KEA-BW KOMPETENZZENTRUM Wärmewende

MINISTRY OF FOREIGN AFFAIRS OF DENMARK

Danish Energy Agency

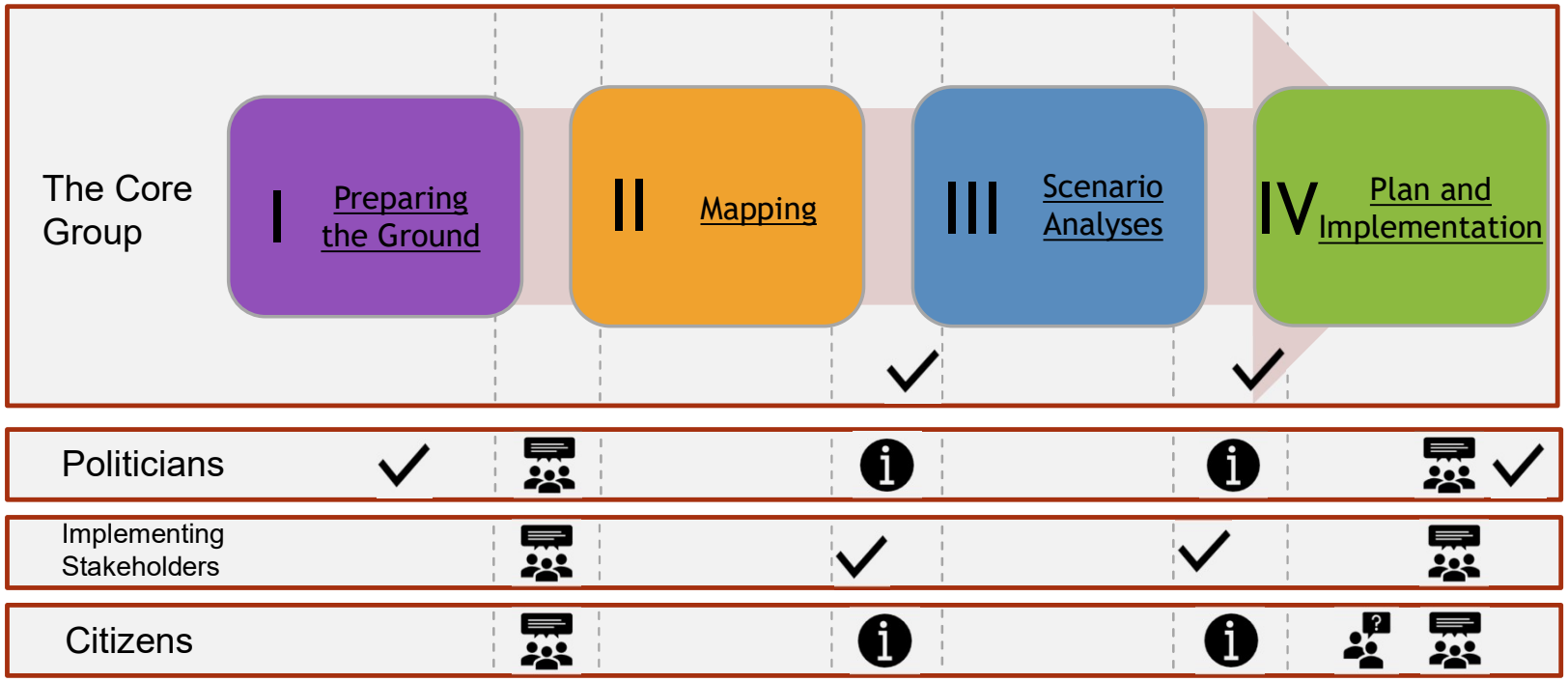
DBDH

PlanEnergi

Read this before working in the toolbox for the first time!

(Click anywhere to continue)

Heat Planning in BaWü – The Toolbox



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About Phase I

The purpose of Phase I is to make all needed preparations for a successful heat planning process. So to say prepare the ground for a high quality, timed and integrated process – i.e., the road to an agreed and accepted heat plan, ready to be implemented.

Preparation is key. The better you perform in this phase, the more successful the acceptance and approval will be in Phase IV. Defining the purpose in the very beginning will be a valuable step in order to ensure agreement and to have something to present to people, if the process stops flowing. Having a clear purpose from the beginning will give the Core Group a direction to pursue along the way and strengthen their mandate.

This phase will ensure that the heat planning process is fully integrated and coordinated with all relevant persons and departments in the municipality. This includes a status of existing plans and targets on EU, national regional and municipal level as well as listing the local drivers and barriers for transition of the heating sector

It also includes setting up the organizational framework for the planning process, a time- and activity plan for the process and involvement of politicians, directly involved stakeholders and citizens.

Phase I in a Danish 75k municipality

Expected duration
≈3 months

Costs (internally)
≈ 0.25-0.5 person (Head of Core Group)

Costs (externally)
≈ 50-100 hours of consultancy (optional)

The Core Group
- Defining the purpose
- Plan the process
- Invite stakeholders to the process
- Inform everyone about the process and what they are expected to do

Politicians
- Defining the purpose
- Participate in kick-off
- Formally: Approve definition, goals and plan for the process

Implementing Stakeholders
- Participate in kick-off

Citizens
- Participate in kick-off
- Demand the needed information flow from others for the whole planning period

I.1: Organizational Setup

- **Purpose**

To set up an organization that can manage the heat planning process and maybe later also manage and/or support the implementation phase. This organization should be organized around a **core group**.

- **Description**

The organizational setup for the heat planning process is a backbone securing that the heat plan is integrated in the municipal plans and accepted by the politicians, directly involved stakeholders and citizens. Transition of the heating sector will mean radical changes in the heat production and consumption. Therefore, a strong core group to lead the transition planning and implementation is needed.

Prepare the organizational setup in a **core group** with leading persons from the city administration (planning department must be included) to secure respect of sector plans and municipal plans. Discuss the heat planning process and the organizational setup in this group.

It is important to have legitimacy in the core group, i.e., higher ups need to have a say in the organizational setup. As the Core Group needs to perform much of the work personally, these higher ups should not be part of the Core Group itself but be informed about status and progress regularly, most intensely in the beginning. It is also through this, that the political level will stay informed about the progress in the Core Group. Consider to also include the communication-department of the municipality at a similar information flow to ensure that the public is informed about the progress too.

The core group needs to have a credible person, who is able to take decisions, as their leader. In case the process stops flowing, someone needs to have the competence to take a decision to ensure progress. If cross-sector planning does pre-exist in the municipality, the organizational setup may very likely be structured around this team.

The organizational setup must in all cases work in your local environment. If there is tradition to manage and steer larger strategical processes with a steering and/or follower board, consider to include one in your heat plan too. However, keep the Core Group itself by any means at an operational size and capacity and make rules of conduct / terms of reference on how and when the steering board should be informed, may interfere with the Core Group's decision etc.

Despite the importance of the Core Group, it is worth mentioning that most planning processes are initiated top-down, e.g. by one or few head(s) of office. These will have a natural interest in the process, but for practical reasons both sides will benefit from these "higher-ups" not being part of the Core Group personally.

- **Do's**

Make a core group of a handful of persons with representatives from the municipal administration and REO. It must consist of persons who from the political level have been authorized to lead the heat planning process and who have the competences to break down the "silos" (walls between administrative offices).

Try to get **one** entrance to the administration.

Think new. Consider and respect how things are usually done but be ready to try out more agile work structures "than usually". Just because something works for broadband, sewage and water works, doesn't mean you need to structure your heat plan work as a clone of this setup.

- **Don'ts**

Don't accept participants without authorization or valuable competences into your core group.

- **The Importance of Communication**

Communicating about the heat plan process to citizens and other stakeholders can be a core element of ensuring backup to the action plan from stakeholders. Discuss the communication plan in each meeting in the Core Group and make sure to have a close dialogue with the PR-office, your PR-consultant or whoever you make responsible for PR and communication. They may also be invited to (some) meetings in the Core Group.

- **One Size Never Fits All**

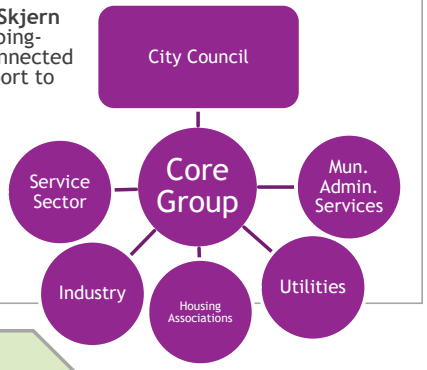
Make sure to adapt a given organizational setup to your local conditions. Depending on the size of the municipality, a "Amtsleiter, "Baubürgermeister", or even the "Oberbürgermeister" may be suitable to have as the "public face" of the heat plan. Having a mandate from these high ranking officials in your Core Group, makes it easier to convince external partners to get engaged.

- **Best Practice - Sønderborg**

In the Danish municipality of Sønderborg (Sonderburg), the director of technical and environmental department was the formal top representative from the administration in the core group and the manager of the planning office was no. 2. In praxis however, one of the employees in the planning office was the one stop contact, who asked for permission if decisions of principal character came up.

- **Best Practice - Ringkøbing-Skjern**

The Danish municipality Ringkøbing-Skjern has an energy council connected to the municipal office for support to the commercial sector.
The energy council takes care of strategic energy planning and has representatives from all stakeholders + politicians and NGO's.
The organization looks like this:



Related Elements

- The Core Group
- Politicians
- Implementing Stakeholders
- Citizens

More Info

- I.1 Derk Loorbach- Article
- I.1 Stakeholder Engagement in Heat Planning in DK

Examples

- Add other examples

I.2: Defining the Purpose

Purpose

To define why the heat plan process is initiated in your municipality – "because the Ministry told us to" does not send a strong signal to citizens and other stakeholders. Highlight local values and pick KPI's that support these.

Description

The work with the heat plan must reflect the local political interests. You can e.g. focus on energy independence, (local) emission-free heating, low-noise heating (no heat pumps in urban areas) etc. Other criteria can be included, e.g. local business development, green transition, (reductions of pollution), better cities to live in, fuel poverty, sector-coupling. The plan may have other (and stronger), underlying, not necessarily directly mentioned, purposes.

In this very first step of the process, consider which values the heat plan should follow – and pick indicators (KPI's) to match these targets. Indicators could be:

- CO_2-emissions (tons)
- share of renewables in the heating sector (%)
- socio-economic costs for the heating sector (M€)
- levelized costs of heat (LCOH - €/MWh)
- level of energy-independence (e.g. measured in amount of imported fuels) etc.

The KPI's and the purpose you define at the beginning of the project should of course be relevant and solid. However, especially if this is the first heat plan, you will experience a steep learning curve. Do adjust and adapt along the way, if your discussions lead to reasons to do so (but still don't drown in iterations!).

The "Inside Out" Approach - Where to Start with District Heating?

Discuss your approach to district heating when defining the purpose. District heating may very well be an option in most urban areas (to be analyzed in phases II-III).

Writing a heat plan will most likely mean to investigate where district heating is a good idea (for above defined reasons) and where it isn't. A way to investigate is to start with the densest areas (e.g. urban centers and/or areas around larger heat sinks, like nursing homes, schools etc.) and then connect further areas and investigate if the additional consumer price is still competitive to individual solutions.

For each citizen, a very important result of the heat plan is if the future heating will be a common solution (district heating) or an individual solution, where they are responsible themselves for green heating.

If you do not have a plan - you do not know if you are in the right place - you do not know where you could go or how to get there.

Do's

Define the purpose in simple statements. "We do this because…". Consider to formulate terms of reference (or whichever format fits your local ways of steering processes!).

Find KPI's that support your purpose and use these consistently throughout your plan process. Have these KPI's in mind when planning your heat plan process.

Advantages of District Heating

Not all arguments for district heating are as tangible and measurarable as e.g. costs, emissions and energy conversion. "Other" arguments for district heating in Denmark are:

- The house installation in a DH system is a compact heating unit easy to regulate. Nearly no maintenance is needed.
- There is no smoke and no noise from the installation.
- Can extend use of renewable energy
  - Can use recycled heat from power production, waste incineration and industrial processes.
  - Can integrate fluctuating electricity production (power to heat).
- No risks for gas explosions.
- The socio economic costs are in most cases lower than for heat production from gas boilers and individual heat pumps.
- Service for the house installation can be included in the heat price – no surprises.
- District Heating creates local workplaces.
- District heating can be integrated in historical cities (unlike e.g. air-water heat pumps).
- Developing a local district heating scheme can create a local cohesiveness and team spirit like e.g. a well functioning sports club and voluntary fire brigades. People can usually identify with these values and develop a proudness of their origin.

Terms of Reference

Some Danish municipalities start their (larger) planning processes with formulating terms of reference for the process. As part of the work with the terms of reference, the purpose is defined and incorporated. In 2019, Holbæk Municipality initiated their first strategic energy planning process – until then, Holbæk was the only (of 98) Danish municipalities with NO district heating. The terms of reference were used as references in the process for structuring the work and e.g. in the call for tender for consultancy services. The purpose mentions fields to investigate in the planning process, e.g. sector coupling (waste-to-energy, district heating, CHP, biogas) and energy efficiency. A key driver for Holbæk Municipality was to "take their share" of the societal challenges in performing the energy transition.

Related Elements

- III.1 Scenario Definition

More Info

Examples

- I.2 Holbæk - Terms of Reference (in Danish)

I.3: Heat Planning as Part of the Municipal Planning

- **Purpose**

To create an overview of the background, timelines, expectations, and previous plans; to identify requirements; to make comprehensive lists of persons and organisations of and with an interest in heat planning.

To make sure that the heat plan will be a part of the municipal planning setup and to start cooperation with the city administration.

- **Description**

The heat plan process has to be in accordance with decisions and targets decided at the utility level, municipal level, regional level, state level (and EU-level)

At **state level** the climate targets are included in the Climate Law on 24 June 2021 saying that greenhouse gas reduction must be at least 65% by 2030, 88% by 2040 and 100% by 2045 compared to 1990. This is an average and the heating sector is expected to run faster.

At the **BW-level**, identify BW-specific targets.

At **municipal level** look for local climate mitigation plans. Energy strategies, SEAP´s/SECAP´s if member of Covenant of Mayors and ask for local targets for climate gas emissions. Other authorities within your municipalities may have strategies too, which need to be considered.

Some **utilities** have own reduction levels. Identify and collect them. Also talk to the chamber of commerce (IHK) and all relevant (business) networks that may have a strategy that is relevant for the implementation phase. This can be used both to align plans but also to identify drivers for the implementation.

- Do's

Propose municipal targets or ask for approval of min. targets according to the Climate Law. Get acceptance on thy targets from the political level in the city and political backup to the heat plan to reach the political targets. Work for 100% acceptance.

- Don'ts

If you fail having a strong political backup when you start the heat planning process, there will be a huge risk of not being able to get political acceptance of the heat plan and a lack of political leadership and decisions when implementing actions

- **Best Practice - Sønderborg**

The Danish city Sønderborg started the strategic energy planning process with three meetings between what in Baden-Württemberg would be the Regional Energy Authority (REA) and the planning department in the municipal administration. The purpose was to find out where existing planning and policies interfere with strategic energy planning.

The meetings resulted in a matrix with the strategic enegy plan process on top and all the existing policies (sustainability policy, climate policy…) and plans (municipal plan incl. plans for situation of large-scale RES-production/infrastructure…) vertically below. In horizontal direction was the timeline and interferences and possible symbioses were identified and described. The filled matrix is linked under Examples.

Besides a coordination between plans, the outcome of the meetings was confidence between the participants and later participation of the planning office in the core group in the planning organization.

- **Worst Practice**

Offices in the city administration not always speak together. One example was a Danish municipality where they have an office taking care of energy transition. They had meetings with the utilities about transition to renewable heating, but never asked the planning department, who at the same time started heat planning which was their responsibility.

Result: angry employees and confused utilities.

More Info

- I.1 Stakeholder Engagement in Heat Planning in DK

Examples

- I.3 Sønderborg Matrix Plan Overview
- I.3 JRC – Best Practice Report (to be published soon…)

I.4: Drivers & Barriers

- **Purpose**

To identify and understand factors that will promote (drivers) or object (barriers) the development of a heat plan (incl. the implementation of the suggested action plan). These drivers and barriers can be organisations, persons, local conditions and rules as well as physical conditions like low heat density.

- **Description**

For every municipality, there are different conditions that can either drive the heat planning process or be barriers. It is essential to find out how the municipality can gain from heat transition but also to find local barriers.

- **"What´s in it for us?" - Examples**

Air pollution from burning oil or coal can be addressed.

Local suppliers to the heating sector might get better market possibilities.

Noise from local air-to-water heat pumps can be avoided by district energy supply.

- **Barriers examples**

District heating might be expensive and bad managed somewhere in the municipality. Can give a lot of resistance.

No tradition of common projects can result in low acceptance of common solutions.

- **Do's**

Find drivers in your own municipality and driving persons. Find barriers in your own municipality and a strategy how to overcome them.

Call a REA friend ☺

Upload input to REA Toolbox ☺

- **Don'ts**

Don't under-estimate citizens' skepticism/resistance!

- **Best Practice - Sønderborg**

The Danish municipality of Sønderborg (Sonderburg) hosts the head quarter of Danfoss. Danfoss is very active in the green transition and likes to have their homestead of Sønderborg as an example of how a future energy system should look. For the heating sector this means district heating wherever feasible, utilization of excess heat in district heating systems, flexible sector coupling using electricity in heat pumps (DH and individual) and PtX.

Danfoss has not been active in the heat planning process, but the heating utilities and the municipality have agreed upon a heat plan including these elements.

- **Worst Practice - Silkeborg**

Barriers can occur if citizens are overruled by the municipality.

The Danish municipality of Silkeborg wanted to convert areas with individual natural gas supply to district heating. This caused huge resistance because people felt overruled.

Another Danish municipality, Horsens, learned from that and had information meetings in all of the natural gas areas, explaining the purpose of transition to district heating. The result is that 10,000 houses were converted to district heating in few years. Not without resistance (150 houses complained), but overall happy citizens.

More Info

Examples

- Add other examples

I.5: Involvement (Politicians, Stakeholders, Citizens)

- **Purpose**

To discuss ideas and create plans for involvement of citizens politicians and directly involved stakeholders. To find out who shall do what (and when). Doing this step properly in early stages will save you MUCH work fighting resistance later.

- **Description**

Since transition of the heating sector is a radical change, it will not come through without involvement of all relevant stakeholders. Different approaches for involvement need to be applied for the different stakeholders (politicians, core stakeholders and citizens). Involvement goes on in all phases of the heat planning process.

Politicians must be aware, that they must take decisions according how ambitious the heat plan shall be. Before the planning process starts, there must be a political decision upon reduction targets (100%?) and a when to reach these (2030? 2045? 2050?) in the heating sector. It is important to have a strong political signal behind the targets and the importance of reaching the targets. If possible, 100% political agreement should be reached, because in the implementation phase there will always come complaints, and then it is important that the politicians show leadership and don't try to gain votes on fighting the common aim.

It is preferable to have the most important stakeholders in a stakeholder group following the heat planning process. Stakeholders are here defined here as stakeholders, who will be directly involved in implementing transition actions. As a minimum involvement, utilities must be represented in this group. When preparing the ground, the core group must establish a stakeholder group and be aware if there among the stakeholders are some who can take care of the transition in the implementation phase. Especially transition of the district heating sector and implementation/expansion of new district heating areas.

The involvement of citizens and acceptance of the necessity of the transition is crucial for politicians to be able to take decisions and thus for a successful transition. Involvement of citizens must start early. In Phase I, the involvement could include elaboration of a communication plan for the heat planning process and arrangement of a public kick-off workshop.

- **Do's**

Go for 100 % political agreement. In Danish municipalities this is typically achievable because a good heat plan will benefit quality of life for the citizens.

Embrace the citizens (and others). Treat comments and ideas seriously and potential barriers become drivers for the transition. Make a plan for this.

Establish the Core Group's understanding of how to involve all relevant parties through the creation of plans for mapping and involvement of citizens, politicians and directly involved stakeholders.

- **Don'ts**

If you try to hide information, you will lose confidence from citizens, which will become a difficult barrier to handle in the implementation phase. Be transparent and honest in communication during the entire heat planning process.

- **Best Practice (for how to engage citizens) - Samsø**

For your inspiration (have this example in mind when planning your involvement and engagement concept):

On the Danish island Samsø, several energy projects have been implemented in the period from 1996 until now with public perception and acceptance. One of the experiences from the implementation projects is that careful preparation in the first steps is a must.

The steps on Samsø are:

- Elaboration of baseline study including
  - Collection of information about local habits and conditions – identify informal local influence structures.
  - Engagement of people that know local habits and conditions.
  - Identify the directly involved project stakeholders.
  - Find "what's in it for me" for the involved stakeholders.
- Define objectives for involvement and a strategy for how to reach the stakeholders.
- Involve the municipality (local authority) in the project.

The process (must be carried out from the bottom and controlled from the top)

- Communication must be clear and proactive. Communication channels must be defined.
- Objective of meetings must be clear and meetings prepared by contacting key stakeholders before the meeting and discuss possible scenarios of what might happen.
- Between the meetings the project can contact key stakeholders, arrange working groups, arrange sightseeing to similar projects.

This method of involvement has created local ownership to all kinds of energy projects on the Island of Samsø. It is also important that there is a master plan for transition to renewable energy for the island and that this masterplan is broadly discussed and politically approved.

- **Include Agents in the Heating Transition**

After you eventually have written a heat plan, many stakeholders will need to get involved in carrying out projects. As district heating is new in many places, you will have to get somebody to help you. For this, find agents who know the local habits, have tried project development before and are respected and credible in the local society. In Northern Germany, these individuals are called "Macher" (they get things done), in the UK, they are called "Champions" (knights fighting on behalf of the princess in the arena in the middle ages). It is important not only to rely on people with heart blood and true commitment (they may get too emotional), but to have people on board who know how to walk the talk.

Related Elements

- I.6 Work Plan
- III.3 Action Plan

More Info

- I.5 Public Perception

Examples

- Add other examples

I.6: Work Plan (incl. Time and Activity Plan)

- **Purpose**

To secure that all activities in the planning process (incl. **when** they take place and **who** is responsible) are covered.

- **Description**

The work to be done in the different phases in the heat plan process must to the largest extent be carried out by the the municipal administration (members of the Core Group or possibly the REO), as it is important to have as much knowledge and experiences anchored in and near the core group as possible. This ensures that follow-up on implementation actions and revision of the actions can be managed within the municipal administration and REO.

In **Phase I**, most of the work can be performed in-house (consultants might be necessary for elaborations of a communication plan and maybe for the overall process plan).

In **Phase II**, most of the work can also be done in-house, but here it has to be estimated if some work can be carried out more efficiently, quicker and cheaper by external consultants. If external consultants are used for scenario calculations (Phase III), they will have to be involved in defining quality and format for the data collection in Phase II.

When coming to scenario calculations and definition of actions (**Phase III**), consultants will normally have an advantage because they are more experienced in these kind of calculations.

In **Phase IV** it is again an advantage, if staff from the municipal administration or REO write the plan themselves.

Be honest about who is good at what. Let your local experts in public relations (either internally in the municipal administration or a PR agency) be involved in the information campaigns and the public participation – they know how to address people. Cooperate with these about writing a communication plan.

- **Do's**

Make a time and activity plan where work in the different planning phases are listed; To be sorted by whether the work can be done inhouse (administration/REO) or must be outsourced (consultants).

A good work plan is any work plan that is a local application of the approach described in this toolbox. One size doesn't fit all.

- **Don'ts**

Don't let consultants keep data and calculations you need for revision of actions or to make a new heat plan. You will depend (too) heavily on these consultants and create a monopoly.

Elements in I.6

Writing the work plan can be split into several overviews and plans that need to be written by the Core Group. The work plan is one of the documents that are approved politically just prior to kick-off.

- **Time and Activity Plan**

The time- and activity plan is the overall project management tool. The time and activity plan could be written as a **Gantt-chart**. The level of details is up to the project managers, but once it's written, no one who is expected to provide data, services, calculate etc. should be in doubt about their responsibilities. Include milestones, documents and meetings in the plan as a minimum.

- **Split of Work**

In I.6, the work with the heat plan must be split in external and internal work. Examples of external work could e.g. be communication and public participation to a communication agency and calculations, to be carried out by consultants. The consultants used in Phase III should also be involved in the mapping in Phase II, a least to validate the data used (otherwise they may not trust the data). The split of work can be described in your terms of reference.

- **Communication Plan**

Public participation can and should be an integrated part of the planning process. However, it is a quest to balance the public's need and craving for involvement and keeping the project organization lean and agile.

Once you have the setup for your planning process, think about how to communicate the need for data, the (preliminary) results, how to involve citizens and stakeholders. If you have a clear plan for entire project period, it will become easier to provide information to be shared. Most PR agencies (or the communications office in your municipality!) will have ideas on who to inform and involve when. Make the communication aspect an integrated part of the Core Group by discussing materials for communication at every meeting (briefly). Have a close dialogue with the PR-responsible, but don't include them in the Core Group (there won't be enough for them to do).

More Info

- I.6 Do it Yourself

Examples

- I.6 Gantt-chart
- I.2 Holbæk – Terms of Reference (in Danish – includes split of work)

I.7: Kick-Off

- **Purpose**

To get everyone to know that NOW an important process starts and give them the opportunity to give their input. The goal is to ensure that all parties understand, agree and accept the goal for, the process and who is involved in the road towards a final heat plan.

- **Description**

When all the preparations are done, you are ready for kick-off. You have prepared well the process, know how important a successful heat planning process is and you are proud of your work, but also curious about the feedback you may get.

Make an event out of it, by having a major carefully planned and broadly announced kick-off arrangement, where you present the planning process, involvement of citizens, stakeholders and politicians, and where you give everybody the opportunity to get answers on their questions and to share their ideas with you.

It is also time for the first workshop in the stakeholder group at this point. At this kick-off workshop you will have to present the status quo of the heat planning and the purpose and steps in the planning process to come. Invite then utilities to present their own plans and ideas for GHG-emission reductions and take the first discussions on solutions.

Present your plans for the mapping phase and fix the dates for discussion of mapping results in the stakeholder group.

- **Do's**

Use your politicians to say welcome to the event(s) and to participate as much as possible.

Use professionals/consultants to arrange larger events (especially the public ones, with citizens).

- **Don'ts**

If events are not carefully arranged and the content is not interesting, citizens and stakeholders might not show up next time.

Don't be afraid of going big here. See it as an investment - you will get return on this event, but if you don't kick it off properly, you may never get started.

Best Practice - Sønderborg

In Sønderborg a strategic energy plan process has been the way to involve politicians, directly involved stakeholders and citizens. Meetings during the planning process have been carefully planned in cooperation with a professional who was also managing the meetings. The meetings included:

- experts from outside informing about status of calculations and central problems
- walk and talk
- own contributions
- group work
- sustainable and delicious food for the participants.

The idea behind is, that a lot of volunteers work for the green transition, and they have deserved to be awarded with exciting workshops where they get new experiences (and maybe good food).

One example (sorry – only in Danish) is an invitation and agenda for the mid time meeting in the strategic planning process (link). Use it as inspiration when inviting to kick-off.

More Info

Examples

- I.7 Midways-event ProjectZero Roadmap2025 (could have been a kick-off too!)

Phase II: Mapping

II.1. Screening

II.2. Adapted Mapping

About Phase II

The purpose of the mapping-phase is to gather all the necessary information needed for calculation of scenarios in Phase III.

The mapping includes end use of heating in housing areas, the service sector and industries and the predicted development in built space and heat demand. It also includes mapping of the existing infrastructure for district heating and natural gas supply. Finally, it includes mapping of possible local resources for heating, such as wind, solar, geothermal, wet and dry biomass and excess heat from industries (direct/as source for heat pumps).

The scenario analyses in Phase III should focus on an "from the inside out"-approach. This means that you start by investigating the feasibility for district heating in the densest urban areas and analyze the next and the next areas step by step. Have this in mind when planning your mapping – are there any excess heat sources close by or far out that would make it important to deviate from this approach?

T.II.1 HotMaps - Screening

T.II.2. Excess Heat Survey

T.II.3. Heat Atlas

Phase II in a Danish 75k municipality

Expected duration
≈2 months

Costs (internally)
≈ 0.25 person (Core Group)

Costs (externally)
≈ 2-300 hours of consultancy
+ Ø 10-15 hours / company you include

The Core Group
- Perform the screening
- Contact stakeholders for data validation
- Coordinate with consultants
- Formally: Power to overrule Impl. Stakeholders, if they don't agree internally

Politicians
- React on info/ newsletters

Implementing Stakeholders
- Supply available studies and data
- Link up with local partners
- Validate data
- Formally: Agree on mapping results.

Citizens
- React on info/ newsletters

II.1: Screening

Purpose

To prepare a first draft of data collection and become aware of what is known through already available information and understand how this can be used. Make a plan for which information will be used and where further date collection is needed.

Description

The mapping is initiated with a brief screening. The purpose of this is to get a rough overview of potential district heating areas in order to identify "low hanging fruits", based on heat density. It also includes a rough screening of heat sources to get a feeling of the scale of available resources (is it 20%/50%/200% of the heat demand?).

Ask those stakeholders who may already have collected and summarized data at this point. E.g. consumer groups/housing companies and utilities (they may have done this exercise for you already!). The data you include yourself should be easily accessible e.g. excess heat is mapped through registers (ETS) and not bilaterally with the companies.

If an (possibly outdated) heat plan does exist, start there. The initial mapping may in this case be quickly done and you can proceed to the adapted mapping.

It is not always necessary to include the findings of the initial screening in the later stages (you might find better data along the way), but a rough screening can initiate the "real" planning process and identify where to dig deeper.

Finally, decide which data to validate in the following steps. Make it depend on proportionality between efforts and gains and decide how much you want to collect yourself and how much you need help for.

Do's

Use what's available. If you have a specifically developed heat demand density map for your local area – use that, otherwise use generic tools, e.g. HotMaps.

Call a REA-friend or your colleagues – has anyone done something like this before … and can you reuse approaches and/or findings?

Don'ts

Don't get carried away by details. Progress is at this stage more important than knowing the result to the last decimal.

The First Steps

The very purpose of the initial mapping (screening) is to develop a feeling in the Core Group of what data does exist and what needs to be done in later stages. The screening should give the Core Group a decent understanding of the figures and aspects and prepare them for the adapted mapping and the scenario analyses. The use of tools and own data gathering/research should at this stage be limited to simple tools. The accuracy at this stage is less important than the development of a feeling of the heat demand, resources etc.

Reserve a week or two for this initial process. Don't drown in documenting your findings in long reports, ready for approval and publication – take instead notes that make it possible for you to discuss this with other stakeholders and consultants in the weeks to come.

Where to Look

You may find inspiration and data:

- Previously conducted heat plan(s)
- Strategy documents from utility companies
- Whitebooks/screenings on over-regional/national levels (KEA reports, AGFW, Fraunhofer-ish studies)
- Screening tools with reasonable effort:results-ratio at acceptable level of details (HotMaps, Peta4)

Here more than other places – ask your colleagues at the other REAs to learn what data they used – this will inform and improve your own search for data sources and create ideas for how to use these.

Related Elements

- T.II.1 HotMaps
- II.2 Adapted Mapping

More Info

- II.1 What should be mapped?

Examples

- Add other examples

II.2: Adapted Mapping

- **Purpose**

To create a dataset that is detailed enough to make it reliable to base calculations in Phase III on these. A good step deeper into the mapping exercise than II.1.

The output from II.2 must be reliable enough that you can present and defend them openly in front of stakeholders.

- **Description**

With the results from the initial screening at hand, the core group has now an informed basis for decisions like where to go next and what data are still missing. This will typically mean an elaboration of data from the initial screening.

For heat demand data, you can try and look into the development of a heating atlas for residential areas, supported by interviews with large companies etc., as generic data may not provide data in a satisfying quality.

For excess heat, you should contact the companies in proximity to heat demands directly. As excess heat is very process-specific, conduct interviews with the companies.

Decide which sources to include and which not. If you have a political zero-waste goal, waste-to-energy is not a relevant resource to map (except for biogas). If relevant, screen the proximity of excess heat sources for sites to build thermal storages.

- **Do's**

Coordinate data gathering and validation with the process for scenario analyses (needs for consultant) to avoid (too many) reruns of this step. The consultants will have preferences regarding resolution and formats of data.

Upload both lists of data sources (II.1 & II.2) and maybe also the specific datasets to REA Toolbox.

(Still) be pragmatic – when you have reached "best available data", you may need to make a cut and proceed, even though you'd wish data were better at this stage.

- **Don'ts**

Don't let other mapping processes define your mapping. Your heating sources may be unique and hence you may need to map other things than your neighbor.

- **Best Practice – Municipal Energy Balances**

Approx. 50 municipalities in Denmark have for years prepared energy balances for the geographical area of their municipality. The methods follow national guidelines for energy planning. Generally, a proportionality principle is applied, i.e. most time is spent on data with the highest impact on the final results (energy conversion and emissions).

The energy balances use the following data sources:

1. Energy conversion in power plants and DH-grids: National register for energy companies (fuels, net production (heat/el), efficiencies)
2. Natural gas consumption in gas-supplied areas: Consumption data (aggregated) from the natural gas grid companies.
3. Fuel/energy consumption for buildings supplied by heat individually: Information about active heating installations from the local chimney sweepers (combined with assumptions about fuel consumption/unit/year).
4. Electricity production from wind turbines: National register for wind power
5. Transportation data: Data on vehicle stock pr. municipality from national vehicle register (combined with assumptions about fuel consumption/unit/year)

You can find a full list of the applied data in the background description prepared in the SmartEnCity-project (see "More Info").

Lessons to be learned from the municipal energy balances:
Make a plan for which data is worth gathering at which resolution and level of details. Aim at proportionality and don't waste too much time on the last decimals and/or minor figures – instead, elaborate on data being worth the effort. However, specifically data on excess heat from combustion processes is very site-specific and only talking to the plant operators will give you valid data. Electricity-based excess heat (e.g. compressors from cooling or data centers) is generally more homogenous, but if you have estimates for excess heat from such processes (based on consumption data), it is still favorable to at least get these validated.

Related Elements

- T.II.2 Data Collection
- T.II.3 Heat Atlas
- IV.3: Evaluation and Monitoring

More Info

- II.2 Mapping (Workshop II)
- Energy-balance (SmartEnCity)

Examples

- Add other examples

Tool T.II.1: HotMaps (Mapping)

Description

The HotMaps-tool was developed in an EU-Project (H2020) of the same name. The tool consists of a database of default data (e.g. heat demand, load curves and resources) and is accessible as an GIS-based browser-based tool. Data can be selected on e.g. Landkreis-level or for manually selected areas.

Functionalities in mapping-phase

Heat Demand Projections can be carried out directly in the tool as well as categorization of areas by heat density. Own data can be uploaded, and default data scaled in order to match own data for a given area and still use functionalities of the tool.

Do's

Use HotMaps in Phase II for a rough overview and maybe to vizualize your own bottom-up data.

Use HotMaps to create a gross list of project areas and to identify the low hanging fruits.

Don'ts

Don't use HotMaps' default data, if better data exist.

Input

None, browser-based tool. Own bottom-up data can be used if better than default data.

Output

Maps and (sub-)totals for e.g. heat demand, biomass potential and industrial excess heat.

Best Practice

Training material was developed and tested in the HotMaps-project. Webinars were recorded and can hence be shown after the project ended in 2020. Please note: Training materials are also available in German!

As the tool was only finalized in 2020, references are still rare. However, the application was demonstrated by:

- A description of a "full" use of the full toolchain (what function to use at what point of time and for which analysis) can be found in the HotMaps-Wiki.
- Possible applications of the HotMaps tool were demonstrated in the HotMaps-project and six (rather differing in their methodological approach) heating strategies were developed for the six pilot areas in the project. These can all be found in the library of the project.
- HotMaps was mentioned by KEA-BW in the development of the Handlungsleitfaden Kommunale Wärmeplanung. The HotMaps tool was shown as an example of how to disaggregate totals for an area to a heat density map (in 100x100m resolution).

The use of HotMaps as an analysis tool for disaggregating totals is powerful, when reliable data is available for e.g. neighboorhoods (private or housing companies), but no geographical distribution of the heat density is available. This can of course also be done based on building stock information etc. in other GIS-tools, but HotMaps has a simple way of handling this.

Related Elements

- II.1: Screening
- T.III.1 HotMaps Calculation Modules

Examples

- Add other examples

Tool T.II.2: Excess Heat Survey

Description

Energy system modelling is only as good as the data put into the model. For many types of data, rather validate data do exist in registers and databases or can be projected with the use of tools (e.g. heat atlas).

Excess heat from industries is a type of data that is very process-specific and hence data should be collected on site-level to avoid specific conditions to be neglected. . Mid- and low-temperature heat sources may very well be fruitful excess heat sources for heat pumps, to supply if not enough high temperature sources are available. Remember to apply the energy-efficiency first principle: The utilization of excess heat should not be an excuse for the company not to perform relevant energy efficiency measures in their process.

Identify relevant companies through business registers and the local chamber of commerce (IHK). They know their members. Also involve your colleagues in the planning department.

Industries typically have two interests that may conflict with your interest: a) They do focus on their core processes/ business and b) they are typically rather reserved about sharing data that may tell competitors about processes, size etc.

To avoid lack of confidence, the industries should be contacted personally, initially phone call, then on-site. Consultants may very well do this on behalf of the Core Group but a signed letter from the City Council should as a first step be sent to the companies to prove legitimacy of the consultant. The survey should be discussed in a meeting to discuss possible sources of excess heat and to avoid misunderstandings.

Do's

Pick up your phone and knock on doors.

Involve a local utility if applicable - let the technicians talk tech-stuff.

Don'ts

Don't start with the tough ones. Pick the low hanging fruits first. If there is only low temperature excess heat, develop a concept that is replicable.

Input

Survey-document, network / knowledge about industries & manpower

Output

Valid data and valuable connections

Best Practice - Hedensted

Hedensted Municipality has an industrial area near the city of Hedensted. Hedensted district heating utility declared, that they were ready to utilize excess heat, but industries are busy, and if you ask them about excess heat, you often will get no answer.

The municipality therefore hired a consultant and in cooperation with the consultant elaborated a procedure for contacting the industries. First step was that the municipality informed the industries, about the purpose of the project and they would be contacted and by whom. Next step was a simple questionnaire sent by the consultant and adapted to each industry. Third step was contact per telephone to most of the industries and visit to the largest.

The result was not only that the amount of excess heat was mapped but also a good relation to the industries. Today the main part of the excess heat is utilized.

Worst Practice - Sønderborg

In the heat planning process 2015 Sønderborg Municipality wanted to map the amount of excess heat. In the municipality are five large brickworks using natural gas. They were contacted by letter and telephone but did not reply with figures or told there was no excess heat that could be utilized.

Later, the municipality decided to take direct contact to the brickworks for a talk regarding excess heat. In the meantime, the brickworks also have changed their minds because they want to deliver bricks with lower footprint! Showing up personally at the doorstep seemingly made a difference.

Related Elements

- II.2: Adapted Mapping

More Info

- T.II.2 Template for Excess Heat Survey
- T.II.2 Mapping Excess Heat in Hedensted

Examples

- Add other examples

Tool T.II.3: Heat Atlas

Description

A heat atlas is a GIS-based register of building stock data and (projected) heat demand in buildings. The extent and quality of building data registers varies very much across countries. If no building register exists (many places in Europe), building models like building information from OSM (built area) and assumptions regarding the number of floors in different building types are the only alternative.

A heat atlas must at least contain data regarding 1) Size (heated floor area), 2) building period/age and 3) Type of building/use. The very most important "nice-to-have" information is the current primary heating source (include if available in building register).

A projection of the heat demand can then be made according to average values for heat demand in building categories. Different sources use different methods to create these average values and do or do not distinguish buildings by their renovation standard. For groups of buildings and larger areas, this is statistically less important, and the building size, age and type is far more important to create a valid estimate of the heat demand.

Do's

Use vector data – it's easier to aggregate these to areas than the other way around. Usually you only work with a limited data model anyways.

Don'ts

Unlikely to be feasible for a local authority to develop. Organize it at Länder-Level to ensure local preconditions are considered.

Input

In vector-format:
Building data (size, age, type).
Preferably also heating source.

Output

Vector-based GIS-model to be used for further analyses.

Best Practice

Aalborg University has continually published a heat atlas for entire Denmark. The heat atlas was originally developed based on a building stock register (BBR) which holds information on all buildings. Only publicly available data like building type, age and heated space was used. For estimations of the net heat demand, a model from the Danish Buildings Research Institute (BUILD, prev. SBi) was used. This model holds average values for useful heat demands (kWh/m^2*yr^{-1}) for a number of building types from different construction periods.

The design of the 2011-version of the Heat Atlas was described by Bernd Möller, Aalborg University. In the latest 2020-version of the Danish Heat Atlas, the team has developed an own model for useful heat demands in building types, which to an even higher degree is based on metered data, rather than national statistics.

The calculated data have several times been compared to metered data where it is always confirmed that the accuracy is satisfying for planning purposes, making extensive surveys redundant.

Related Elements

- II.2: Adapted Mapping

More Info

- Methods Danish Heat Atlas 2011
- BUILD/SBi-report 2017:16
- Danish Heat Atlas 2020

Examples

- Add other examples

Phase III: Scenario Analyses

III.1. Scenario Definition

III.2. Energy System Modelling

III.3. Action Plan

T.III.1. HotMaps – Calculation Modules

T.III.2 Technology Data

T.III.3. energyPRO

The purposes of Phase III:

1. To find out if heating supply in an area shall be individual (heat pumps, biomass, solar thermal… on household level) or through district heating. **District heating** has **advantages** when utilizing excess heat from industries (production processes/waste incineration) and utilizing electricity for heating purposes in a flexible way. However, district heating may be **too expensive** in areas with **low heating density**. The result is an overview over areas and a prioritization in e.g. three categories (DH // maybe // individual heating).
2. To **calculate scenarios** for different supply solutions. For individually heated areas the solutions are usually limited to energy savings and different types of supply from heat pumps, PV, solar thermal and biomass. For district heating the solutions consist of a combination of energy savings and energy efficient production systems, using excess heat and other renewable resources. Since new district heating is a radical change, it must be built out gradually, but according to **a long-term vision**.
3. To develop an **action plan** where it is defined **when** and **how which** actions will be carried out **by whom**, to reach a certain scenario. Especially for new district heating, it is essential to mention a responsible stakeholder (e.g. Stadtwerke, private company, cooperative…).

In phase III much of the content of the heat plan is developed - including a map of the municipality/city showing the future heating supply form for different areas. The analyses in this phase serve to substantiate possible solutions and to expose unrealistic "wishful-thinking" scenarios. The analyses and results must be clearly linked to the purpose of the heat plan, and so detailed and elaborate that they can support a hearing process and ultimately acceptance of the heat plan.

However, before a district heating plant is realized, more detailed feasibility studies are conducted, incl. hydraulic modelling etc. Your analyses must "only" point at which areas to supply how and the calculations should be kept at a suitable level of abstraction. This is considered in the estimated budget for consultancy services.

Phase III in a Danish 75k municipality

Expected duration
≈6 months

Costs (internally)
≈ 0.25 person (Core Group)

Costs (externally)
≈ 300 hours of consultancy (consider to reserve additional 1-200h)

The Core Group
- Define scenarios
- Cooperate with consultants
- Formally: Power to overrule Impl. Stakeholders, if they don't agree internally

Politicians
- React on info/ newsletters

Implementing Stakeholders
- Cooperate with consultants and Core Group
- Provide info for model calculations
- Validate models
- Formally: Agree on scenario results and conclusions

Citizens
- React on info/ newsletters

III.1: Scenario Definition

- **Purpose**

To determine what to calculate in the scenario analysis. Prepare the purpose of the work from the consultant in the next step. Find realistic possible scenarios og eliminate impossible/not desired solutions. Write down the arguments behind eliminated scenarios – to ensure quality in phase III and valuable knowledge in the discussions towards acceptance of the heat plan in Phase IV.

- **Description**

The collected data on heat demand and available heat sources from Phase II are used to categorize areas by their heat density and proximity to heat sources:

- Green: District heating
- Yellow: Maybe district heating
- Red: Individual heating

This will be the basis for the scenario analyses, which can now focus on the green and yellow areas and describe solutions for the red areas. A very applicable approach is to focus on the green areas and calculate which area will be the marginal one to supply with district heating. Said differently – how far out should district heating expand (always starting in the most feasible areas, but not limited to these)?

An overall aim of heat planning in Denmark is to ensure the socioeconomic most feasible solution for heat supply. For district heating this means that all areas, where district heating is socioeconomically feasible, should be supplied with district heating if it is also feasible for the citizens. In many other countries, especially when commercial utilities are involved, the heat planning will only focus on whether it is good business to supply an area with district heating or not.

- **Know your target and focus on few options**

You know that your heat plan needs to fulfill a political target: CO_2-neutrality in 2045. If you can't find a plan to support this, your plan failed. Hence start with the 2045-scenario and investigate necessary intermediate steps back to your point of departure. Broken down to steps and phases, the overall goal will seem much more reachable.

There may be many options to reach the 2045-target. However, not all of these will be relevant in the final report. Investigate as many options as relevant in your work in Phase III (to be defined together with the Implementing Stakeholders and your consultants) but focus on those that seem to be most promising.

- **Do's**

Follow the "inside out" approach: District heating is most likely feasible in dense areas – investigate possible new areas step-wise. The last area to convert should still be feasible (but won't be as feasible as the very first ones).

Include sensitivity analyses in a background report and keep it to the conclusions in your final report. Too many scenarios in the main report will confuse the readers (remember your audience).

- **Don'ts**

Don't limit the analysis to a simple feasibility analysis of areas, because then you will miss many good projects, which however not have the same return on investments as the most promising ones.

Best Practice - Sønderborg

In the analyses for the 2021 heat plan for Sønderborg Municipality, scenario analyses for the existing district heating area of the largest city (Sønderborg) investigated a series of relevant supplementing heat sources (e.g. minor excess heat sources) to the pre-existing waste-to-energy plant. When all these alternatives were investigating in a marginal approach, these alternatives were combined to see whether the combination of these smaller alternatives could replace the waste-to-energy plant.

The result was a heat plan showing that new heat sources stepwise could be added to the existing system without changes in the consumer price. In this way the waste-to-energy plant could be replaced in 2030 without major changes in the production system because the changes were already implemented.

Related Elements

- T.III.1 HotMaps Calculation Modules

More Info

- III.1 Steps in DH
- III.1 Erlach et al.: Optimierungsmodell REMod-D.
  IN GERMAN:
  Materialien zur Analyse »Sektorkopplung« - Untersuchungen und Überlegungen zur Entwicklung eines integrierten Energiesystems

Examples

- Add other examples

III.2: Energy System Modelling

- **Purpose**

To link the mapping and scenario evaluation – how do resources and demand correspond.

To answer the question of where to do district heating and where to continue individual heating – and how to supply both.

- **Description**

With the scenarios defined in II.1, these scenarios need to be calculated. The (available) data has been collected and confirmed, scenarios have been defined, now it's time to do detailed model calculations. This would typically be a job for a consultant, due to training and regular use are preconditions for efficient and reliable calculations.

Discuss the selection of tools with your consultant. Find tools that support your targets and the level of details you wish to be able to show in your plan. Different tools have different ways to optimize a given system and you need to define the KPI's you wish to investigate in the scenario analyses. Most tools on the market provide results and optimization for e.g. emission reductions and lowest price.

If you have DH-utilities/calculate on existing grids link the utilities and the consultant together – the utility is more likely to act on a heat plan, if they agree in your calculations. And they can't agree in something they haven't seen.

When comparing results from the scenarios, be clear about your KPI's and how they are ranked (if they are). CO_2-reductions may come with a price tag – but how high may the price tag be? Also describe scenario consequences that are not as tangible as € and ton CO_2, e.g. increased comfort (no-noise nor local emissions…), level of local energy-independency (no Putin-gas) and the like.

The calculations should be evaluated according to the purpose of the heat plan that may be broader and more than simply becoming carbon neutral. Often these calculations are done by external consultants, to have the highest credibility-

For individually heated areas the solutions are usually limited to energy savings and different types of supply from heat pumps, PV, solar thermal and biomass. For district heating the solutions consist of a combination of energy savings and energy efficient production systems, using excess heat and other renewable resources.

- **Do's**

Make it relatable. If you have existing utilities, they will need to be able to see their systems in your calculations. Make concrete calculations (based on (future) local systems) wherever possible. More relatable than generic examples of systems.

Keep it simple. At this stage, a comparison of CAPEX (annuities) and OPEX for a price estimate are OK. Sophisticated budgets need to be prepared later.

- **Don'ts**

Don't get lost in too advanced model calculations. The basis model needs to be able to be adapted and iterated along the way, as you adapt preconditions and assumptions. Remember to mention this in your contract with the consultant.

If you have many scenarios, don't compare every imaginable combination. Split it into series of scenarios, e.g. expansion-scenarios, heat pump-scenarios etc.

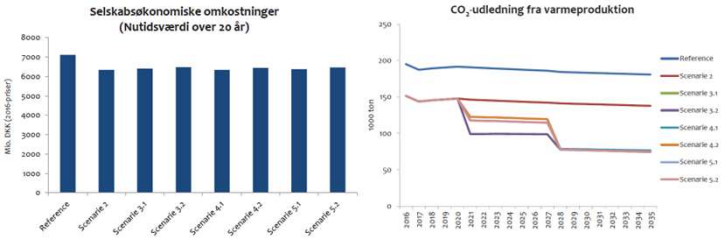
- **Scenario Comparison**

When comparing scenarios, be aware what you want to evaluate and what you want to show. In the presentation of results limit the extent and resolution of results to the key parameters. LCOH, energy turnover and CO_2-emissions will most likely be relevant in any case. More specific results like the level of self-sufficiency/use of local resources may not be of interest everywhere. In any case, be aware to match the parameters used by e.g. the KEA-BW.

- **Best Practice - Aalborg**

The eight scenarios in Aalborg, described in T.III.3 energyPRO, were presented in the final report too. The report contained a rather detailed description of the different consequences of the primarily investigated eight scenarios. Descriptions included:

- Heat production in 2028-35 (goal year)
- Fuel consumption (2028-35)
- CO_2 emissions (2028-35)
- Socio-economic costs (net present value – 2028-35)



This consistent use of the scenarios made it easy for decision makers and other external readers to follow results and combine economical, environmental and energetical consequences across scenarios. Behind these eight scenarios lay of course plenty of pre- and subanalyses, sensitivity analyses etc. Relevant results from these have been condensed and described throughout the final report, focusing strictly on these eight "main" scenarios.

Related Elements

- T.III.1 HotMaps Calculation Modules
- T.III.2 Technology Data
- T.III.3 energyPRO
- T.III.4 Scenario Comparison

More Info

- III.2 Principles of cost modelling

Examples

- Add other examples

III.3: Action Plan

- **Purpose**

To make all necessary stakeholders aware of what to do when and how – all of which with the overall aim of the heat plan process in mind.

- **Description**

An action plan tells how the suggested scenarios from II.2 will be carried out through tangible actions. The purpose is to give a clear guide to which part of the city gets what kind of heating, including why, what, when and defines a responsible actor for each part of the city. The plan is fairly detailed and can act as a specific action plan to the involved stakeholders in the implementation process. And commit all parties to the agreed plan.

The action plan should be structured thematically, e.g. by how certainly a project is to be developed or should be investigated further, as a project that "just" needs to be developed should be an action for the Implementing Stakeholders, whilst further elaborations may be split between the local administration and the (local) Implementing Stakeholder(s).

Finally, the action plan must be a central part of the heat plan itself, either as a chapter by itself or an independent appendix (that can be updated separately).

- **Include Agents in the Heating Transition**

After you eventually have written a heat plan, many stakeholders will need to get involved in carrying out projects. As district heating is new in many places, you will have to get somebody to help you. For this, find agents who know the local habits, have tried project development before and are respected and credible in the local society. In Northern Germany, these individuals are called "Macher" (they get things done), in the UK, they are called "Champions" (knights fighting on behalf of the princess in the arena in the middle ages). It is important not only to rely on people with heart blood and true commitment (they may get too emotional), but to have people on board who know how to walk the talk.

- **Do's**

Actions must be tangible and measurable (when is this action fulfilled?). Further, they need to be appointed to someone (incl. a time schedule).

Include a protocol for new development areas – both regarding new heat/cooling demand and possible sources for excess heat.

- **Don'ts**

Don't present more details than the accuracy allows for. Be frank about the level of details – your conclusions are OK, as you calculate for a city at a time.

- **Best Practice - Sønderborg**

The heat plan 2021 for Sønderborg includes actions for three topics:

1. New district heating areas
2. Heat production in existing district heating areas
3. Areas outside district heating.

For each action is described the **purpose** (for instance transition of individual heat supply to district heating), a **description of the action** (including a map showing the areas), **responsible** for the action (for instance a district heating utility) and an **explanation** why this action is decided.

The plan has five actions for new district heating, three actions for change in heat production and five actions for areas outside district heating. This resolution and format makes the actions tangible and measurable in the process towards a revision of the heat plan.

- **Worst Practice**

Way too many – every time conclusions end up being declarations of intent instead of committing action plans.

Related Elements

- I.5 Involvement
- IV.1 Writing the Heat Plan (incl. Action Plan)

Examples

- IV.1 Sønderborg Final Heat Plan 2021

Tool T.III.1: HotMaps (Calculation Modules-CM)

Description

The HotMaps tool includes a series of calculation modules (CM), which can be used as part of a scenario analysis in the tool or as stand-alone installation. This description focuses on the tools available in the browser-based tool. To install the tools stand-alone (IT-specialists only), please find the repositories on GitHub.

If you wish to use your bottom-up data on heat densities, you need to upload these into HotMaps in order to process them in CMs. This functionality is demonstrated in the training materials (see More Info).

Do's

Use the calculation modules for the area assessments in III.1 and to check results from your consultant or other stakeholders – do you reach the same conclusions (figures may differ)?

Don'ts

Don't start detailed and multi-layer analyses on your own – use HotMaps-CM's for second opinion and to challenge stakeholders.

Input

Heat demand data (default data is available), assumptions for parameters, IT-skills (medium).

Output

Cf. the different CMs.

HotMaps holds a large variety of calculation modules (CM). A selection is presented here:

- **CM District heating potential areas: user-defined thresholds**

This calculation module calculates district heating potential within the selected region using 2 threshold values: 1) Minimum heat demand in each hectare, 2) Minimum heat demand in a DH area. Areas within the selected region, which fulfill these conditions are returned as DH areas.

- **CM - District heating potential: economic assessment**

Similar as "user-defined thresholds", but higher level of details in the evaluation parameters. The CM considers these parameters: 1) heat demand and gross floor area density maps, 2) costs of network expansion, 3) development of heat demand and connection rates, 4) depreciation time, 5) interest rate and 6) a threshold for the accepted heat distribution costs.

- **CM - District heating supply dispatch**

Two modes – Dispatch and Invest. In both modes, it returns the costs (CAPEX and OPEX), energy consumption and emissions for your scenario. In Dispatch-mode, you can calculate the optimized dispatch of heat sources for a given district heating areas – for each hour of the year. In Invest-mode you can optimize for heat capacities to match the given heat demand.

- **CM - Scenario Assessment**

A template to an Excel-spreadsheet for scenario comparison. Connects individual heating alternatives and the output from district heating scenarios.

Related Elements

- III.1: Scenario Definition
- III.2: Energy System Modelling
- T.II.1: HotMaps (Mapping)

More Info

- HotMaps-Wiki (page for each CM on the right)
- Training Material

Examples

- Add other examples

Tool T.III.2: Technology Data

Purpose

To get a consistent overview over relevant technology alternatives. The consistency can be checked by involving stakeholders in the development of a technology data catalogue.

Description

Technology data need to be included in all steps of the scenario analyses. It starts with an evaluation of the applicability of a given technology in your area – e.g. legal limitations.

For each technology to include in your scenarios, you need to identify parameters like applicable capacities (kW/MW/GW-range?), efficiencies and costs (investment CAPEX and operational OPEX).

The Danish Energy Agency has since the 1970's published technology data catalogues, which can be used in energy planning. As it is a catalogue that aims at serving most utilities and municipalities in the whole country, specific local preconditions may not always be considered. Larger utilities and municipalities have in recent years decided to make adapted technology data catalogues to be used in their local planning process (one from Aalborg from 2017 linked). The difference in these is e.g. the selection of technologies included in the catalogue and the involvement of (local) suppliers in the data gathering. Typically, these local catalogues are used as an appendix to the heat plan for a) documentation of assumptions, coefficients etc. and b) as reading material for the politicians to give them better understanding of the projects they are asked to approve.

The concept of adapting generic data to a local context is also adapted in KEA-BW's approach, where default data are taken from the national Danish catalogue and supplied wherever relevant and/or possible.

Do's

Find inspiration to solutions in international technology reviews.

Don'ts

Don't overestimate the value of a catalogue – if you have a specific question, asking a supplier for a rough estimate may give you a decent result too.

Input

Knowledge about what to look for (which technologies, desirable capacities etc.).

Output

Investments, energy efficiency, OPEX (O&M, maybe fuel costs, personell costs)

Necessary and desirable data

Data to be gathered and presented in a technology data catalogue can be split into necessary (need-to-have) and desirable (nice-to-have) data. In the context of energy system modelling for a heat plan, parameters to be gathered can be:

Need-to-have

- Energy flows (fuel/drive energy), outputs (medium, temperature levels)
- CAPEX (€/MW, €/unit or €/MWh heat/cold/electricity)
- OPEX (fixed and/or variable pr. MWh, hour of operation or…)
- Efficiencies (lower or higher heating value)
- Emissions (local and global)

Nice-to-have

- Flexibility aspects (cutin/-out, integration with/need for storage)
- Availability and fluctuations (hours downtime for maintenance, dependency of operation)
- Operating crew (fixed/variable) and qualitative description of daily operations.
- References (where can I see this?), incl. list of supplier(s) and contact information from operators.
- Footprint (m^2/kW)
- Applicability (base-/peak load, describe why)

Best Practice - Aalborg

The municipal district heating utility of Aalborg made a heat strategy in 2017 to investigate future options to replace a lignite CHP. In the scenarios, different ways of supplying the projected heat demand in 2028/35 were modelled. The applied assumptions regarding availability, efficiency, economy etc. were documented in two (consistent!) data catalogues:

1) Internal: For Core Group & Implementing Stakeholders, to be used in the energy system modelling, and
2) External: A "Pixibuch", for politicians and citizens.

This allowed for more details in the internal version, whilst being able to present a comprehensive and consistent overview for non-experts in the external one.

Related Elements

- III.2: Energy System Modelling

More Info

Examples

- Danish National Catalogue
- T.III.2 Aalborg External Tech Cat 2017

Tool T.III.3: energyPRO

Description

energyPRO is an hourly energy system model, allowing for calculation of consistent scenario analyses at proportionate effort. The model is adequate for all kinds of energy systems but is developed and optimized for district energy systems and sector coupling. energyPRO calculates scenarios for one given energy system (i.e. one district heating plant) at a time.

The time-series setup of energyPRO allows for hourly resolution of all relevant input data, e.g. temperatures (e.g. ambient air and/or those of the district heating system), energy prices (electricity and gas markets) and availability of capacities. This makes it possible to calculate the efficiency of heat pumps rather precisely, as efficiencies can be calculated as a function of temperatures. The modeling of energy storages makes it possible to assess how well a given capacity fits a given heat demand.

When modelling the operation of a given system, the model can be calibrated to match the reference situation. Operation scenarios (expanded operation of existing capacities, new capacities in the existing system…) can easily be evaluated, once the reference scenario is calibrated to match a status quo.

The setup with time series allows for easy and efficient calculations of sensitivity analyses of e.g. varying energy prices and changes in heat demand.

energyPRO optimizes the operations for cheapest operational costs. Investment costs and CAPEX can be added to the model or calculated on the side, depending on the users' preferences. An optimal capacity for a given unit is thus determined through calculations of a series of different options.

The results (energy, economy, emissions) are calculated on an hourly basis (preferably for a calculation period of 1-3 years) and can be exported for each unit or for the entire system as hourly, daily, weekly, monthly or annual (sub-)totals.

Do's

Use consultants for this tool. If your consultant has their own tool, discuss the described advantages of energyPRO with them – can they match it?

When calculating for an existing plant, develop the reference model together with the operator/utility.

Don'ts

Setting up a reference model takes time. Don't set up a calibrated energyPRO-model, if a different tool serves well for an existing utility. If you wish to cross-check the results the utility's model may show, consider to use even more user-friendly and simple tools, e.g. HotMaps.

Input

Facts about the heat plant to be evaluated. Parameters like prices and heat demand at hourly or aggregated level (can be disaggregated with built-in functions).

Output

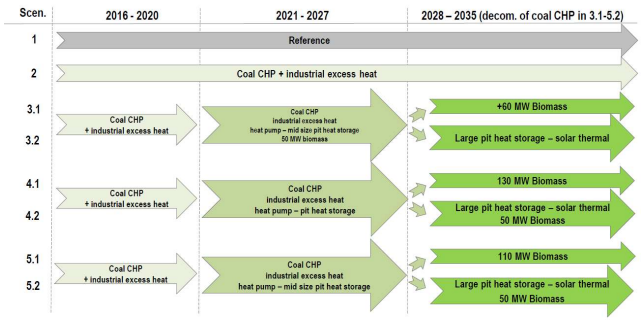
Operational costs, emissions and energy turnover. Resolution hourly-annually for each energy unit or a whole system.

Best Practice - Aalborg

Aalborg District Heating Utility worked on a heat plan with the aim to investigate the consequences of phasing out the lignite fired CHP by 2028. energyPRO was used to model this complex system with 10+ baseload sources (lignite CHP, waste-to-energy, 7+ excess heat suppliers of varying size in the 100-MW down to single MW size).

A total of eight scenarios was modelled for the final strategy, looking into distributed integration of smaller heat sources and a conversion of the lignite CHP to biomass (moist woodchips), also looking into increased use of excess heat and the introduction of seasonal heat storage.

To keep the model operational, it was chosen to split the model into three steps (reference – midways – 2028), following the same logic as suggested in III.1.



Related Elements

- III.1: Scenario Definition
- III.2: Energy System Modelling

Examples

- Add other examples

Phase IV: The Final Heat Plan

IV.1. Writing the Heat Plan (Draft)

IV.2. Approval Process (incl. Public Phase)

IV.3. Evaluation and Monitoring

About Phase IV

The purpose of Phase IV is to present the results of the heat planning process in a **final document** and to secure that implementation of the actions will take place.

The result of the heat planning process will be many documents. It is important to have a short version of plan and actions, but also that all documents are available in full extent.

The heating plan may **be pre-approved** in the municipal technical and environmental committee and hereafter put to the citizens for a final chance for commenting. A **public phase** (and final iteration round) is preferable before **final political approval**.

Try to come as close as you can to **100% political agreement** behind the plan in the final approval! The next step after the heat plan should be an implementation phase, where district heating is being developed in your municipality. At that stage, it is paramount that the politicians agree on the heat plan (believe in it and stick to the action plan), as the project development WILL develop resistance and political agreement is a strong signal against this.

Most of the follow-up actions have already been defined in III.3 Action Plan. In Phase IV the framework is set for how a) the Action Plan is communicated (IV.1 and IV.2) and b) it is monitored that the Action Plan is carried out and projects are developed because of it (IV.3).

Implementation of actions are up to the responsible stakeholders. It has to be monitored that the actions really are implemented to take care of supervision of actions carried out. For this it may be necessary to continue the core group or at least approve a follow-up process to ensure continuation and iteration of the heat plan.

Phase IV in a Danish 75k municipality

Expected duration
≈ 4 months

Costs (internally)
≈ 1/1 person for 1 month (head of Core Group) + ¼-½ person (same) for public phase & approval

Costs (externally)
Maybe costs for hosting a launch event. Consultants should be redundant in this phase.

The Core Group	•Write the draft and iterate after hearings •Prepare for continuation with action plan and monitoring •Connect and condense activities
Politicians	•Formally: Final approval
Implementing Stakeholders	•Engage in action plan and monitoring activities.
Citizens	•Engage in public hearing

IV.1: Writing the Heat Plan (Draft)

Purpose
To write a plan that communicates all necessary information to all relevant stakeholders at a proportionate level of details and can be legally approved.

Description
The work in the heat planning process will be documented in the heat plan. The writing-work must be anchored in the municipal administration and preferably the one stop representative in the Core Group should write it him-/herself as this ensures as much anchoring as possible. Therefore, the best solution is that gathering of documentation and writing the heat plan is done in the municipal administration, maybe assisted by the REO.

Writing the heat plan is a technical job but writing a summary that can be used by politicians and understood by citizens is a job for people experienced in writing understandable texts. Also, layout of the summary and the heat plan is a job for professionals (this may be the same PR-office/consultancy you engaged with in I.1 Organizational Setup).

Part of the heat plan is to describe responsibilities in the implementation phase. Who will be responsible for implementing actions and how (III.3 Action Plan). Who will be responsible for supervision control of the actions are carried out as planned?

The organization of this must be described in the heat plan.

Iterations and Revisions
You will most likely receive input in the public hearing (IV.2) that makes it necessary to recalculate elements/scenarios. Prepare for this, e.g. by having a section in the end of the report where you suggest areas to elaborate "in the next heat plan" or when implementing actions (should not be too extensive). This is an obvious point for an action for the municipality/Core Group in the Action Plan.

Also, the plan will be outdated sooner or later – prepare for this by including a schedule for iterations and follow-up analyses.

Do's
"Do it yourself" – the Core Group received much help along the way but writing the heat plan is a **mandatory** exercise for the Core Group (preferably the Klimaschutzmanager or a similar position).

Make it possible for citizens to find all preconditions/assumptions and scenario calculations. Transparency is a precondition for confidence/trust.

Remember to include a plan for revision – your plan WILL be outdated sooner or later and an outdated plan is worth less than no plan.

Don'ts
Don't be too smart in the technical documents. Be honest and let the professionals make it readable.

Best Practice - Sønderborg

In Sønderborg an organization is set up to secure that the purpose of reaching 100% CO_2-neutrality in 2029 is coming to reality. There are 15 responsible hotspot-groups, one for each topic.

One of those groups is "CO_2-neutral district heating" where the manager for the largest DH-utility is hotspot-owner, supported by a project manager.

KPI incl. fuel consumption and greenhouse gas emissions are calculated every year for each hotspot, for monitoring and follow-up.

Example: Table of Content

The table of content could look like this:

1. The Framework (local agendas and strategies, BaWü/National regulations…)
2. Screening of Areas (district heating/individual heating area boundaries)
3. District Heating Areas: Heat Production (sub-chapters for each of the identified grids)
4. Measures Outside District Heating (how is the heating transition addressed for individual heating?)

The Action Plan can be integrated in each of the chapters or written as separate chapter in the end – the way you organize the stakeholders may suggest either or. The action plan can also be an appendix, which may make it easier to update/iterate it.

The links under "Related Elements" feed directly into this table of content. You can of course also include findings from many other elements in the toolbox.

Related Elements

- I.3 Municipal Planning
- II.2 Adapted Mapping
- III.2 Energy System Modelling
- III.3 Action Plan

More Info

Examples

- IV.1 Sønderborg Final Heat Plan 2021

IV.2: Approval Process (incl. Public Phase)

Purpose

To make sure all stakeholders feel they had a chance to share their opinion. Any implementation will create resistance and concern – but the better an approval process the smoother the implementation.

Description

The draft of the heat plan must be approved according to your work plan. It should be discussed politically and then be sent to a public hearing, before finally approving the plan. The initial political discussion before the public hearing may very well be done in a committee (the political committee that also treats other plans – municipal/local plans).

When the heating plan is written and all Implementing Stakeholders have had their say in the process, the public is involved in a hearing phase. Create a hearing process that includes everyone with an interest and a claim and that can add new details and clarification to the plan. It is important to make sure the plan is understood, agreed AND accepted and all stakeholders are ready to support and /or accept implementation. This is the time when you find out if your process has been sufficiently integrative.

When planning the hearing phase, assess which kind of feedback and which kind of resistance against the plan you expect. If you have reason to believe that citizens will rise public resistance against the plan, make sure to be open in the communication and allow enough time for Q&A for concerned citizens. If the information and involvement tasks have been done well, meaning the planning period has been perceived as open and transparent, most of this has been dealt with already.

You opened with an event in the kick-off – you wrap up with a "*Planning done – now we kick off the implementation event*" to celebrate the job done. If the job was done right in phases I-III this will more be about discussing solutions than receiving resistance from the public.

Do's

Reserve the time it takes to listen to and integrate the input.

Prepare a Q&A for the public hearing and discuss it with your REA-friends/consult the toolbox. Others will very likely get the same questions as you did!

Don'ts

Don't ignore (public) resistance. Embrace it and give solid answers. "We'll look into this, cf. our action plan" is a different answer than "no". Appreciate the input and make it a driver (if possible).

Things to consider

Be prepared before going public (Core Group and the political level). You did a proper job and your plan is good. Know the content when addressing the public and leave a professional impression.

Prepare a Q&A – people may have the same questions (district heating is new to most). Write down your answers in order to always give the same answer to the same question.

Many questions may be the same for entire BaWü – consider to create Q&A for the entire state.

Remember to have a communication strategy before and during the launching – tell the good stories along the way (and afterwards).

If you receive input that points at e.g. surplus energy or urban areas that you missed, note these down in your action plan (data to follow up in next steps). Don't revise conclusions if they are not too major. Be pragmatic and get the plan approved and elaborate the action plan.

Related Elements

- Phase I (prepare your ground properly!)

More Info

Examples

- Add other examples

IV.3: Evaluation and Monitoring

- **Purpose**

To ensure that the action plan is not forgotten and that projects are developed according to the plan.

- **Description**

Many plans never come through and remain a dead document on the shelf. To stop climate change, this needs to change.

To be sure that actions are implemented an annual evaluation is necessary. In this evaluation the status of each action has to be described. Also new ideas coming up have to be included.

A fuel consumption reporting system must be set up, if not already established. From that GHG-emissions for heating can be calculated and monitored. Utilities (district heating, gas, electricity) and energy suppliers (oil) should be obliged to report fuel consumption to the municipality. District heating utility should also inform final consumption.

The greenhouse gas emissions from the heating sector and status of actions can then be presented to citizens and politicians every year.

If your municipality is a member of the Global Covenant of Mayors, a monitoring scheme may already be in place. It may be necessary to expand this monitoring to emphasize (more) on the heating sector. Check out the "Examples" for inspiration to setups.

- **Do's**

For comparison (and if possible), report not only GHG-emissions from the heating sector, but for all sectors incl. in the Paris Convention (incl. industry, land use…).

- **Don'ts**

Don't accept status of actions and consumptions not reported. Without figures, you are not able to act.

- **Best Practice**

Many Danish municipalities make status of GHG-emissions from all monitorable activities within their geographical area annually or bi-annually. They either use a national CO_2-balance calculator for all Danish municipalities or a specific energy balance (consultancy service).

The status makes it possible to follow changes in emissions (or point out lack of changes) and prioritize where to react to reduce emissions next.

Part of the status is a GHG-emissions from each district heating utility and GHG-emissions from individual heating.

- **Worst Practice I**

Many Danish municipalities have old heat plans that have not been maintained. In the next ten years buildings heated with natural gas have to be converted to either district heating or individual heating (in the future typically heat pumps).

Without a heat plan deciding district heating or individual heating citizens don't know how to invest and suffer because of lacking municipal leadership.

- **Worst Practice II**

Many municipalities are proud of actions they have done, but often it only causes minor changes. If emissions only are calculated for a given project/activity and not for the municipality as a geographical area, citizens and politicians may believe that they move in the right velocity – but really they have no speedometer in their car!

Related Elements

- I.1: Organizational Setup
- I.2: Defining the Purpose

More Info

Examples

- Energy-balance (SmartEnCity)
- CO_2-calculator (DK)

The Core Group

Roles

Overall
- Project Management

I
- Define the purpose
- Plan the process
- Invite stakeholders to the process
- Informe everyone about the process and what they are expected to do

II
- Perform the screening
- Contact stakeholders for data validation
- Coordinate with consultants
- Formally: Power to overrule Impl. Stakeholders, if they don't agree internally

III
- Define scenarios
- Cooperate with consultants
- Formally: Power to overrule Impl. Stakeholders, if they don't agree internally

IV
- Write the draft and iterate after hearings
- Prepare for continuation with action plan and monitoring
- Connect and condense activities

Description

The core group is the overall responsible and operating actor in the heat planning process. The Core Group should be linked closely to the political level and the communication department in the municipality to guarantee political legitimacy and progress in the communication plan. The initiative to forming the Core Group will typically be taken by a head of office or a mayor, depending on the size of the municipality.

The Core Group should not be too extensive (a handful persons) and the division of decision-making competences internally and in the process in total must be clarified in the very beginning (part of Step I.2.). For this, include the relevant heads of divisions to the first meeting in the Core Group. If your local habits crave that every one of these heads of divisions gets a say – create a steering group and let them discuss there. The Core Group is for practitioners!

In order not to drown in practical matters, the core group should delegate work to other actors in the planning process and/or external consultants to ensure quality and progress. However, the organization and management of the process must stay within this group throughout the entire process.

Every member of the Core Group will have an active role in the development of the heat plan. Make sure only to include people who will do this and consider personal matches (team players are more useful than lone fighters – a mix of technical experts and planner-types can be fruitful).

And, as with everything, but especially here: Adapt it to your local setup. **One size rarely fits all.**

Suggestion for members

Members in the Core Group could be Klimaschutzmanager, REA-energy planner, an additional local administrative employee, e.g. from the commercial division, maybe 1-2 high-ranking officer(s) from the municipality or politician (if so, for representation). One of the administrative members must preferably act as "One stop shop" entrance in the city administration

Competences

Needs to be competent to overrule the Implementing Stakeholders when stagnating in Phases II-III.

Responsibilities

Overall project management and progress in the process. Writing the heat plan in Phase IV. Ensuring the follow-up activities (monitoring and action plan).

Politicians

Roles

Overall	• Decision Makers
I	• Participate in kick-off • Formally: Approve definition, goals and plan for the process
II	• React on info/ newsletters
III	• React on info/ newsletters
IV	• Formally: Final approval

Description

The politicians may be involved at several levels, e.g. in a follower group, following the work of the Core Group closely. Based on your local traditions and habits, it may be "necessary" to include (high ranking) politicians in the Core Group itself or in a steering board. This may be OK, if this is what works in your local setup. As the city council eventually will approve the final heat plan, the approving body (city council or technical committee) should at least be informed about progress in the Core Group's work regularly throughout the process.

- **Suggestion for Members**

The politicians in your city council. These may be split into the city council and a technical/planning committee, depending on the organizational structure.

- **Competences**

Approving body: "OK" to kick-off and final approval.

- **Responsibilities**

Participating in public and status meetings.

Some: Be the external face of the heat plan process to show that there is political agreement about the heat plan process.

Implementing Stakeholders

Roles

Overall
- Practitioners
- Those who will implement the suggested projects

I
- Participate in kick-off

II
- Supply available studies and data
- Link up with local partners
- Validate data
- Formally: Agree on mapping results

III
- Cooperate with consultants and Core Group
- Provide info for model calculations
- Validate models
- Formally: Agree on scenario results and conclusions

IV
- Engage in action plan and monitoring activities.

Description

The stakeholders who are directly involved in implementing transition actions. These are split into the supply and demand side.

For the **supply side**, the implementing stakeholders are responsible for the action plan being followed up with feasibility studies and eventually project development.

On the **end user side**, a common approach is to develop projects around large consumers (see list below) and hence these should be involved here. Individual consumers are (especially in larger cities) usually not organized in a way that suits this process and should thus not be considered an implementing stakeholder (but be aware of the importance of public participation!). If they are organized, involve them.

- **Suggestion for Members**

Suppliers: Utilities for supply of heat, gas and/or electricity (e.g. Stadtwerke)

End-users: Housing associations and large public consumers (schools, nursing homes, swimming pools etc.) or large commercial consumers.

- **Competences**

Formally none, as they can be overruled by the Core Group, if they do not find agreement in phases I & II.

- **Responsibilities**

To propose data and results for approval in phases I & II.

Citizens

Roles

Overall	•The heat consumers
I	•Participate in kick-off •Demand the needed information flow from others for the whole planning period
II	•React on info/ newsletters
III	•React on info/ newsletters
IV	•Engage in public hearing

Description

Including the citizens in the planning process is important as a good involvement process ensures that the citizens won't feel run over by the municipality.

If citizens are to be involved formally, only do so in a steering/following group. Not in the Implementing Stakeholders or Core Group, as there is a risk that they will hinder the operationality of these two groups. But keep them informed regularly and discuss openly, if the interest is high. Otherwise, it may seem as if you're hiding something, even though you are just creating peace to work.

If consumer associations in the energy field do exist, include them in the communication plan. Maybe green transition movements are already organized. Be aware of the difference in involving and informing people. Fair and open information can be sufficient to avoid public resistance. Let your PR-office or consultant have a say in who to address and how to involve/inform them.

- **Suggestion for Members**

The citizens of the area of investigation, typically split by the areas of investigation (area boundaries cf. III.1. Scenario Definition). Identify "Machers" and use them as agent in the process.

- **Competences**

Heavy resistance against a heat plan draft may disrupt the approval process. Hence, involving the public well in the previous phases is key!

- **Responsibilities**

To stay informed about the process (cf. communication plan) and to get engaged in the public phase(s) and at a later stage in the implementation process.

About this Toolbox

- **Applying the toolbox locally**

This toolbox is based on ≈ 70 % Danish experiences. Use it as inspiration and add experiences from your local context when you get them. Then it will hopefully after a while be ≈ 70 (or 80?) % experiences from everywhere.

Don't think that the "Danish way" can always be copied or is the best solution. Think yourself and do it "your way". It is key to adapt this toolbox to your local setup and background. One size rarely fits all and this is especially relevant for a process that includes a variety of stakeholders that is unique for each case.

- **How to get started and where to apply the toolbox**

If you wish to get an overview of the full heat planning process, start by reading the introductions to all four phases (links in the arrows below). The phase-introductions, incl. the list of steps (left side) and stakeholder-roles (bottom-right) will give you an idea of where to start and which necessary steps to do along the way.

The descriptions in this toolbox are based on heat plans in Danish municipalities, typical size ≈30-75,000 inhabitants, with 3-5 cities (≈3-20,000 inhabitants each). The presented process can however be scaled and adapted to larger and smaller areas. For larger areas, you may need to divide the work more (more project management in the Core Group), for smaller areas, you may need to concentrate more around the available stakeholders and agents (more direct work for the Core Group). Starting with reading the four introductions to the phases is a good place to start either way.

- **But… where are all the tools?**

A good process and integrative planning approach is the very key of this toolbox. The tools presented as such in this toolbox are taken from Danish references and are limited to those actually applied in recent years.

The most important aspect in the selection of tools is the validity of results. This is most commonly reached through the users being familiar with the tool. If your consultant is more familiar with other energy system models, don't let this toolbox limit them, if this leads to lesser results. Instead use this toolbox for a discussion on applicable tools with these consultants.

- **"No" limits**

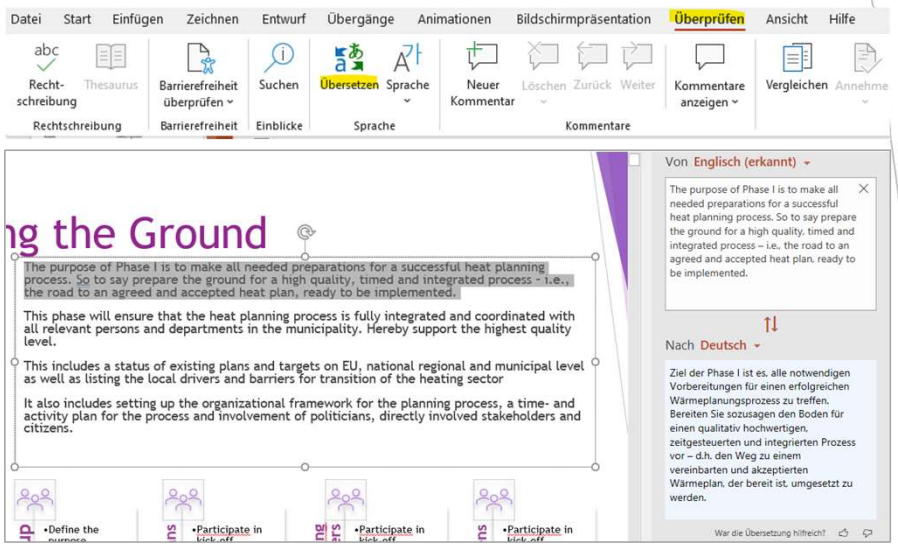
The process in this toolbox illustrates one example of a full heat planning process. If you wish to include your citizens more – please do so. If you feel like creating a steering board to the Core Group (e.g. with local politicians) – please do so. But always keep in mind that the organization needs to be operational in its core. If the process becomes too extensive and big, time will be wasted on iteration runs and hearings instead of results being created (and stakeholders may get impatient).

Translation

How to Translate the Toolbox

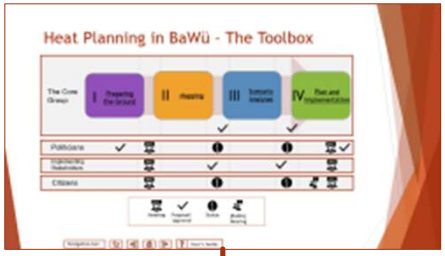
In reading-mode (not presentation/F5):

- Mark the text you wish to translate
- Select the “Review” tab in the top
- Select “Translate” under “Language”
- Select “English” and “German”/”French”/”Spanish”/”Dutch”… and read the translated text in the right side.
- You can also decide to translate the entire content. However, this will delete much of the formatting work done.

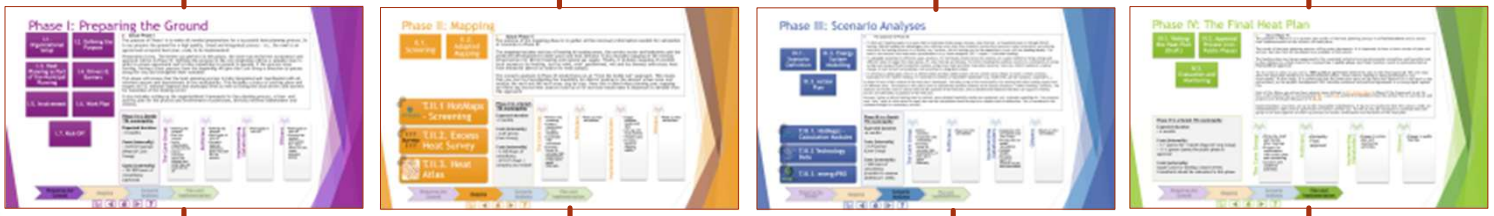


How to Unfold the Toolbox I/II

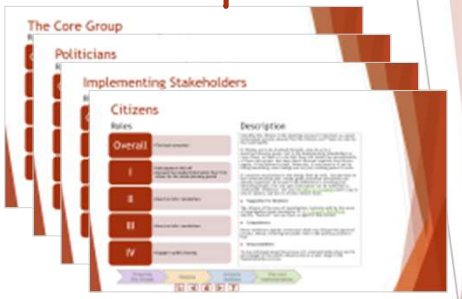
The ”Home”-Screen:



4 Phases

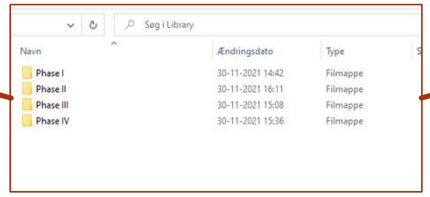


4 Stakeholder-pages



2-7 working elements pr. phase

Document Library

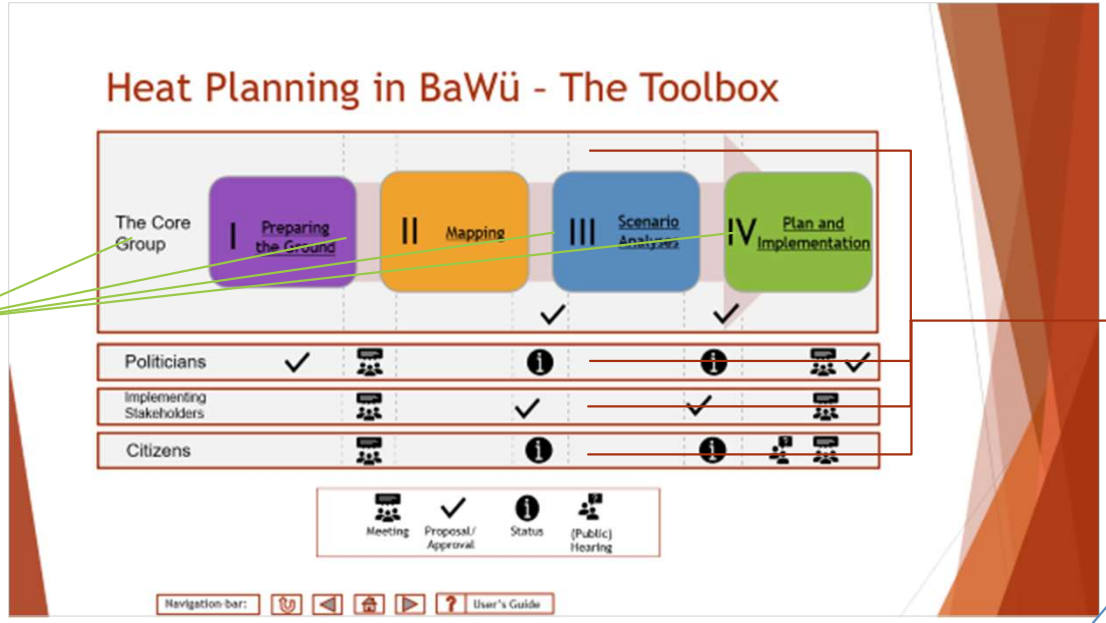


0-4 ”tools” pr. phase

Preparing the Ground | Mapping | Scenario Analyses | Plan and Implementation

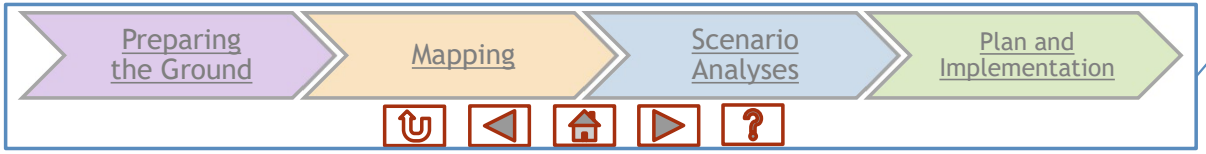
How to Unfold the Toolbox II/III

- The Structure-slide is the entrance to all content.
- Navigation bar in the bottom (incl. ”Home”-button)
- Internal hyperlinks on most “buttons”
- External hyperlinks (to homepages etc.) are usually marked with underlined text



Link to phases

Link to Stakeholders

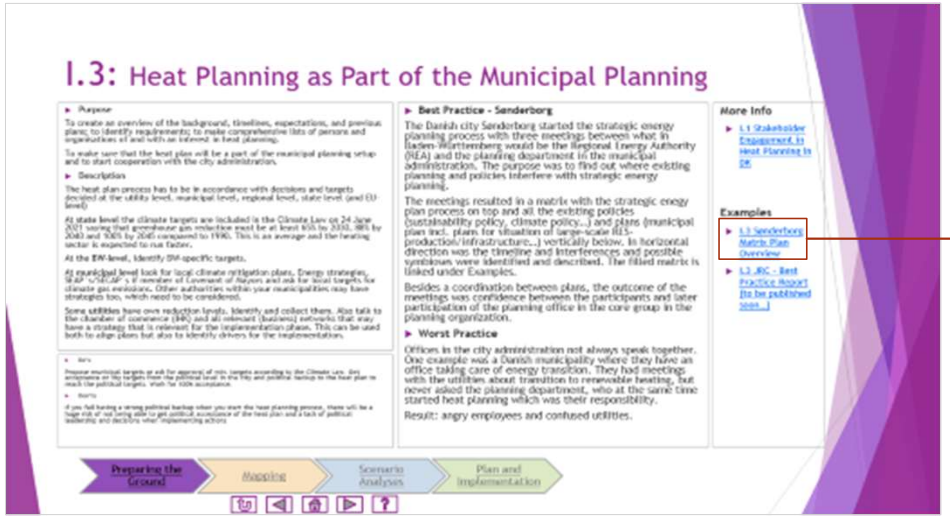


Navigation-bar

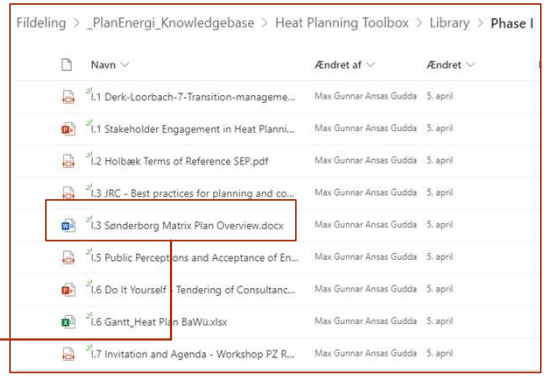
- Link to phases
- Last shown page
- Previous page in order
- “The Toolbox”-page
- Next page in order
- HowTo (this section)

How to Unfold the Toolbox III/III

- Link(s) to the Library:



- Finding the item in the library:



Item “I.3 Sønderborg Matrix”

Impressum

This toolbox was developed by PlanEnergi in collaboration with the Danish Board of District Heating (DBDH). The original target group were regional energy officers in the regional energy offices in Baden-Württemberg, who shall turn to this toolbox when supervising local energy planners in heat planning processes. Behind the toolbox, a library is implemented, where the 12 REA's can share experiences and materials for inspiration. This living library is currently only established and maintained for the REA's in Baden-Württemberg but may at a later time be expanded to a more international audience.

The development of this toolbox was financed and supported by the Foreign Ministry of Denmark, Royal Embassy in Berlin, and the Danish Energy Agency, Center for Global Cooperation.

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Preparing the Ground | Mapping | Scenario Analyses | Plan and Implementation

Start diving into the toolbox!