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**title: Mini-Lecture 8.1 -- Introduction to regions and aggregation**

keywords:

- Regions

- MUSE

authors:

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This mini-lecture provides an overview of different regions within energy systems models and how these can be represented within MUSE.

# Learning objectives

- When to aggregate data into different regions

# Aggregation

Regions within energy models play an important role. We often want to aggregate technoeconomic data from multiple regions into one. For example, the UK is made up of many different counties with different energy demands and supply. However, it could be the case that we do not have comprehensive data for each of these counties. We may, however, have plentiful data for the UK as a whole, or even for England, Scotland, Northern Ireland and Wales. We can therefore aggregate these data and make assumptions about the geographical locations of supply and demand.

This is an example of aggregation and can make the modelling process more straightforward, whilst losing a small amount of accuracy. This is because we do not need to model each individual power plant, demand centre or end-use sector. This means we can use aggregated data which are often easier to access.

We can also aggregate multiple countries into regions. For example, we can merge the European continent together. This would be especially useful if we are considering a global model. However, it must be noted that we would lose significant detail by aggregating up to a supranational level. It is up to you, the model user, to consider the trade-offs between aggregation and disaggregation. For example, if you only wanted to model a single country, it would be possible to have a single region. However, if you had good access to data at the local level, you could disaggregate the data further. It does not matter whether the region is a single country, a number of counties or at a supranational level. The regions depend on your case study and the data you have access to.

# Summary

In this mini-lecture we learnt about the trade-offs between aggregation and disaggregation when defining regions. We learnt that the more aggregated the model, the less granular data are required. This can be helpful in cases where the data are not available at a local level, but available at a national level.

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**title: Mini-Lecture 8.2 -- Disaggregation of regional data**

keywords:

- Disaggregation

- Regions

authors:

- Alexander J. M. Kell

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This mini-lecture introduces the concept of disaggregation of regions in further detail.

# Learning objectives

- When to disaggregate regional data in MUSE and energy systems models

# Disaggregation

Disaggregation of regions can often be a good way of gaining a deeper understanding of the interactions between regions. For example, if you have a lot of technoeconomic data on the locations of supply and demand, then it may make sense to disaggregate regions. This will also allow the modeller to understand where there may be issues within a specific region or country.

An interesting example of this would be for the Southeast Asia region. Laos has a good amount of hydropower availability, whereas Thailand has more solar and wind resources. If we modelled the Southeast Asia region as a single region in MUSE, we would lose information on the potential for trade between these two countries.

It is also interesting to see energy flows between regions within a country, similar to the Southeast Asian example. For example, if a country has a large demand centre in the south of the country, but large energy resources in the north, it could be interesting to disaggregate this country into those two nodes.

Similar to the previous mini-lecture, this disaggregation is largely dependent upon your requirements and the data available to you. There is no one solution for all areas, or even for the same area and different case studies. For example, one case study may only require the modelling of a country as a single region. Another case study, however, may require the modelling of that same country by many regions. It all depends on the question you are trying to answer and the data available to you. It must be noted, that a more disaggregated case study will take longer to run in MUSE.

# Summary

In this mini-lecture we explored reasons for disaggregating a case study. We discovered that disaggregation (and aggregation) of regions depends largely on the data available to you and the questions you want to answer for your case study. However, we found out that the greater the disaggregation, the more detail the model may reveal, but the longer the model will take to run.

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**title: Mini-Lecture 8.3 -- Communicating research**

keywords:

- Science communication

- Visualisation

authors:

- Alexander J. M. Kell

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In this mini-lecture, we will explore the different ways that research can be communicated effectively.

# Learning objectives

- Understand how to communicate the results of your research to influence policy development

# Effective communication of research

Throughout this course, we have explored the useful insights and analysis that can be provided by energy systems models. We have also explored the types of results that can lead to changes in the planning of energy systems, for example by taking a more holistic approach to investment planning.

However, it is important that these results are communicated effectively to ensure that decision makers can fully understand the implications of these results. Effective communication also allows the methodology of the study to be better understood, which allows for the positives and limitations of the model to be explored.

## Presenting figures

It is crucial to present figures in an understandable way. Figures are often the first thing that the audience will look at and try to understand. Figures can be used to convey the key results from your study in an impactful way. There are therefore some things that should be considered.

The first of these is to design the figure with the target audience in mind. For example, if the audience is made of non-specialists, it may be sensible to ensure figures focus on the message without lots of technical jargon. For any audience, it is important that they understand the content of the figure, and so it is important to always include a figure caption, a legend (explaining colour coding and any symbols) and axis titles where appropriate. Finally, the colours chosen can have a large impact and so the colours should be chosen carefully with sufficient distinction between the colours.

## Common mistakes

This section focuses on the commonly made mistakes when presenting figures in research. It can often be the case that figures are too confusing and contain too much data. This can often result in the message of the figure being unclear. It may be the case that by confusing your audience you reduce the impact of your research findings. Therefore, it is advisable to make figures as simple as possible to ensure that they are understandable.

Other common mistakes include:

- The use of inappropriate axis for graphs which can distort results

- Lack of figure captions, axis titles, labels or legends

# Summary

In this mini-lecture we explored the different ways that we can communicate our research for maximum impact and ways to make figures understandable to our target audience.

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**title: Mini-Lecture 8.4 -- Oral presentations**

**keywords:**

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authors:

- Alexander J. M. Kell

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In this mini-lecture we will focus on effective oral communication of research.

# Learning objectives

- Implement tips for improved oral presentations to influence policy development

# Key features of presentations

The key features of presentations are:

- Entry point: capture the audience's attention

- Aim: focus on what you want to achieve with the presentation

- Structure: ensure consistency across the slides and tell a coherent story from beginning to end

- Audience: plan for your audience and their background

- Impact: identify key take-home points that the audience should remember

Firstly, there is the entry point of the presentation. It is important to focus the audience's attention. This ensures that they are interested in the presentation and understand what will be presented. This could take the form of presenting a question that you know will interest your audience, and telling them that by the end of the presentation they will know the answer.

Throughout the presentation it is important to have the aim in mind. For example, you could be trying to increase engagement with a new department. For example, if you wish to demonstrate the advantages and disadvantages of building a new coal-power plant in a particular country, the figures and data you present should be focused on this particular situation, rather than providing information about scenarios that are not affected by a new coal power plant.

The structure of the presentation can be tailored to your aim. It is important to have a clear beginning, middle and end. There should be consistency across the presentation to maximise the audience's understanding.

To further ensure that the audience understand and engage with the presentation, it should be designed with the audience's backgrounds and motivations in mind (see more below).

Finally, it is important to consider the impact of the presentation and identify key points or policy recommendations that you would like the audience to remember.

## Audiences

It is important to understand the types of audience that you will be presenting to. For instance, they may be generalists or non-specialists. Or they could be scientists from different disciplines, or even scientists from the same discipline, but focusing on different topics.

The presentation should be adapted depending on your audience in order to increase the audience's understanding and engagement. Technical content, for example, can be explained in a simple and understandable manner if the audience contains non-specialists. If you think that your audience, on the other hand, will have technical expertise, you can spend less time on explaining technical content. The amount of technical detail you provide may also change: if you are speaking to a policymaker they may be more interested in the results and recommendations than the modelling process.

The purpose of the presentation should be optimised throughout. For example, if you are aiming to create a partnership with a new department, the presentation should have a focus on the implications of your research for that department and the benefits of the proposed partnership for the audience.

# Summary

In this mini-lecture we introduced some key tips for oral presentations. We explored why understanding your audience of importance, especially when introducing technical content. We also learnt that we can be strategic in our presentation planning and should optimise for the aims for which we want to achieve.

This is the final lecture of the Agent-based energy systems modelling: MUSE course. After this lecture you should be in a good position to develop your own models through MUSE, which can then be used to assess the impact of different policy options.

Thank you for engaging with this course, and we hope you have enjoyed the lectures, found them valuable, and find practical uses for MUSE in your research.