

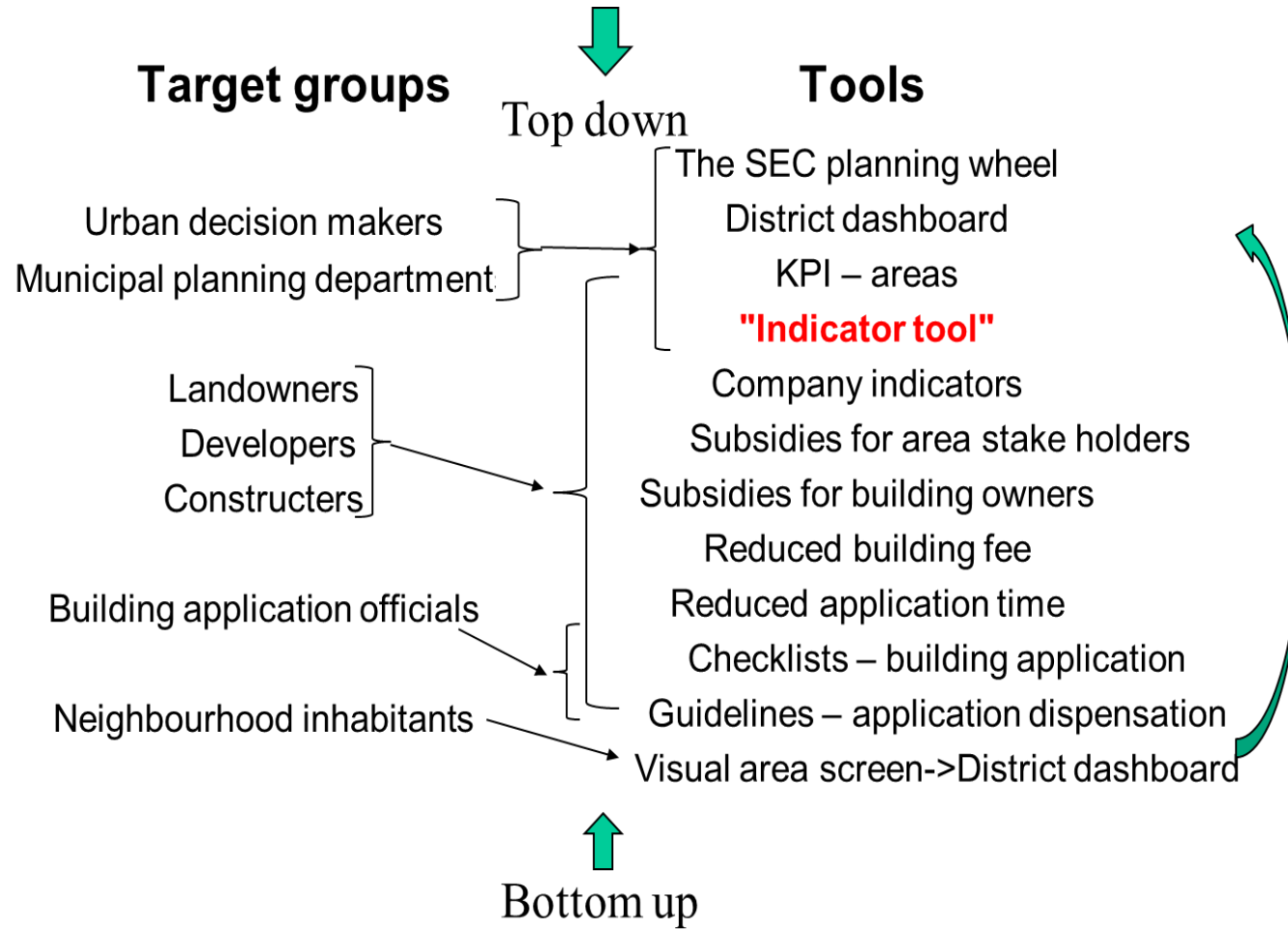
INDICATOR TOOL

Mads Mysen, Kari Sørnes, Åse Sørensen, Harald Taxt Walnun,
Åshild Hauge

PI SEC Indicator tool

- Why PI SEC Indicator tool?
- Step by step introduction
- Interplay with the Planning wheel
- Demonstration of Excel and Web-based versions
- SWOT
- Future development

Tools overview





Missing link



Urban planning:

- Define goals
- Realistic scenarios
- Close gaps
- Target incentives

Estate development

- Define goals
- Reveal deviation

Indicators

- Define baseline
- Measure progress
- Adjust plans

Step 1 – Defining the project

[illegible]

Step 2 – Building a neighborhood

| PI-SEC KPI planning TOOL | | Initial Situation | | 2015 | | |
|---|--------------------------------|----------------------|-----------|-----------|----------------------|-------------------------------|
| Neighbourhood | | Furuset | | | | |
| Buildings | Add | Upgrade | Demolish | | | |
| General description | | | | | | |
| | | | | | residents/ employees | Res above 13y/ Other Users |
| Building | Category | Year of construction | Area [m2] | Ownership | [#] | [#] |
| Furuset senter: kjøpesenter, bibliotek, svømmehall | Cultural building | 1960 | 3500 | Private | 5 | 100 |
| Furuset senter: kjøpesenter, bibliotek, svømmehall | Comercial building | 1960 | 6500 | Private | 60 | 200 |
| Furuset senter: kjøpesenter, bibliotek, svømmehall | Office building | | 9600 | Private | | |
| Furustien barnehage. Parkering | Kindergarten | | 400 | Public | | |
| Papyrusbygget: lager og kontorer. (Huser bla Dekkm | Office building | | 4000 | Private | | |
| Papyrusbygget: lager og kontorer. (Huser bla Dekkm | Comercial building | | 600 | Private | | |
| Papyrusbygget: lager og kontorer. (Huser bla Dekkm | Industry/Workshop | | 12400 | Private | | |
| Furuset forum: Ishall, håndballhall, noen kontorer | Sports Facility | | 16500 | Public | | |
| Scala barnehage, friområde | Kindergarten | | 600 | Public | | |
| Bakers bakeri (produksjon), Først laboratorium | Office building | | 3600 | Private | | |
| Bakers bakeri (produksjon), Først laboratorium | Industry/Workshop | | 3600 | Private | | |
| Suveren rørmøbelfabrikk | Industry/Workshop | | 4800 | Private | | |
| Øvre Furuset borettslag, byggeår 1980, planlegger o | Residential apartment building | | 22700 | Private | 505 | |
| Nordre Gran borettslag, byggeår 1978, opprusting ut | Residential apartment building | | 32300 | Private | 719 | |
| Granstangen borettslag, byggeår 1979, opprusting f | Residential apartment building | | 17400 | Private | 387 | |
| Granstangen borettslag, byggeår 1979, opprusting f | Residential apartment building | | 22000 | Private | 489 | |
| Gransletta borettslag, byggeår 1978, opprusting ute | Residential apartment building | | 9100 | Private | 202 | |
| Gransletta borettslag, byggeår 1978, opprusting ute | Residential apartment building | | 9900 | Private | 220 | |
| Gransletta borettslag, byggeår 1978, opprusting ute | Office building | | 6000 | Private | | |
| Gransletta borettslag, byggeår 1978, opprusting ute | Comercial building | | 2000 | Private | | |
| Kurland borettslag, byggeår 1978, fasader pusset op | Residential apartment building | | 34500 | Private | 768 | |
| Ulsholt borettslag, byggeår 1978, fasader pusset op | Residential apartment building | | 22900 | Private | 509 | |
| Lager | Industry/Workshop | | 26500 | Private | | |
| Furuset sykehjem | Nursing home | | 9300 | Public | | |
| Ny Gran ungdomsskole (bygges nå, FutureBuilt-pros | Kindergarten | | 4100 | Public | | |
| Ahmadiyya-moskeen | Cultural building | | 4000 | Private | | |
| Furuset skole | School | | 10000 | Public | | |
| Gran skole | School | | 8000 | Public | | |
| Kurland barnehage | Kindergarten | | 500 | Public | | |
| Del av Furuset senter | Office building | | 11500 | Private | | |
| Del av Furuset senter | Sports Facility | | 3000 | Private | | |
| Moske, næringsbebyggelse | Cultural building | | 1000 | Private | | |

| Infrastructure | | | | | | |
|---------------------|--|----------------------|-----------|-----------------------------|-------------------------------|---------------------|
| General description | | | | Energy performance | | |
| Outdoor lighting | | Year of installation | # units | Energy performance Category | Energy consumption [kWh/unit] | |
| Lighting | | 1980 | 1000 | Low efficiency | 550 | |
| Snow Melt Systems | | Year of installation | Size [m2] | Energy performance Category | Energy consumption [kW/m2] | Efficiency/COP [-] |
| Snow Melt | | 1980 | 500 | Low efficiency | 350 | Electric heater 0,9 |

Local energy plant

| Energy Source | | | | | Heating to District Heating system | | Cooling to District Cooling system | | Electricity to grid | |
|---------------|---------------|----------------------|----------------|--|------------------------------------|------------------|------------------------------------|------------------|---------------------|------------------|
| Type | Energy Source | CO2 Emission [g/kWh] | Efficiency [%] | | Capacity [kW] | Production [kWh] | Capacity [kW] | Production [kWh] | Capacity [kW] | Production [kWh] |
| CHP | Pellets | 19 | 85 % | | 400 | 2500000 | | | 200 | 1250000 |
| Solar PV | Sun | 0 | 100 % | | | | | | 500 | 500000 |

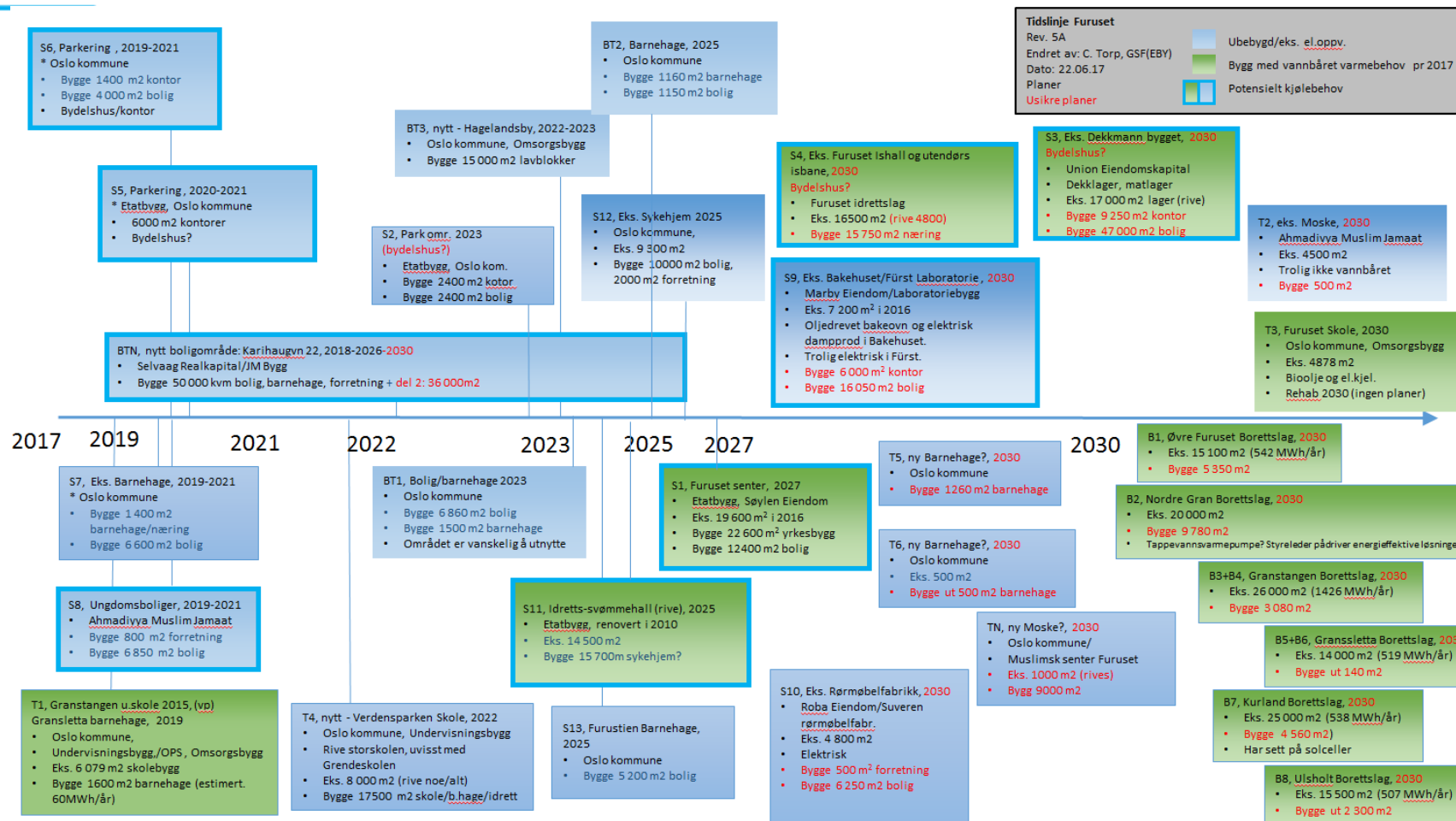
District Heating

| Energy Source | | | | | Distribution | |
|--------------------|--------------|----------------------|---------------------------|--|---------------------|--|
| Heat Source | Coverage [%] | CO2 Emission [g/kWh] | Production efficiency [%] | | Distribution losses | |
| Electricity | 28,2 % | 123 | 0,95 | | 10 % | |
| Heat Pump | 7,9 % | 123 | 3,125 | | | |
| Solar Collector | | 0 | 1 | | | |
| Waste Heat | | 0 | 0,9 | | | |
| Waste Incineration | 57,6 % | 11 | 0,9 | | | |
| Wood Chips | | 18 | 0,9 | | | |
| Pellets | 1,7 % | 19 | 0,9 | | | |
| Bio-oil | 3,6 % | 10 | 0,9 | | | |
| Bio-gas | | 10 | 0,9 | | | |
| Fossil Oil | 0,2 % | 268 | 0,9 | | | |
| LPG | 0,8 % | 235 | 0,9 | | | |

Step 3 – Creating a baseline scenario

[illegible]

Step 3 – Creating a baseline scenario



Step 3 – Creating a baseline scenario

| PI-SEC KPI TOOL | | Baseline | | 2030 |
|---|--------------------------------|---------------|-----------|-----------|
| Neighbourhood | | Furuset | | |
| Buildings | Add | Upgrade | Demolish | |
| General description | | | | |
| | | | | |
| Building | Category | Year of cons. | Area [m2] | Ownership |
| Furusetrenter:kjøperenter, bibliotek, summa | Cultural building | 1960 | 3500 | Private |
| Furusetrenter:kjøperenter, bibliotek, summa | Commercial building | 1960 | 6500 | Private |
| Furusetrenter:kjøperenter, bibliotek, summa | Office building | | 9600 | Private |
| Furuset barnehage, Parkering | Kindergarten | | 400 | Public |
| Pappyrurbygge: lager og kontorer. (Huset ble | Office building | | 4000 | Private |
| Pappyrurbygge: lager og kontorer. (Huset ble | Commercial building | | 600 | Private |
| Pappyrurbygge: lager og kontorer. (Huset ble | Industry/Workshop | | 12400 | Private |
| Furuset forum: lhall, håndballhall, noen kontor | Sports Facility | | 16500 | Public |
| Scala barnehage, friområde | Kindergarten | | 600 | Public |
| Bakers bakeri (produksjon), Furst laboratorien | Office building | | 3600 | Private |
| Bakers bakeri (produksjon), Furst laboratorien | Industry/Workshop | | 3600 | Private |
| Suveren narmabelfabrikk | Industry/Workshop | | 4800 | Private |
| Mure Furuset barerettelag, byggeår 1980, planl | Residential apartment building | | 22700 | Private |
| Nordre Gran barerettelag, byggeår 1978, oppru | Residential apartment building | | 32300 | Private |
| Granntangen barerettelag, byggeår 1979, oppru | Residential apartment building | | 17400 | Private |
| Granntangen barerettelag, byggeår 1979, oppru | Residential apartment building | | 22000 | Private |
| Granletta barerettelag, byggeår 1978, oppru | Residential apartment building | | 9100 | Private |
| Granletta barerettelag, byggeår 1978, oppru | Residential apartment building | | 9900 | Private |
| Granletta barerettelag, byggeår 1978, oppru | Office building | | 6000 | Private |
| Granletta barerettelag, byggeår 1978, oppru | Commercial building | | 2000 | Private |
| Kurland barerettelag, byggeår 1978, farader pur | Residential apartment building | | 34500 | Private |
| Urhalt barerettelag, byggeår 1978, farader pur | Residential apartment building | | 22900 | Private |
| Lager | Industry/Workshop | | 26500 | Private |
| Furusetrykehjem | Nursing home | | 9300 | Public |
| Ny Gran ungdomsskole (bygges nå, FutureBuil | Kindergarten | | 4100 | Public |
| Ahmediyya marken | Cultural building | | 4000 | Private |
| Furuset skole | School | | 10000 | Public |
| Gran skole | School | | 8000 | Public |
| Kurland barnehage | Kindergarten | | 500 | Public |
| Dol av Furusetrenter | Office building | | 11500 | Private |
| Dol av Furusetrenter | Sports Facility | | 3000 | Private |
| Marka, næringsbygg | Cultural building | | 1000 | Private |
| Furusetrenter:kjøperenter, bibliotek, summa | Residential apartment building | | 10000 | Private |

Step 4 - Creating development scenarios

[illegible]

Step 4 - Creating development scenarios

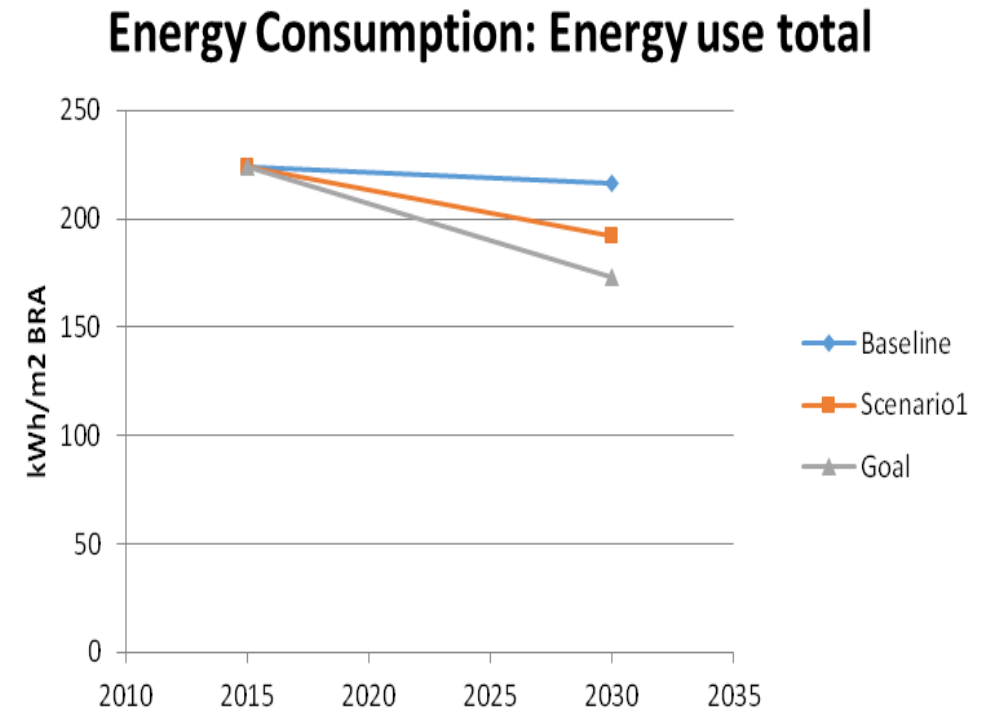
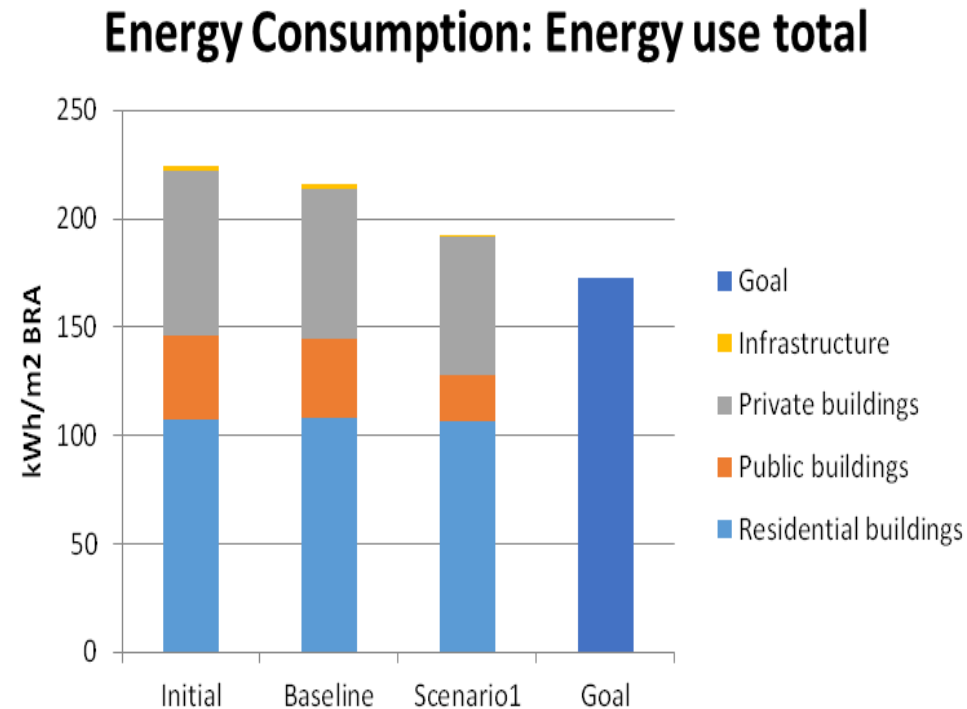
| Neighbourhood | | | | | | | | | | | | | | | | | | | | |
|---|--|-----|---------|---------------|-----------|-----|-----------------------|----------------------|---------------------|-------------------|---------------------|-----------------------------|--------------|-----------------------------|-------------------------------|--------------|---------------|-------------------------|-------------------------------|-------|
| Buildings | | Add | Upgrade | Demo | | | | | | | | | | | | | | | | |
| General description | | | | | | | Energy performance | | | | | Renewable energy production | | | | | | Energy | | |
| | | | | ts/ employ | | | | | | | | Solar Thermal (calculated) | | | Solar PV (total) | | | M | | |
| | | | | | | | | | | | | Peak production | | | Yearly production | | | | | |
| Building | | | | Area [m2] | Ownership | ees | Energy certificate | Performance input | Heating [kWh/m2] | Water [kWh/m2] | Cooling [kWh/m2] | Electricity [kWh/m2] | Size [m2] | Peak production [kWp] | Yearly production [kWh] | Size [m2] | Input type | producti on [kWp] | Yearly production [kWh] | [kWh] |
| Øvre Furuset borettslag, byggeår 1980, planlegger c | | | | 22700 | Private | 505 | B | Low energy | 30 | 29,8 | 0 | 33 | 678,2 | 678,16 | 474709 | | | | | |
| Nordre Gran borettslag, byggeår 1978, opprusting ut | | | | 32300 | Private | 719 | B | Low energy | 30 | 29,8 | 0 | 33 | 550,0 | 550,02 | 675467 | | | | | |
| Granstangen borettslag, byggeår 1979, opprusting f | | | | 17400 | Private | 387 | B | Low energy | 30 | 29,8 | 0 | 33 | 296,3 | 296,30 | 363874 | | | | | |
| Granstangen borettslag, byggeår 1979, opprusting f | | | | 22000 | Private | 489 | B | Low energy | 30 | 29,8 | 0 | 33 | 374,6 | 374,63 | 460070 | | | | | |
| Gransletta borettslag, byggeår 1978, opprusting ute | | | | 9100 | Private | 202 | B | Low energy | 30 | 29,8 | 0 | 33 | 155,0 | 154,96 | 190302 | | | | | |
| Gransletta borettslag, byggeår 1978, opprusting ute | | | | 9900 | Private | 220 | B | Low energy | 30 | 29,8 | 0 | 33 | 168,6 | 168,58 | 207032 | | | | | |
| Gransletta borettslag, byggeår 1978, opprusting ute | | | | 6000 | Private | | B | Low energy | 23,2 | 5 | 9,8 | 63,2 | | | | 125 | Auto | 20 | 20000 | |
| Gransletta borettslag, byggeår 1978, opprusting ute | | | | 2000 | Private | | B | Low energy | 30,4 | 10,5 | 18,7 | 72,8 | | | | 100 | Auto | 16 | 16000 | |
| Kurland borettslag, byggeår 1978, fasader pusset op | | | | 34500 | Private | 768 | B | Low energy | 30 | 29,8 | 0 | 33 | 587,5 | 587,49 | 721474 | | | | | |
| Ulsholt borettslag, byggeår 1978, fasader pusset op | | | | 22900 | Private | 509 | B | Low energy | 30 | 29,8 | 0 | 33 | 390,0 | 389,95 | 478891 | | | | | |
| Lager | | | | 26500 | Private | | | TEK 87 | 134 | 10 | 32 | 75 | | | | | | | | |
| Furuset sykehjem | | | | 9300 | Public | | A | Passivhouse | 20,2 | 29,8 | 11 | 70 | | | | 250 | Auto | 40 | 40000 | |

Step 4 - Creating development scenarios

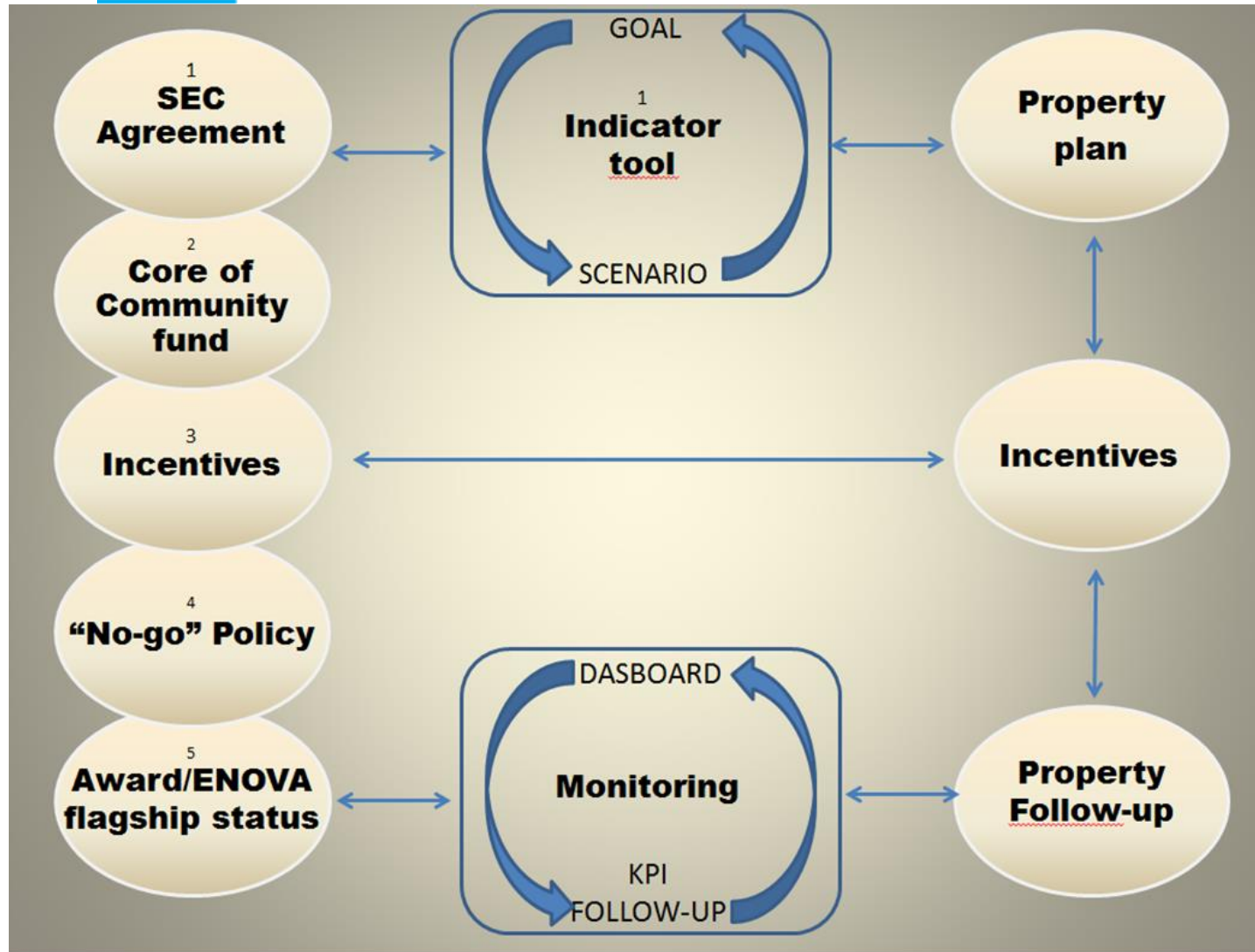
| District Heating | | | | | |
|--------------------|--------------|----------------------|---------------------------|---------------------|--|
| Energy Source | | | | Distribution | |
| Heat Source | Coverage [%] | CO2 Emission [g/kWh] | Production efficiency [%] | Distribution losses | |
| Electricity | 0,0 % | 123 | 0,95 | 10 % | |
| Heat Pump | 0,0 % | 123 | 3,125 | | |
| Solar Collector | | 0 | 1 | | |
| Waste Heat | | 0 | 0,9 | | |
| Waste Incineration | 100,0 % | 0 | 0,9 | | |
| Wood Chips | | 18 | 0,9 | | |
| Pellets | 0,0 % | 19 | 0,9 | | |
| Bio-oil | 0,0 % | 10 | 0,9 | | |
| Bio-gas | | 10 | 0,9 | | |
| Fossil Oil | 0,2 % | 268 | 0,9 | | |
| LPG | 0,8 % | 235 | 0,9 | | |

Step 5 – Calculation & Analyzing data

Step 6 – KPI follow-up



Interplay with the Planning wheel



A detailed Property plan is based on a realistic development scenario from Step 5

Property follow-up is extracted from KPI follow-up data from Step 6

Excel or Web-platform?

Excel: Planning - Web: Planning and indicator follow-up – information sharing

Strengths

- Enabling simultaneous use by multiple users
- More options for data import and indicator follow-up

Weaknesses

- More time-consuming to develop
- Require internet to use

SWOT

Opportunities

- More options for enlarged functionality, for instance support a district dashboard or show energy performance among property owners.
- Simpler to add-on with data-collection og data processing. More suitable for indicator follow-up.

Threats

- System communication is complicated.
- Data import is often a challenge regardless of data-platform.

Further development

0-6 months

- Test Indicator tool on ZVB and Furuset
- Discuss with stake-holders

6-12 months

- Develop and retest
- Web-based platform (3 PM)

9-15 months

- Final version – Excelbased or web-based

What are the first thought that come to mind when you see the electronic "indicator tool"?

- Easy? Complicated? Useful? Possible to use on the case studies? Do you have people with competence to use the tool?
- Do you need the tool? Why/ why not? Other tools?
- Web-based in PI SEC



Teknologi for et bedre samfunn