat+ 15% Pellets/ Biomass (peak load)- Electricity: 50% local PV,- Grid set up in already sealed settlement area- GEMIS Prozess: 'Netz\Wärme-de-KoWa-Zukunft

Sustainability assessment of the developed concepts

Methodological foundations

Results for fictitious concepts

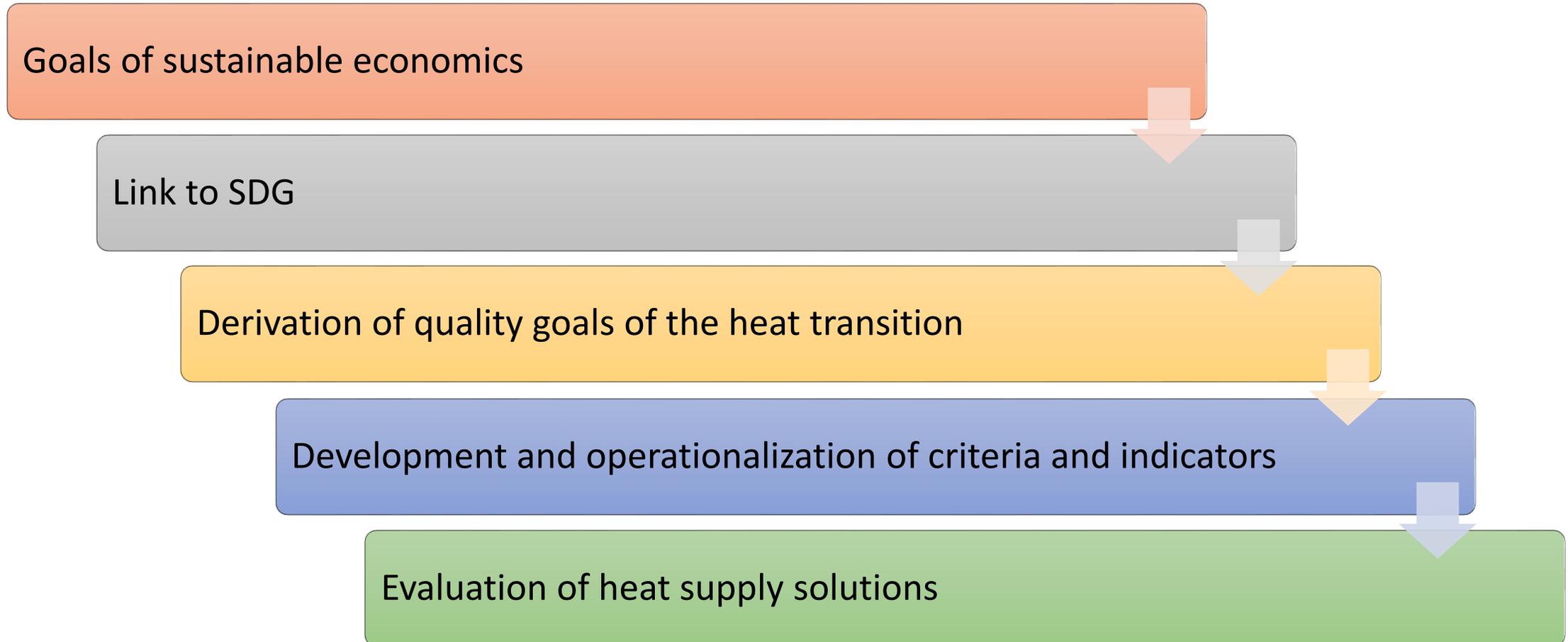
Target System of a sustainable economy

Ecological	Economic	social
Limit global warming to 1,5°C	Decent work: secure jobs, no vulnerable employment	Good governance
Nature compatibility	Satisfaction of basic needs: with sustainable products	Social security, no poverty, controllable demography
Sustainable use of renewable resources	Price stabilities, stabilizing financial flows, low concentration, high efficiency	Equal opportunities, distributive justice
Sustainable use of non-renewable resources	Foreign trade balance, high level of self-sufficiency, reduction of dependencies	Conflict avoidance
Healthy life conditions	State budget,	No unacceptable risks

SUSTAINABLE DEVELOPMENT GOALS



Procedure



Goals and indicators ecological dimension

Challenge	Goal	Target indicator
Ecological Dimension		
Global warming	Limit global warming	GHG-Emissions in $\text{kgCO}_{2\text{eq}}/\text{MWh}$
material requirement	Less primary raw materials	Cumulated material requirement in kg/MWh
Overuse of renewable resources	Sustainable use of renewable resources	Impact on regeneration rate compliance
Endangering human health	Healthy life conditions	Pollutant emissions in $\text{kgSO}_{2\text{eq}}/\text{MWh}$
Destruction of eco-systems, biodiversity/lands. diversity	Nature compatability	Impact on nature compatibility

Goals and indicators economic dimension

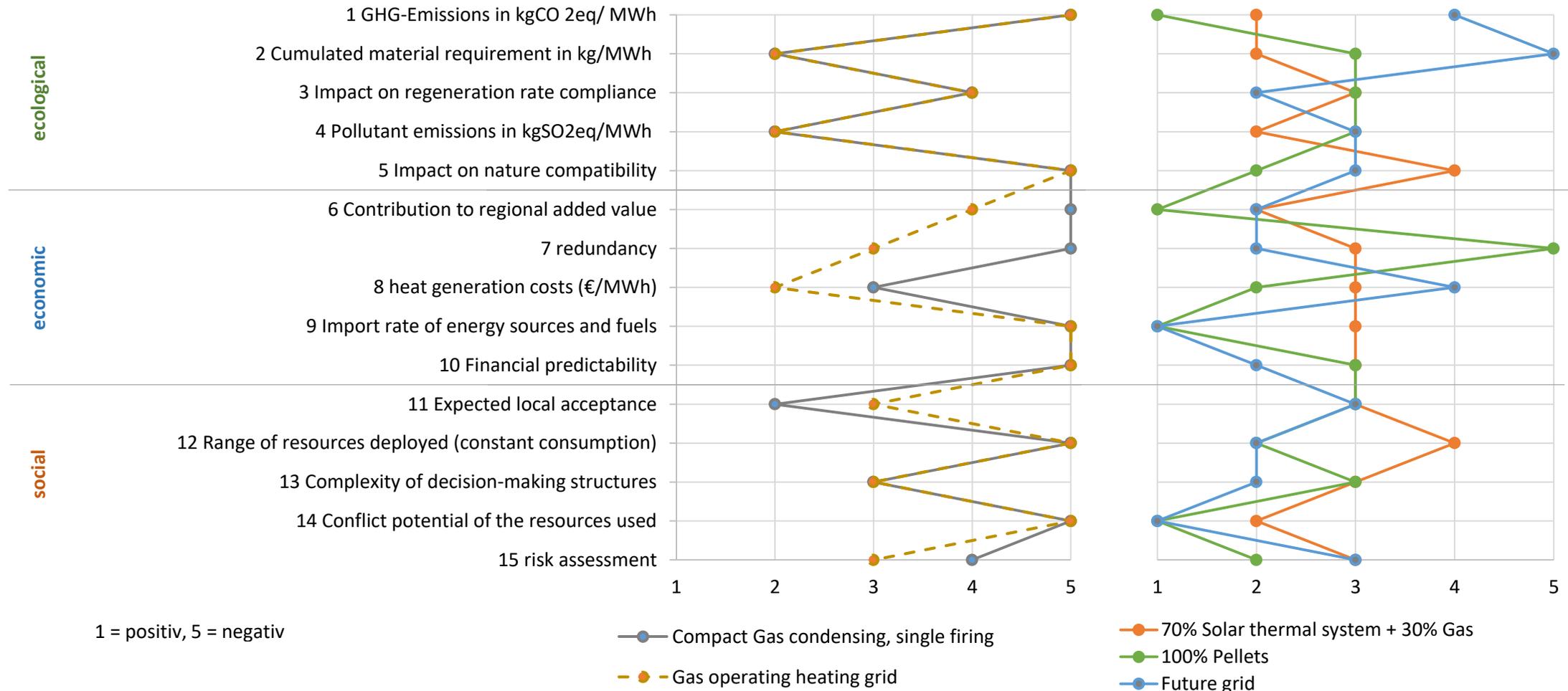
Challenge	Goal	Target indicator
Economic Dimension		
Negative developments on the job market	Decent work: secure jobs, no vulnerable employment	Contribution to regional added value
Lack of sustainable products to satisfy basic needs	Uninterrupted security of supply/ system stability	redundancy
Instability of monetary value and on fin. markets (depreciation), external costs	Low heat generation costs	heat generation costs (€/MWh)
External economic imbalances, underdevelopment	Low foreign trade dependency	Import rate of energy sources and fuels
Overindebtedness, lack of provision of merit goods	Financial ability to act	Financial predictability

Goals and indicators

social dimension

Challenge	Goal	Target indicator
Social Dimension		
Undesirable developments in business, politics	Good Governance	Expected local acceptance
Uncertainty of long term energy supply	Long term energy supply	Range of resources deployed (constant consumption)
Centralization of supply structures	Appropriate decentralization and participation	Complexity of decision-making structures
Violent conflicts	Conflict avoidance	Conflict potential of the resources used
Technological risks (z.B. nuclear, Fracking)	Avoidance of risky technologies	risk assessment

Sustainability assessment of the developed concepts



Assessment of GHG

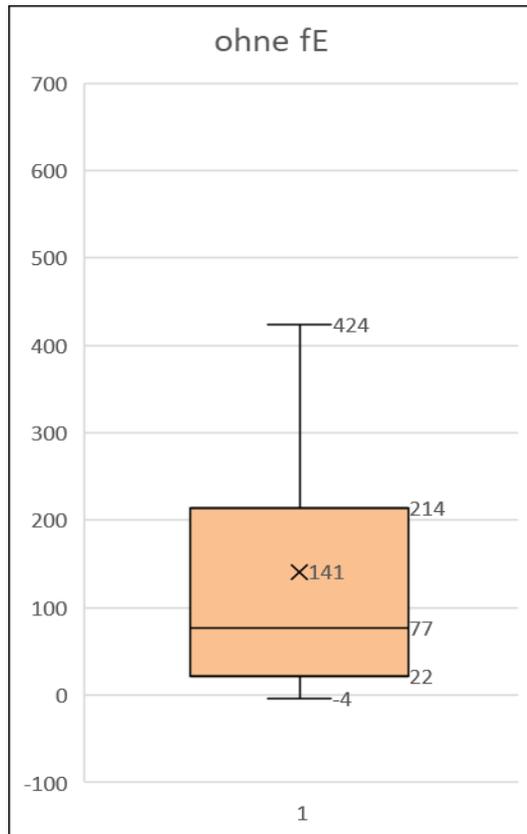


Abbildung 1: Boxplot der GEMIS-Prozessdaten in kg CO_{2eq}/MWh für die spezifischen Emissionen der Wärmeversorgungstechnologien.

Challenge	Goal	Target indicator
Ecological Dimension		
Global warming	Limit global warming	GHG-Emissions in kgCO _{2eq} / MWh

Assessment	Meaning: The specific CO _{2eq} -Emissions of the supply option are	
	greater or equal	(but) smaller than
Stufe 1	-	50 kg CO _{2eq} / MWh
Stufe 2	50 kg CO _{2eq} / MWh	100 kg CO _{2eq} / MWh
Stufe 3	100 kg CO _{2eq} / MWh	150 kg CO _{2eq} / MWh
Stufe 4	150 kg CO _{2eq} / MWh	200 kg CO _{2eq} / MWh
Stufe 5	200 kg CO _{2eq} / MWh	-

Spotlight 1: GHG-Emissions in kg CO_{2eq}/MWh

Ecological Dimension

<i>No.</i>	1
<i>Challenge</i>	Klimaerwärmung
<i>Goal</i>	Klimaneutralität
<i>Indicator</i>	GHG-Emissions/MWh

<u>Compact Gas condensing, single firing:</u>	232 kg / MWh	Rating	
<u>Gas operating heating grid:</u>	204 kg / MWh	Rating	
<u>70% Solarthermie + 30% Gas+Grid :</u>	71 kg / MWh	Rating	
<u>100% Pellets:</u>	19 kg / MWh	Rating	
<u>Future Grid (current electricity mix):</u>	158 kg / MWh	Rating	

Assessment of Redundancy

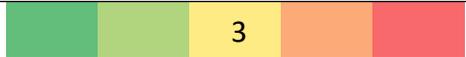
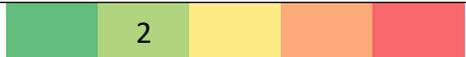
Rating	Description
Stufe 1	very high level of resilience, Failure of any heat source of more than three can be compensated.
Stufe 2	high level of resilience the failure of one of three heat sources can be compensated by another, possibly by emergency units.
Stufe 3	The short-term security of supply is formally given. the failure of <u>one of two heat sources</u> can be compensated.
Stufe 4	The short-term security of supply is not completely given. If a heat source fails, the supply can only be partially guaranteed, possibly with noticeable restrictions.
Stufe 5	Uninterrupted supply cannot be guaranteed .

Spotlight 2:

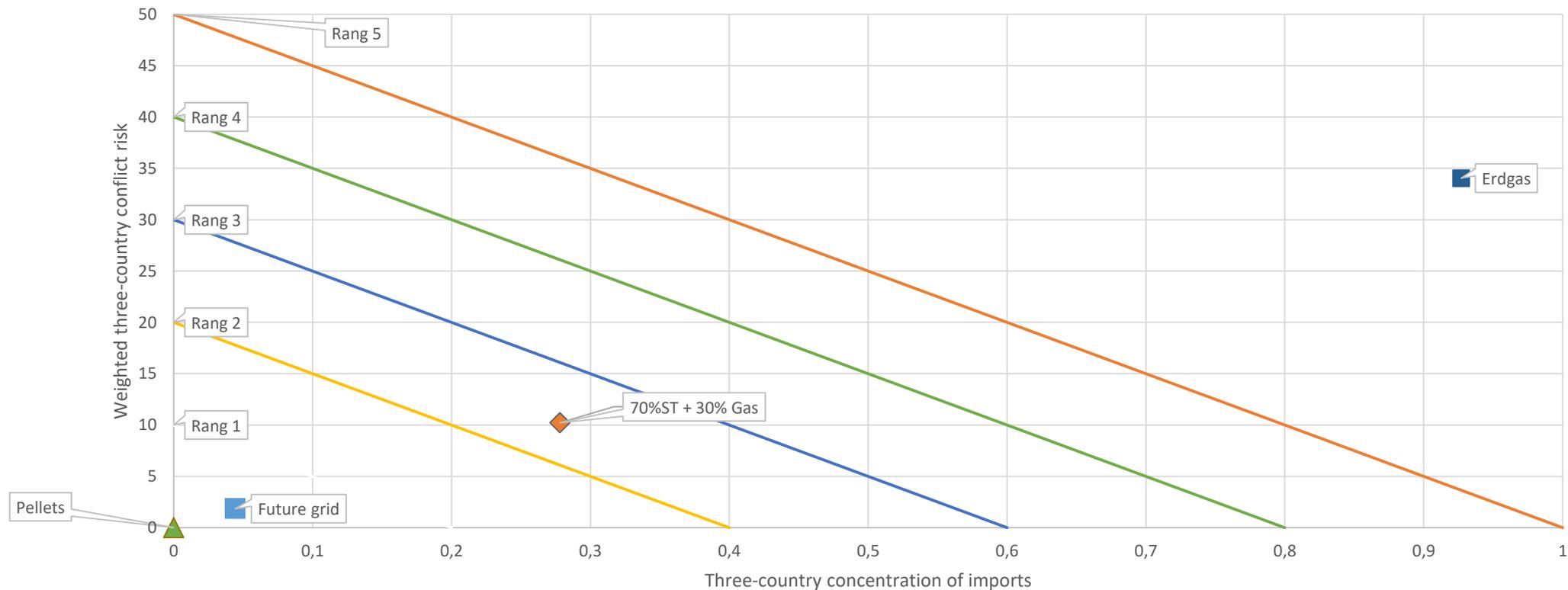
Uninterrupted security of supply/ system stability

Economic Dimension

<i>No.</i>	7
<i>Challenge</i>	Lack of sustainable products to satisfy basic needs
<i>Goal</i>	Uninterrupted security of supply/ system stability
<i>Indicator</i>	Redundancy

<u>Compact Gas condensing, single firing:</u> 1 Boiler	Rating	
<u>Gas operating heating grid:</u> 2nd Boiler	Rating	
<u>70% Solarthermie + 30% Gas+Grid :</u> For 70% ST large pit store.	Rating	
<u>100% Pellets:</u> 1 Boiler	Rating	
<u>Future Grid (current electricity mix):</u> Three sources	Rating	

Spotlight 3: Conflict potential of the resources used



Schlaglicht 3: Conflict potential of the resources used

Social Dimension

<i>No.</i>	14
<i>Challenge</i>	Violent conflicts
<i>Goal</i>	Conflict avoidance
<i>Indicator</i>	Conflict potential of the resources used

<u>Compact Gas condensing, single firing:</u> 3LK = 0,92; WCR= 34	<i>Rating</i> 
<u>Gas Wärmenetz:</u> 3LK = 0,92; WCR = 34	<i>Rating</i> 
<u>70% Solarthermie + 30% Gas+Grid :</u> 30% Gas 3LK = 0,27 & WCR = 10,21	<i>Rating</i> 
<u>100% Pellets:</u> 100% from GER, no WCR	<i>Rating</i> 
<u>Future Grid (current electricity mix):</u> Small portions of imports in electricity mix	<i>Rating</i> 

Thank You!

IZES

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<https://www.kowa-projekt.de>

Projektbeteiligte



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