

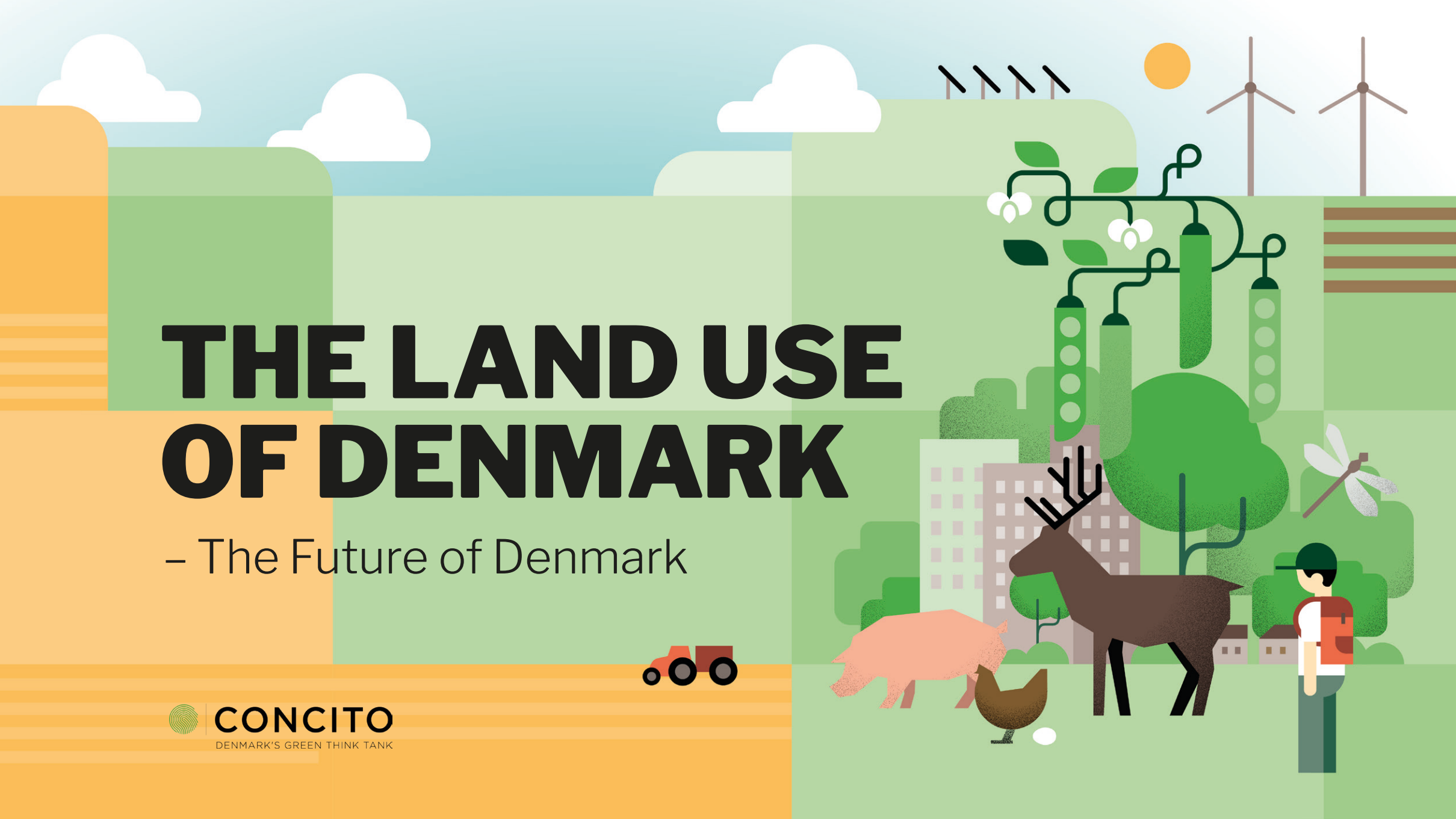
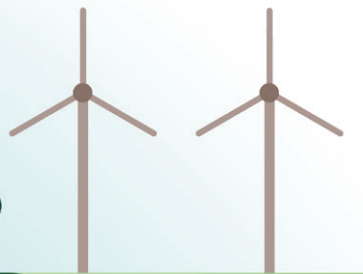
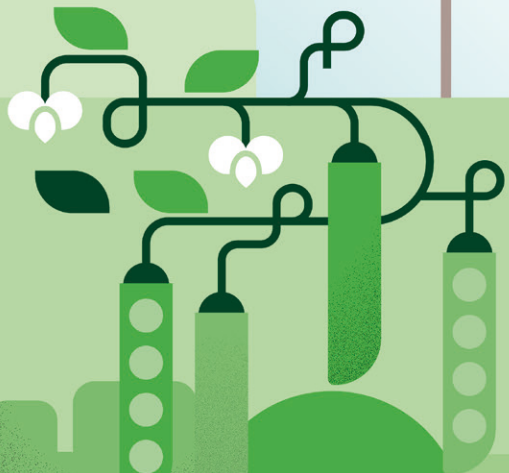
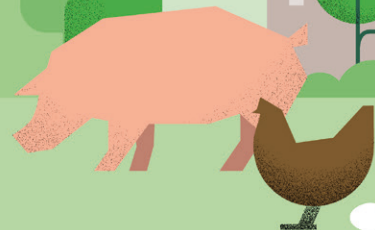
THE LAND USE OF DENMARK

– The Future of Denmark



CONCITO

DENMARK'S GREEN THINK TANK



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This report is the first in a series on Denmark's land use published by CONCITO under the Rethink Denmark project. The purpose of the Rethink Denmark project is to form and discuss visions for land use in a climate neutral and climate resilient Denmark. Using these visions, the project will provide an understanding of the many and complex choices and dilemmas that exist between different types of land use. The project will also identify the transitional elements needed to fulfil the goal of a climate neutral and climate resilient Denmark from a land-use perspective.

The project will be carried out over a two-year period until the end of 2024. During the course of the project, CONCITO invites stakeholders to discuss the choices, dilemmas and possible pathways of the future. The project's reference group consists of the Confederation of Danish Industry, the Danish Chamber of Commerce, the Danish Agriculture & Food Council, Green Power Denmark, the Danish Society for Nature Conservation, KL – Local Government Denmark and Danish Regions.

The project is funded by VILLUM FONDEN.



Rethink Denmark

Land use is the key to the green transition. We need land for the deployment of land-based wind turbines and solar panels as well as infrastructure for transport, storage of CO₂ and production of new fuels such as PtX.

But we also face a number of other major societal challenges in the upcoming years. We need to better protect biodiversity, adapt Denmark to climate change and develop and reorganise agriculture and food production. The land use also needs to take human well-being into account. Access to nature and recreational areas improves people's quality of life and their ability to fulfil their potential.

The future land use must therefore serve multiple purposes at the same time. Space is limited and the landscapes are already in use. We therefore need a coherent strategy that ensures that all the right societal objectives are met.

The necessary changes require us to imagine a different way of organising and using the Danish land. Small scale adjustments are not enough as we look towards a climate neutral and climate resilient society. To create a new and visionary Denmark, we need to set our imagination free. We need a positive vision with a goal to work towards rather than a present crisis to avoid.

This report is the first step towards creating a vision for our future land use. The report takes stock of Danish land use today as well as the challenges that lie ahead in the coming years and suggests possible imagined futures for a climate neutral and climate resilient land use that also provides good living conditions for people and habitats for flora and fauna. Over the next two years, CONCITO will delve deeper into the topic and contribute to the joint discussion on the vision that will lay the foundation of a coherent Danish land use strategy.



Report structure

Introduction

Introduction to the problems and summary of the findings of the report.

Denmark's land

The report takes stock of Danish land use today and the land-related challenges that lie ahead.

Pathways to a future Denmark

Examples of different possible imagined futures of land use that is both climate neutral and climate resilient while also providing good living conditions for people and habitats for flora and fauna.

Challenges and dilemmas

Examples of some of the key challenges and dilemmas highlighted by the imagined futures, which will guide the coming discussions.

Key messages

Denmark faces a number of challenges that needs to be addressed. The climate impact must be tackled and we must be equipped to deal with inevitable climate change. We also need to recognise that if we are to ensure a sustainable future, then climate change is just one of the areas that require a significant global shift.

A total rethink of Denmark's land use

Reducing our climate impact requires developing new methods of food production, allocating space for renewable energy production, expanding carbon stocks in soils and forests, and conserving landscapes for climate resilience. To reverse the decline in biodiversity, we must allocate much more space to nature. These tasks are not optional, but fundamental for a sustainable Denmark that fulfils its international obligations. Without a significant change in the way we use our land, a sustainable Denmark is unachievable.

A comprehensive land use strategy – with local implementation

These are measures that require space – so much space that it will become a competitive parameter if we are not careful.

In the short term, far-reaching decisions will be made that will determine how the land use of Denmark will look for many years to come. Short term decisions need to be made urgently but must not be made at the expense of the long term land use priorities.

In the long term, the land use of Denmark must be climate neutral and climate resilient while supporting human well-being. Only through a clearly prioritised – and, where possible, multifunctional – use of the land can these needs be met simultaneously. We therefore need a coherent land use strategy based on national principles with local implementation.

A unified vision

While the green transition presents several challenges, it also presents a number of opportunities. Properly executed, the transition can lead to a sustainable society where both nature and people thrive more than is the case today. We can create a map of Denmark where people live closer to a nature with a high diversity of species and rich on positive experiences, promoting better mental and physical health in their daily lives.

The green transition also offers opportunities for Danish businesses and the Danish economy. Despite some challenges, Denmark still leads the way in a number of green technological areas. We can maintain this position in the future if we focus on continued development in areas such as food production, bio-solutions, carbon storage and energy systems. In order for all this to happen, we need a vision that serves as a common denominator in future political decisions.



The planetary boundaries

Environmental sustainability challenges the silo-based approach to policy-making that we have in place today. Climate change is not the only threat to the planet's environment. In several other areas, human society is putting pressure on the planet's environmental equilibrium. In 2009, 28 international scientists identified nine fundamental processes that are key to an environmentally stable planet. By monitoring the state of these processes, the overall state of the planet's environment can be assessed.

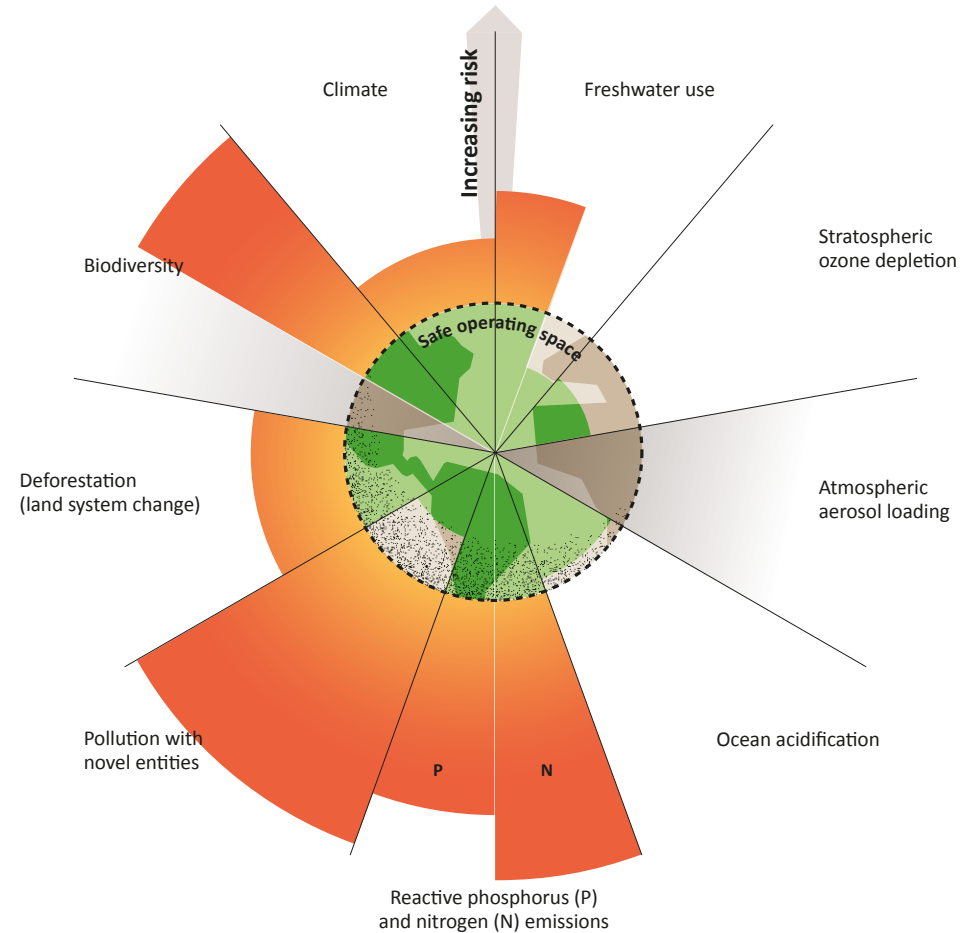
The nine planetary boundaries

1. Climate
2. Biodiversity
3. Deforestation (land system change)
4. Freshwater use
5. Atmospheric aerosol loading
6. Stratospheric ozone depletion
7. Ocean acidification
8. Reactive phosphorus (P) and nitrogen (N) emissions
9. Pollution with novel entities

These processes are essential to ensuring a stable environmental state but they are under pressure from human activity. Planetary boundaries describe how much disturbance the system can tolerate while still remaining in equilibrium. Today, several of these boundaries are being significantly exceeded.

The processes are interconnected and their resilience is dependent on the other systems being in balance. If one system collapses, others will be further weakened, increasing the risk of irreversible environmental changes. It is therefore essential that environmental problems are tackled in a way that recognises all areas where the state of the environment is under threat. Climate politics that simultaneously worsens the conditions for biodiversity is not sustainable politics. Future land use must be designed in a way that is truly environmentally sustainable, and which ensures that Denmark respects the planetary boundaries.

Figure 1. The level is sustainable when the load is within the green zone. When we enter the orange zone, we are crossing the boundary. The darker the orange, the greater the load.
Source: Steffen et al. (2015)



A vision with three considerations



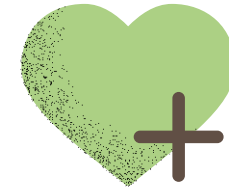
Land use must be sustainable – for the environment and the climate

Land use must, in a broad sense, be sustainable in relation to environment and climate. This means that it must be climate neutral while also being able to cope with changes to the future climate. Land use must also be sustainable where the planet's other environmental limits are under pressure: we must protect and preserve biodiversity, we must ensure that sources of pollution do not contribute to the destruction of habitats and ecosystems, and we must guarantee that the land use activities do not leave the land in a worse state than when we inherited it. Sustainable land use is essential to safeguarding the way of life of future generations.



Land use should support the societal economy

Land use should support socio-economic development. Land is an essential resource for value creation in society, including the production of food, materials and energy. The socio-economic value of land use covers both classical economic returns from the activities on the land, but also the values that can't be determined in monetary terms, such as nature values, clean drinking water, recreational values and avoided damage costs from climate change.

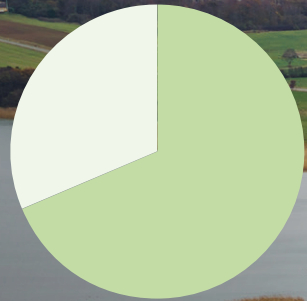


Land use should support human well-being

Human well-being depends to a large extent on the way we use our land. The landscapes around us matter to people's well-being. They provide opportunities for recreational use as well as physical and social activities, and thus play an important role in people's health. With this in mind, land use should serve as a key tool to counteract the lack-of-wellbeing trends of recent years.

The use of our land affects all Danes, and so our vision should be developed through a joint discourse across society. National agreement on our target is the best guarantee for achieving real transition. The joint discourse will need to clarify multiple frameworks, goals and guiding considerations. We should therefore be cautious about building targets into the vision before we have gained widespread agreement on them. That said, there is a fundamental principle that the vision must fulfil: It must be sustainable. Real sustainability implies that the vision fulfils the following three considerations:

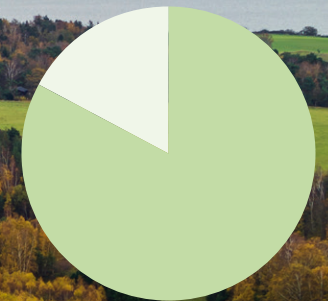
Where do the Danes stand?



68%

find that Danish agriculture is of an appropriate size.

Epinion for Altinget and DR, 2022



83%

find that there should be larger areas where nature can unfold freely.

Kantar Gallup, 2020

Imagined futures

The following section presents different imagined futures in four areas that are of major importance to land use: biological production; biodiversity; urban settlement; and settlement in rural areas. The Imagined futures are an attempt to describe what Denmark could look like in year 2050 when land use fulfils the three considerations: environmental sustainability, socio-economic development and human well-being.

The imagined futures can be constructed in many different ways. The rationale for the four selected areas is that politics and decisions in these areas have major consequences on land use and its impact on human well-being.

Each area will have two or three imagined futures drawn up. The imagined futures paint a unique picture and provide examples, in words and images, of what a sustainable future could look like. The imagined futures will also help us identify which decisions and areas are important, and suggest what dilemmas and challenges lie ahead. Not all imagined futures work together, and as a society we therefore face a choice of which goals of land use we want to pursue.

Biological production dominates land use today. The development and the framework will determine which and how much land could be converted to other land uses.

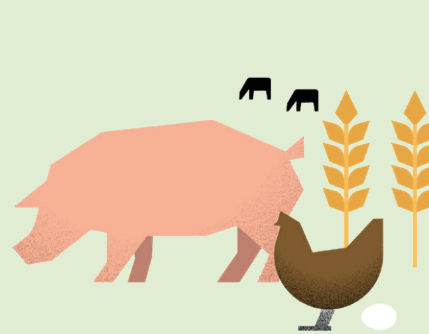
Biodiversity places high and specific demands on land use. The political pathways to meet the biodiversity target have a major impact on land demand.

Urban development has little impact on overall land requirements, but has a major impact on human well-being and the wider framework that will contribute to a sustainable future.

The settlement pattern in rural areas has a major impact on the ability to accommodate the necessary new land uses and facilities required by the transition.

Biological production

Key prerequisite: We are able to feed the same share of the global population in the future as we are today.



Targeted optimisation

Food production remains dominated by animal husbandry. Through targeted optimisation and development, the climate and environmental footprint of food production has been significantly reduced.



Transformation

Changing demand and technological breakthroughs have transformed Danish food production to almost exclusively plant-based foods – both as inputs for precision fermentation and high-quality vegetables.

Biodiversity

Key prerequisite: Species decline has been stopped and good conditions have been secured for our ecosystems. Denmark honours international agreements on biodiversity and biodiversity protection.



Focus on nature

Based on the areas with the highest nature value, a significant area has been set aside for biodiversity protection alone.



Focus on people's experience in nature

Starting with the areas where the recreational value and the impact on people's well-being are greatest, significant areas have been set aside for biodiversity and nature experiences.



Focus on production

The protected area has not increased since 2023, but protection has been significantly strengthened.

Urban settlement

Key prerequisite: As urbanisation and population growth continue, the cities of the future will have to accommodate more people.



Cities are expanding outwards

Cities have expanded outwards in tandem with population growth. The gardens of single-family homes have become a green refuge for many. Apart from the fact that the cars run on electricity, private car ownership remains unchanged. More people are working from home or from local shared offices.

Cities are growing upwards

Cities have not grown outwards; on the contrary, people live closer together and on fewer square meters. Shared facilities and green spaces ensure well-being. Private car use in cities has been replaced by public transport. Nature and production areas are located close to the urban centre.

Settlement in rural areas

Key prerequisite: Rural areas will continue to provide space for settlement in the future, so that people can continue to be part of local communities and live in the countryside.



Dispersed settlement in rural areas

People continue to live in dispersed settlements and small villages. This type of housing offers homeowners opportunities to be close to nature and practice recreational farming. Close-knit communities and local sources of supply compensate for the distance to community services. Modernised flexi-transport has generally reduced car ownership.



Clustered settlements in rural areas

The rural population is more concentrated in and around a number of villages, which now have public services, cultural and leisure activities and a rich local economy. The clustering of key services means that mobility is primarily by foot and bike. The reduction in number of dispersed settlements in the open countryside has freed up land for other uses.

Challenges and dilemmas

The imagined futures highlight a number of challenges and dilemmas. Here are some examples of questions that can help frame the future discourse.

Challenges

1

How do we strike a balance between production areas and everything else?

2

How do we deal with a smaller production area?

3

How do we find synergy between national targets and local implementation?

4

How do we strike a balance between global and domestic needs?

Dilemmas

1

Production forest or biodiversity forest?

2

Densification or urban expansion?

3

Difficult target fulfilment or strong political priorities?

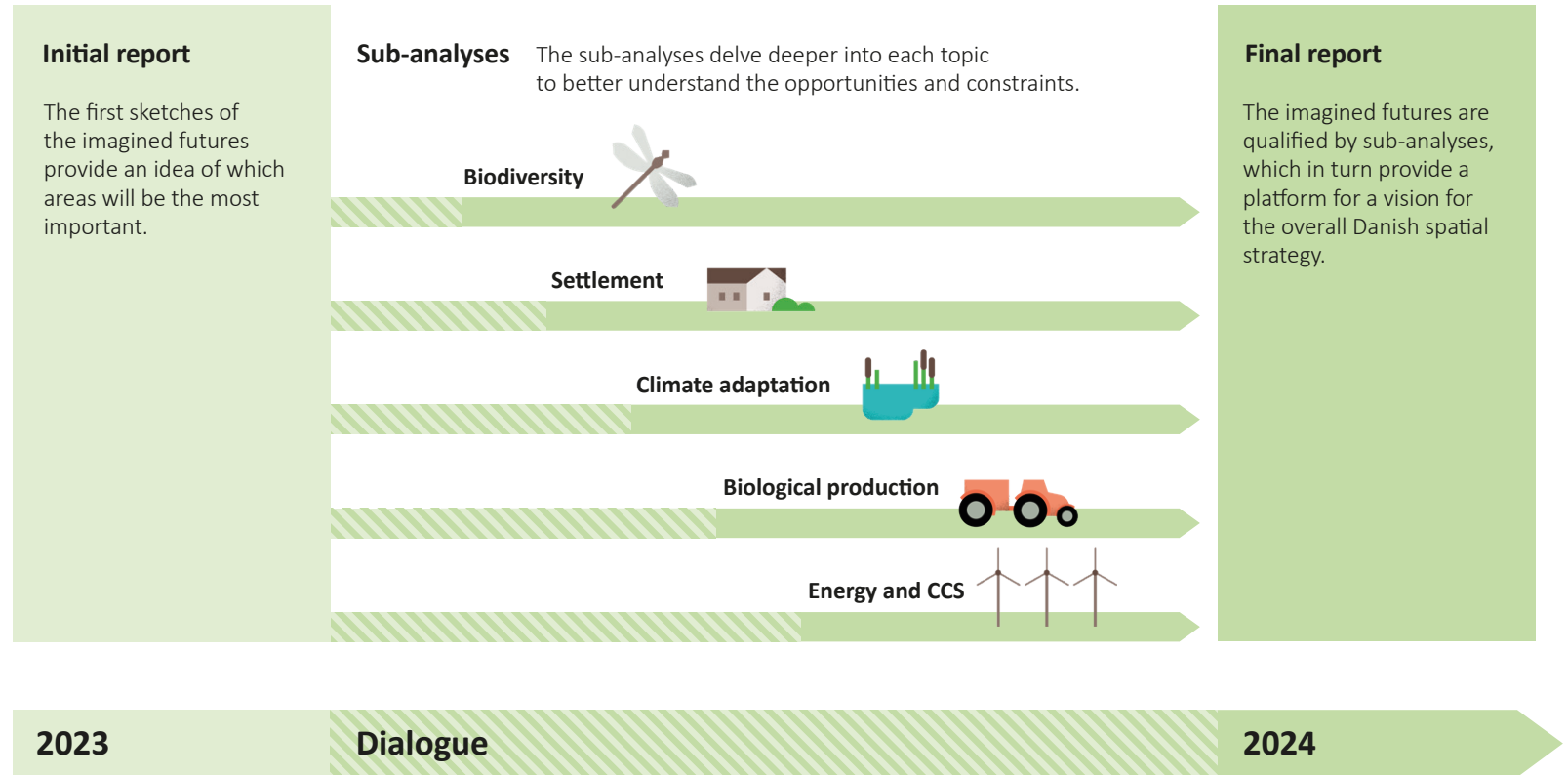
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Smart technologies or changes in behaviour?

The project's process

Toward 2024, CONCITO will reinforce the imagined futures with data and impact assessments through a number of sub-analyses. This information will serve as a qualified point of departure for a discussion on future land use. Along the way, CONCITO will invite stakeholders to participatory and open dialogue meetings to ensure that all relevant stakeholders are heard, and that the future land use has the broadest possible foundation. Towards the end of the project, the dialogue will focus on how to translate the visionary goals into a strategy that leads to concrete action.

You can follow the project at concito.dk/fremtidens-arealanvendelse.



Where do the Danes stand?



87%

are either very satisfied or satisfied with their access to nature.

Norstat for the Danish Agriculture & Food Council and the Danish Forestry Association, February, 2021



85%

long for nature in their daily lives.

YouGov for VELUX, 2019

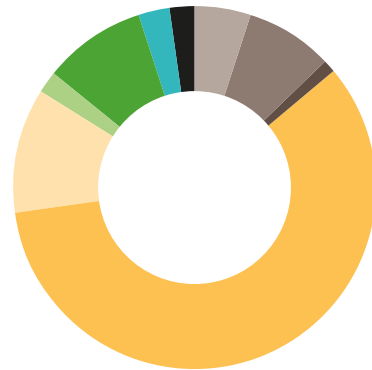
Land is a scarce resource

Denmark is one of the most intensively cultivated countries in the world. The countryside is widely used for biological production, mainly of food, but also of wood products for materials and energy. Already today, existing political objectives points toward a shift in land use in the future. It is also clear that a new approach is necessary to accommodate all the priorities we have for the land and the land use.

Land use today

Denmark's geography supports a high degree of land utilisation. With the exception of Bornholm, the land is flat and has no bedrock. The land is therefore accessible and arable. Much of the soil is fertile and the Danish climate is favourable for cultivation. Land use is currently governed by a significant number of laws and other policy frameworks. Figure 2 shows the land use in Denmark. Agricultural production dominates, covering 59% of the land area. Buildings and roads occupy about 14%, forests about 13%, heathland, meadows and other natural areas about 9%, and watercourses and lakes about 3%.

Figure 2. Most of Denmark is cultivated.
Source: Statistics Denmark (2023)



- 5% Roads and similar
- 8% Buildings
- 1% Other artificial surfaces
- 59% Agriculture
- 11% Production forest
- 2% Non-production forest
- 9% Heaths and other nature
- 3% Lakes and watercourses
- 2% Unclassified

Biological production

Approx. 70% of Danish land is used primarily for biological production, either as food production on agricultural fields (59%) or production of wood for construction, materials and energy (11%) (Figure 2). Denmark is among the four EU countries (along with Ireland, Hungary and Romania) where agricultural production accounts for the largest share of land area. Despite considerable Danish livestock production, the most prominent activity in the landscape is the production of annual crops such as cereals and maize. However, these crops are mainly used for animal feed, and animal feed is produced on 76% of the cultivated area (Animal Protection Denmark & Danish Society for Nature Conservation, 2022).

76%

of cultivated land is used to grow animal feed

How do we measure Denmark?

Denmark's land area is just under 43,000 km². This report uses the **hectare** unit of measurement, abbreviated to **ha**. A hectare is 100x100 metres and there are 100 hectares in 1 km². Denmark's land area is just under 4,300,000 hectares.

In addition to shaping the landscape, intensive agricultural production also has an impact on uncultivated land and the aquatic environment in lakes, rivers and the sea around us, through the leaching of nutrients such as nitrogen and phosphorus (Animal Protection Denmark & Danish Society for Nature Conservation, 2022).

The land area in Denmark devoted to agriculture is declining steadily, and has been since the 1940s, when it peaked at around 74% of the total land area (Statistics Denmark, 2017).

The impact of land use on the climate

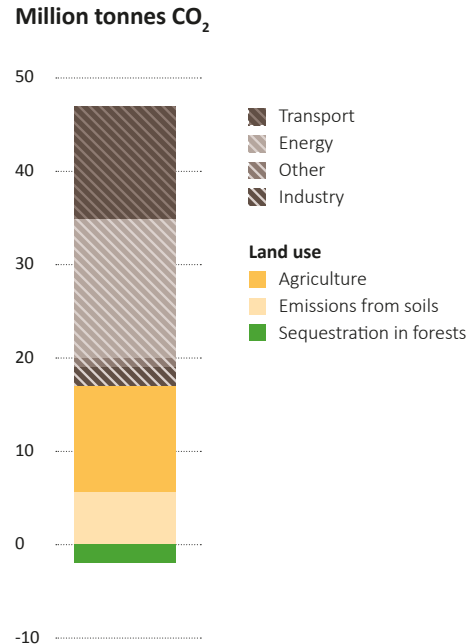
Danish land use has an impact on the climate. In 2020, 32 % of national land use emissions came from food production, wood products and drainage of organic soils (Figure 3). The land management has a major impact on the greenhouse gas emissions. Afforestation and establishment of permanent vegetation cover can contribute to sequestering greenhouse gases. Danish emissions from soils and biological production have increased by 0.8 million tonnes since 2010 and were 14.5 million tonnes in 2020 (Danish Energy Agency, 2022).

Protecting biodiversity

The high rate of land utilisation has put pressure on Danish biodiversity. Denmark currently ranks 24th among 28 EU countries in terms of protecting habitats and species under the EU Habitats Directive (European Environment Agency, 2020). Along with the intense use of land in agriculture, nutrient leaching also poses a threat to biodiversity (Ejrnæs et al., 2021). The Danish Biodiversity Council (2022a) estimates that 2.3 % of Denmark's land area fulfils the EU definition of protected nature. The EU target is 30 % protected nature by 2030, of which at least one third should be strictly protected (European Commission, 2021).

Figure 3. Around one third of Danish emissions in 2020 came from soils or biological production. As shown here, land can also sequester CO₂.

Source: The figure is based on the Danish Energy Agency's data sheet with the CRF table, which is used in the Agency's Climate Status and Projections Report (Danish Energy Agency, 2022)



Urban development and settlement

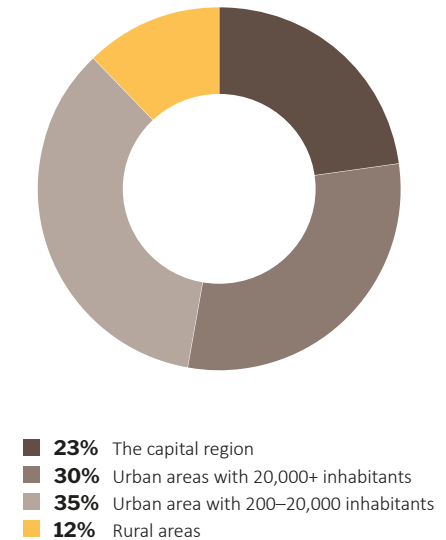
The built-up environment accounts for about 14 % of Denmark's total land area. The average built-up area per Dane has remained unchanged since 2011 (Statistics Denmark, 2023), so the increasing pressure on land from buildings, roads and infrastructure is due to population growth. Denmark is currently among the four EU countries with the highest number of built-up square metres per person (Eurostat, 2021).

In addition to occupying land, buildings, infrastructure and transport form a framework for resource-intensive consumption patterns (Baastrup et al., 2022). In Denmark, 40 % of all households consist of only one person, which has a major impact on the resource and energy consumption of buildings (Jack & Ivanova, 2021). Denmark has the second highest climate footprint per capita from consumption in the EU (Danish Council on Climate Change, 2022).

The last few decades have seen a number of geographical shifts in favour of population growth in urban areas and population loss in rural areas. Today, just under a quarter of the population lives in the capital region area, about a third in cities

with 20,000+ inhabitants, about a third in cities with 200-20,000 inhabitants and just over a tenth in rural areas (Figure 4).

Figure 4. Settlement by size of urban area. Figures for 2022. Source: Statistics Denmark (2022)



The areas are regulated by a considerable number of laws

The use and management of land is currently governed by a variety of laws, which in practice are influenced by national and EU support schemes. A comprehensive land use strategy can help provide stronger coordination and clarity on the necessary legal framework.

In Denmark, the overall framework for spatial planning is laid down in the Planning Act. The purpose of the act is to ensure coherent, holistic and sustainable land use planning. As such the act must cover several societal interests, including nature, the environment, energy production, business, economic growth, beautiful landscapes, infrastructure of roads and buildings, mixed development, etc. The Planning Act applies three zoning concepts: urban zone, rural zone and summer house zone, each of which have different rules for land use (Danish Business Authority, 2020). While the planning tradition in urban zones is strong, there has traditionally been less focus on planning in rural zones.

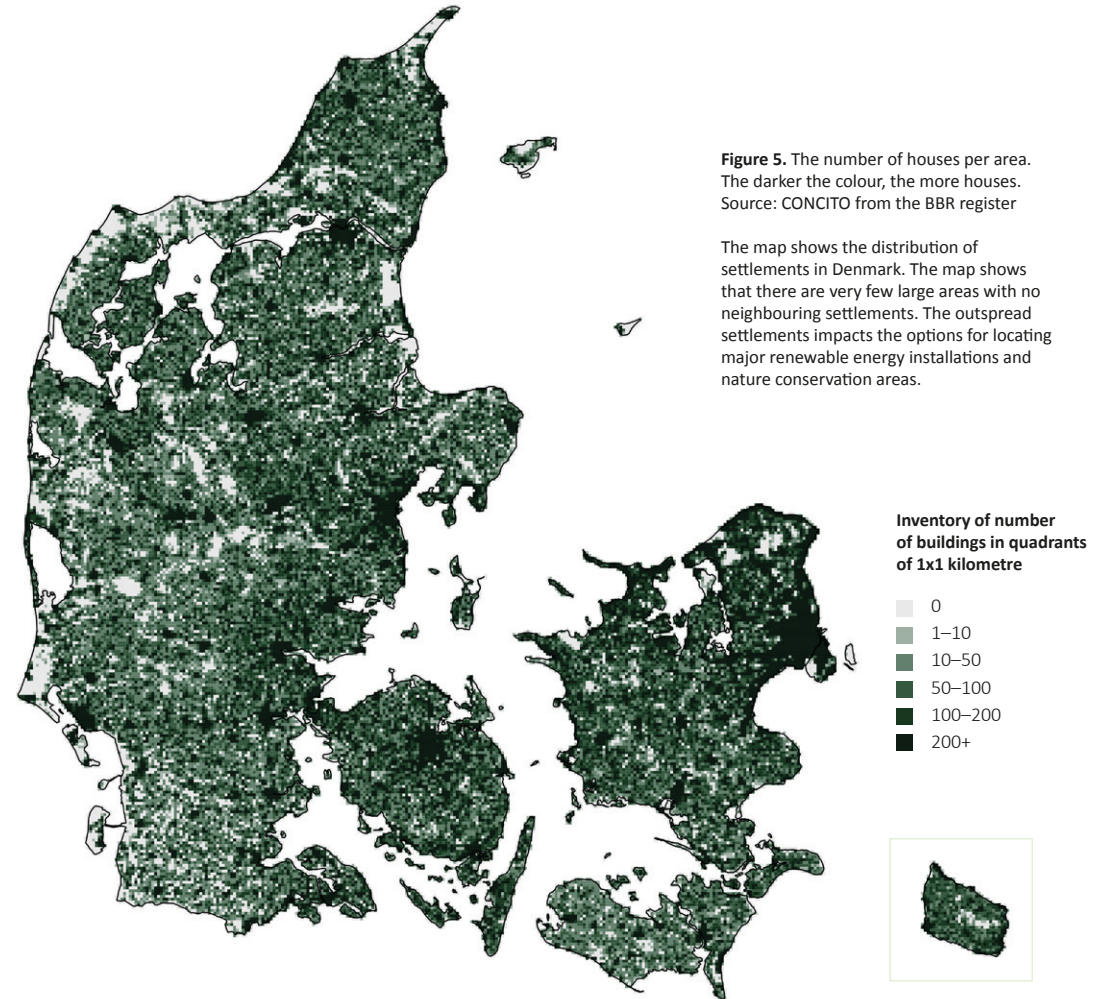
Overall, there are a significant number of laws and regulations – national and from the EU – that influence land use, and they do not always pull in the same direction.

A number of other laws also influence land use. Here is a non-exhaustive list:

- Water planning law
- Agricultural law
- Forest law
- Nature conservation law
- The Environmental Objectives Act
- Act on raw materials
- Act on the use of the Danish subsoil
- Floods Act and Soil Pollution Act

Several of these laws are based on EU directives and are influenced by EU regulations and overall policy developments; examples of these are:

- Water Framework Directive
- Habitats Directive
- Birds Directive
- Floods Directive
- Common Agricultural Policy (CAP)

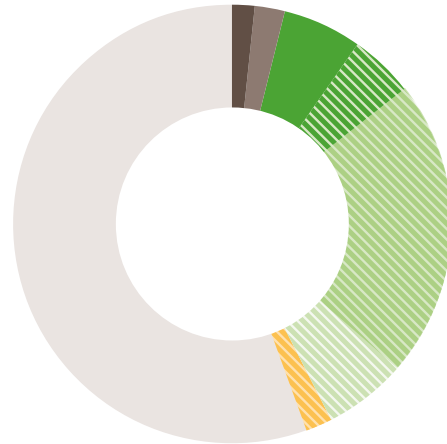


Political objectives

In 2017, the Danish Board of Technology published the report “Prioritering af Danmarks areal i fremtiden” (Arler et al., 2017) (“Prioritising Denmark's land use in the future”). It showed that by 2050, we will need more land than Denmark has available, particularly for forests, nature, climate adaptation and energy. Future land requirements have only intensified since.

In the coming years, several political decisions will be taken that will significantly change land use and the Danish landscape. Figure 6 illustrates future land requirements following a number of existing political objectives for which space has not yet been found. It's not only at the national level that the debate on land use has intensified. The Nature Restoration Law will be negotiated in the EU in 2023 and will set out the framework for new land use on large areas in the EU, including in Denmark (European Commission, 2022). The demand for land is increasing.

Figure 6. At present, there are already a large number of political objectives (adopted and potential) that have specific land requirements.



* The government platform does not specify how much land will actually be used for groundwater protection. DANVA has pointed out inadequate protection of 200,000 ha, which is mentioned in the government platform, and is used as a baseline here (The Danish Government, 2022).

** The government platform does not specify an area size, only that the effort should contribute to the EU biodiversity strategy. It is assumed that Denmark takes a proportional share of the area for protection (30%), and that there are already protected areas corresponding to 2.3% -7.6% (The Danish Biodiversity Council, 2022).

*** No area is specified in the government platform, but it is stated that a national climate action plan is to be drawn up (The Danish Government, 2022). The area requirement has been assessed by CONCITO. Source: CONCITO

Area	Hectares	Share of Denmark's area	Source
Politically agreed requirements			
RE on land incl. agreement to quadruple RE on land	36,600 ha	0.9%	Danmark kan mere II (Denmark can do more II)
Peatland restoration	100,000 ha	2.3%	Agreement on the green transition of Danish agriculture
Increasing the forest area	250,000 ha	5.8%	Government platform 2022
Total agreed area requirements	386,600 ha	9%	
Politically indicated requirements			
Groundwater protection*	200,000 ha	4.7%	Government platform 2022
Additional area for nature conservation EU Biodiversity Strategy and the 30% protected nature target**	960,000–1,190,000 ha	22–28%	Government platform 2022
Climate adaptation***	>86,000 ha	>2%	Government platform 2022
Total indicated area requirement	1.25–1.48 million ha	29–34%	
Total	Approx. 0.4–1.9 million ha	9–43%	

Climate adaptation

The extent of land needed for climate adaptation is not well defined, as shown in Figure 6. Global climate change is increasingly affecting Danish land use in various ways.

- Increased risk of flooding due to rising groundwater (Henriksen, 2023; Henriksen et al., 2012).
- Drought stricken areas with increased risk of wildfires (IPCC, 2022).
- Increased risk of flooding from cloudbursts and pollution of watercourses and coastal waters from sewers (Climate Adaptation, 2020).
- Loss of land area and habitats to sea level rise (Canal-Vergés et al., 2022).
- More frequent and severe storm surges as sea levels rise (Pedersen et al., 2021).

Impacts will vary across the country which will be reflected in localised adaptation efforts. The need for land used to cope with the changing climate depends to a high degree on the local climate adaptation strategy. It is not unrealistic to assume that at least 2% of the Danish land area will be affected by climate change to such an extent that it will impact what type of activities the land can be used for (Arler et al., 2015).

Other area-related objectives

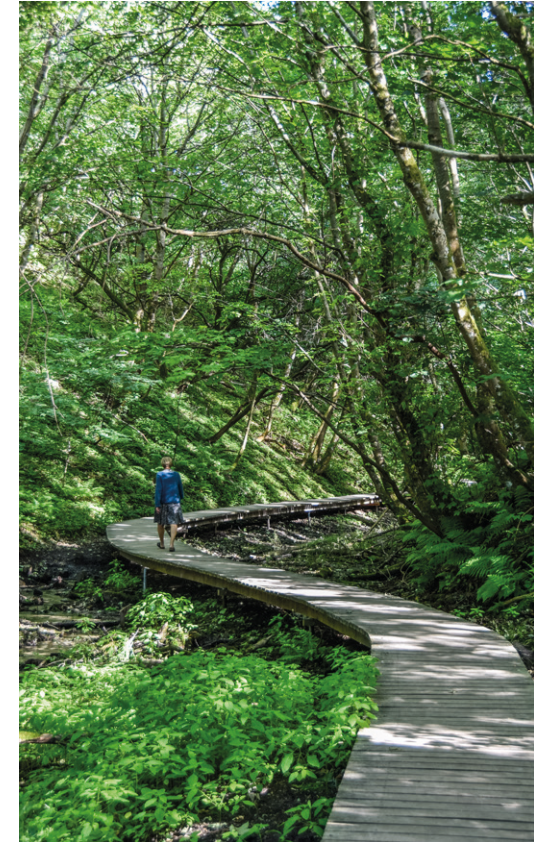
There are a number of additional political objectives and agreements that requires land. However, the actual land footprint of these policies cannot be quantified as clearly. The Danish government will form a vision plan for Danish agriculture and food production to support an ambitious transformation of the agricultural and food sectors. Furthermore, the government platform proposes the formulation of a raw materials plan, the establishment of 15 national nature parks and the designation of five additional national nature parks (The Danish Government, 2022). The EU Water Framework Directive must also be met. All these political objectives require land.

Altogether, current and potential political agreements and goals require a change in the land use on 0.4–1.9 million ha (Figure 6). However, some of these new activities could take place simultaneously on the same land or in combination with the current land use. This is a way to reduce the overall land footprint from implementing the political objectives.



9–43%

of Denmark's total land area
have to change land use



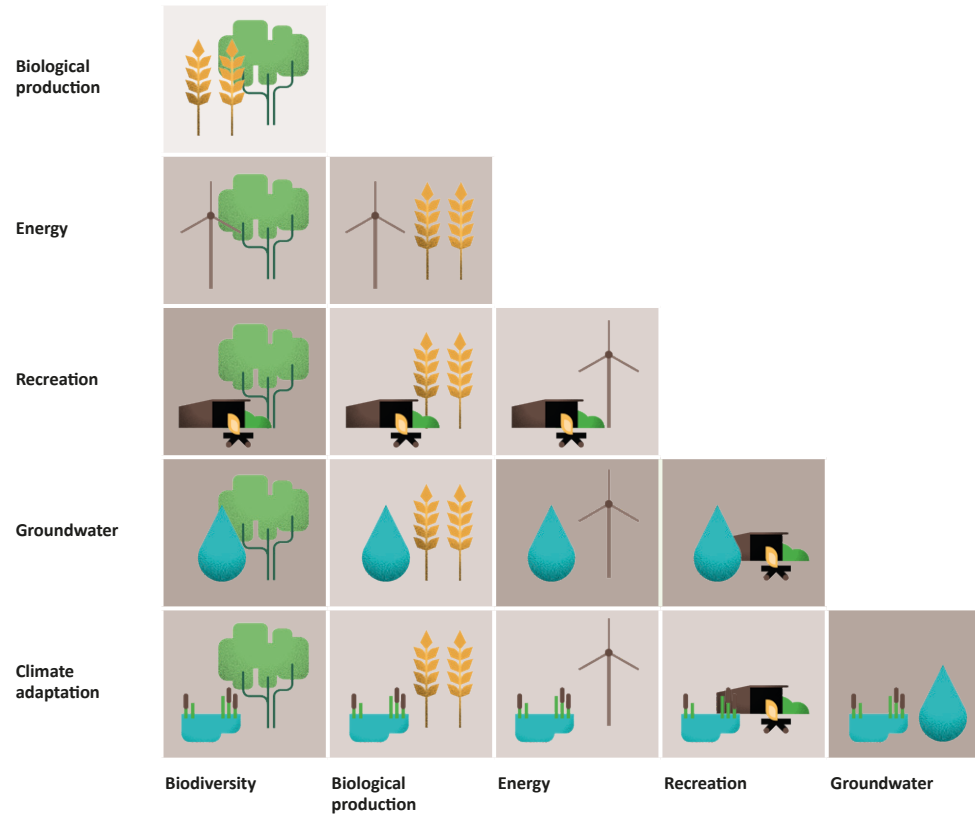
Multifunctional use is one way to reduce the demand for the land

An essential tool to make the competition for land less intense is by using the same land for multiple purposes, also known as multifunctional land use. The potential for multifunctional land use largely depends on which activities are sought combined. For example, it is generally difficult to combine biological production with biodiversity protection, while it is relatively easy to combine biodiversity protection with recreation and groundwater protection.

The potential for combining land uses depends on the location and the exact function of the area. A thorough multifunctionality analysis of the different land uses can map the potentials as well as preconditions for multifunctionality. It will help to make informed decisions regarding objectives, requirements and priorities of the land uses.

Figure 7 illustrates different possible combinations.

Figure 7. Many activities can, to a varying degree, be carried out on the same land, while others cannot. The darker the colour, the better the possibility for combining two activities. Source: CONCITO



Multiple considerations make the prioritisation exercise difficult

The many purposes that the land needs to fulfil pose a major challenge to planning – a challenge that becomes even greater if the job of delivering each purpose lies with different parts of the political administration, each of which may have a limited mandate as well as narrow and specific objectives. Addressing multiple challenges on the same land therefore places considerable demands on the authorities involved. Denmark has positive experience with experimenting with multifunctional approaches to land use change (see the following page), which can provide a solid foundation for solving these planning challenges.

Experiences with multifunctional land consolidation

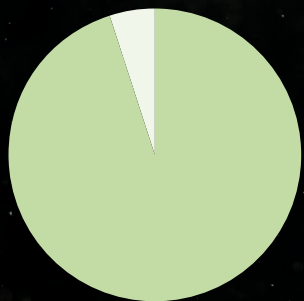
Since 2014, Realdania has facilitated the project and the subsequent collaborative forum "Fremtidens Bæredygtige Landskaber", also known as Collective Impact, following the working methodology on which the project was based. Collective Impact brought together 15 stakeholders with different interests in how Denmark's land was used, with representatives from e.g. agriculture, forestry, renewable energy production and recreation.

They adopted a multifunctional landscape approach, where land use change took into account multiple purposes by involving multiple stakeholders. Among other things, the Collective Impact group carried out a land distribution project at Glenstrup Lake, Northern Jutland, in 2018–2022. Experience from this project showed that the range of possible solutions grew considerably when a larger area, more objectives and a large number of stakeholders were involved. The solution was a land consolidation project with strong local support, a positive impact on multiple objectives and a potential socio-economic benefit. The Collective Impact initiative was finalised in 2022 and summarised its experiences in six recommendations:

1. A multifunctional approach allows for synergies between both national and local objectives.
2. Future subsidy schemes must allow for and support multifunctional land use.
3. The catchment area steering committees must ensure that local projects and consolidation efforts are coordinated across municipalities.
4. Landowners must be recognised for – individually or together with other landowners – creating nature positive initiatives, amenity values and recreational opportunities on agricultural land.
5. Tackling major societal challenges is – and should be – an important opportunity for reviving our rural areas.
6. Resources from the Future Green Fund must ensure collaboration with private investment in balanced, land-intensive projects, such as climate forests and energy plants.

Source: Collective Impact (2022)

Where do the Danes stand?



95%

have to a greater or lesser extent either changed their behaviour or are willing to change their behaviour because of climate, environment, or sustainability concerns.

The Danish Agriculture & Food Council, 2019



35%

associate eating meat with quality of life to a high or very high degree.

CONCITO's Climate Barometer, 2022



Visions for land use

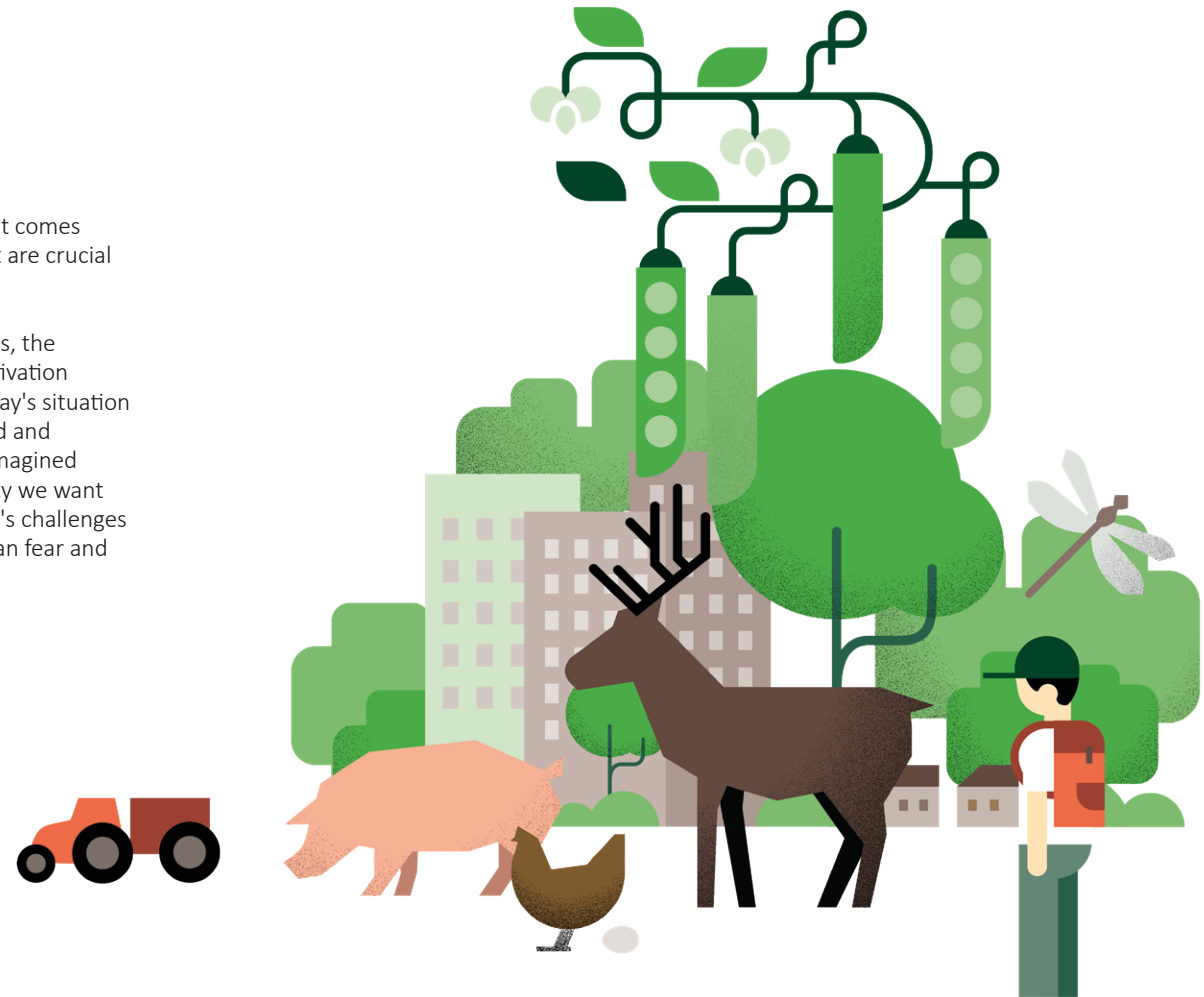
This section presents nine visionary descriptions, so-called imagined futures, of what the land use could look like in a climate neutral and climate resilient Denmark. The imagined futures are based on four selected areas of action. Each will, individually and collectively, help spark the debate on the current choices and priorities that must be made and translated into action.

Role of the imagined futures

The necessary changes require us to imagine a fundamentally different allocation and use of Denmark's land. Current land use is the result of centuries of ongoing decisions, prioritisations and efforts shaped by the most important considerations at the time. Today, we are in a situation that requires fundamental systemic changes to happen within a short period of time. To prioritise, plan and decide on initiatives that can ensure such radical and critical changes, we need to free our imagination and create a new and visionary map of Denmark, where our land is used differently than it is today. Imagined futures

serve as key reference points when it comes to identifying the new solutions that are crucial to achieve the transition.

As well as serving as reference points, the imagined futures will also spark motivation and action. Instead of looking at today's situation as a series of crises we need to avoid and conditions to move away from, an imagined future can paint a picture of a society we want to move towards. The scale of today's challenges demands action and hope rather than fear and discouragement.



Imagined futures

The following section presents nine imagined futures, each of which represents a part of a possible future vision for Danish land use. The aim of the imagined futures is to enable a broad and cross-disciplinary discourse. The imagined futures shed light on both challenges and solutions, thus providing a foundation for identifying some of the key factors needed to trigger the necessary transition.

These imagined futures focus on possible end goals, but not on the route to these goals. They do not address which circumstances that have preceded the sustainable society. It is up to the subsequent discourse to identify these circumstances.

Each imagined future is built around a unique narrative that explores a rather extreme single track strategic approach. This is done to make the options, choices and dilemmas more apparent and highlight the role and consequences of the guiding principles. The methodology for each area is based on an extension of some of the trends we are currently experiencing (see box). Each imagined future operates with a specific objective that has been successfully achieved.

The combination of imagined futures highlights the cross-cutting dilemmas and opportunities

The imagined futures are isolated images. As such, they only go a limited way towards providing a coherent picture of what Danish land use could look like in a sustainable future. To create a coherent picture, we would need to link the various imagined futures together.

Each imagined future includes an assessment of the overall land requirements and the importance of a few key areas that are particularly relevant to that particular imagined future. This provides the first indication of whether the imagined futures are mutually supportive or mutually exclusive.

Methodology used to create the imagined futures

The approach used for creating the imagined futures involved describing a desirable future, rather than trying to predict the future. The imagined futures were created in co-operation with Urban Creators and relevant professionals. The process began by defining the main premise and some minimum criteria that the final imagined futures had to fulfil.

The main prerequisites are climate neutrality and climate resilience, while the minimum criteria include a high quality of life for people, sustainability on a number of other environmental parameters, the same share

of food production and more effective biodiversity protection.

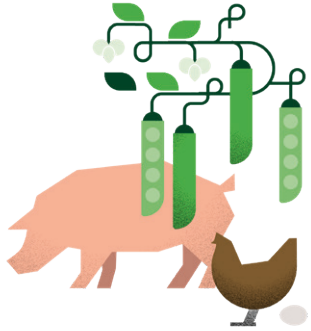
The imagined futures are not the only possible futures. By following different trends or focusing on different considerations and minimum criteria, we can draw up alternative imagined futures.

The imagined futures described will be qualified in collaboration with researchers and experts as part of the coming sub-analyses in the Rethink Denmark project.



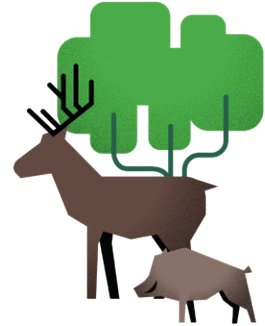
Linking together different imagined futures will bring out the cross cutting dilemmas. It will become clear which factors or activities are critical and which conditions need to be present in order to achieve certain objectives. At the same time, positive opportunities and synergies will be highlighted. Most importantly, we will start to establish a clearer and more coherent picture of what a climate positive and climate resilient Denmark could look like in the future. We will have a foundation for a shared vision of what the sustainable land use of the future could look like.

The imagined futures are organised around four main areas that have a particularly large and direct impact on Danish land use:



Biological production

Biological production dominates land use today. It covers the production of food, materials for the chemical and construction industries, and inputs for energy production. The area includes both agricultural fields and production forests, and is largely where we will find space for other land uses. The development and the framework concerning biological production will therefore determine which and how much land can be converted to other uses. In this main area, the imagined futures describe two different ways we could manage biological production in the future.



Nature and biodiversity protection

Biodiversity places high and specific demands on land use. More land is needed to reverse biodiversity loss. EU deems that 30% of the land area should fall under nature conservation. Nature as well as people's access to this land affect people's physical and mental health, which is why this relationship is also a crucial factor to consider when prioritising future land uses. Political pathways to meet the biodiversity target affect land demand, and decisions on the prioritisation of land for nature conservation have a major impact on overall land use. This main area describes three different approaches to biodiversity action.



Urban settlement

Urban development has little impact on the overall land requirements but has a major impact on human well-being and the wider framework that will contribute to a sustainable future. Urban settlement is a decisive element in determining how we use our land both in and around our cities. The geographical location of our settlement is inextricably linked to transport needs, business development and the need for climate adaptation, as well as the supply of water, heat and electricity. These structures – systems, institutions, infrastructures, and norms – determine the framework for people's resource, climate and environmental footprint. To reduce this footprint, we need to change the structures. This main area describes two examples of how urban development can progress.



Settlement in rural areas

The settlement pattern in rural areas has a major impact on the potential to find space for large, contiguous areas for nature conservation, energy production and energy infrastructure. Sustainable rural settlement requires a transformation of transport, energy and food production, as well as many more shared solutions to ensure sufficient climate, environmental and social cohesion. This main area describes two different imagined futures of what settlement in sustainable rural areas could look like in the future.

Nine takes on the future

The nine imagined futures centre around four main areas that have a particularly strong and direct impact on land use. Within each area, 2–3 imagined futures have been established to show different versions of a possible future. In addition to a narrative, the imagined futures also

contain a number of indicators that allow for cross-comparison. Following the imagined futures, we present the methodology and key assumptions that allow us to assess the futures and the indicators we have used to illustrate them.

Biological production

Targeted optimisation

In many ways, the Danish landscape looks the same as it did back in the 2020s. Global demand for food has grown, but our eating habits have remained largely unchanged. Basically, the same products are being produced as in the 2020s, so Danish livestock – pigs, chickens and, to some extent, cows – are still the core of Danish food production.

Intensive research-based efficiency improvements have reduced the impact of livestock production on climate and the environment. Efficiency improvement has also made it possible to slightly reduce the total cultivated area without compromising overall food production. In order to maximise the climate impact and minimise production losses, the set-aside areas are typically drained peatlands with high emissions or marginal and low-yielding agricultural soils.

The cereals, maize and grass are still mainly grown for animal feed. Emissions from the production have decreased as new technologies have been introduced. Nutrient leaching has been significantly reduced thanks to various precision technologies. The crops have been adapted to yield as much value as possible, which means a higher overall production of dry matter, which can be used to produce energy or materials in valuable

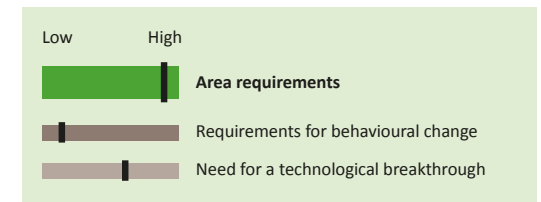


side flows using bio-refining technologies. Alternative plant-based food products are a niche in the Danish economy.

The food we eat is very similar to what we ate 20–30 years ago, and our diets and food habits have not been challenged or required active consumer engagement.

To reach this point, we have continued to do what we were already good at, utilising the infrastructure and capital stock we already had. Research and development efforts have been focused on making the animal production more efficient and more climate-friendly. Despite the targeted research and development, food production will continue to generate greenhouse gas emissions that need to be offset.

Forests have been planted on agricultural land that was set aside, leading to an increase in biomass production in the form of wood chips and timber.



Biological production

Transformation

A new global demand for food has changed the Danish landscape. Over the past 10-15 years, plant-based alternatives to animal products have become so cheap and can be produced with such high quality that animal products are now niche products.

Denmark has led the transition to plant-based diets and has become specialised in creating high-quality food products through e.g. precision fermentation, bio-refining and cultured meat. Inputs for the high-tech food industry are grown in fields and industrial facilities, while fresh vegetables, fruit and nuts are produced in open fields and greenhouses. The variety of crops has generated a new landscape. Emissions of both greenhouse gases and nutrients have been reduced. Livestock production continues, but largely among highly specialised producers, recreational farmers or as part of landscaping initiatives.

The products available to consumers in shops and restaurants do not differ in taste, appearance or nutritional content from 20–30 years ago, but they are entirely derived from plants. After initial inertia, a majority of the Danes – and global citizens in general – have chosen to make plant-based alternatives a dominant part of their

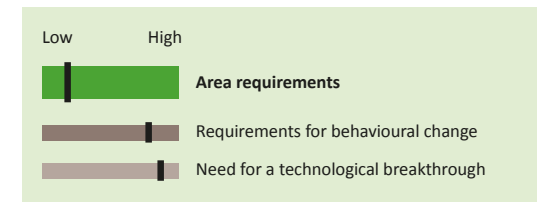


diet as quality increased, prices fell and norms shifted.

Plant-based food production has increased land efficiency so significantly that large areas of land can be dedicated to other uses without reducing overall food production.

To reach this point a whole new value chain has been deployed to support the new technology. Business development has helped to ensure that Danish agriculture is part of the new value chains in the same way that the old co-operative slaughterhouses and dairies used to be. A number of livestock production farms have had to be closed down or converted, and a process has been organised to support individual farm owners in the transition.

Forests have been planted in parts of the agricultural land that was set aside, leading to an increase in biomass production in the form of wood chips and timber.



Nature and biodiversity

Focus on nature

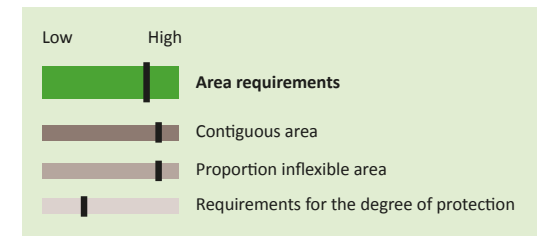
There is space for biodiversity in Denmark. Large, contiguous areas have been reserved to nature and the protection of biodiversity. Starting with the areas with the highest biodiversity potential in the 2020s, Denmark has followed international recommendations and does now protect a significant part of the land area. The populations of animal and plant species, including endangered ones, are increasing. Climate change has led to changes in the species configuration but the large, protected natural areas ensure extreme weather resilience for most species.

Large contiguous areas mean that natural coastal dynamics, flooding streams and the reintroduction of large grazing animals dominate the protected areas. This has created a dynamic landscape that ensures a wide variety of habitats with low maintenance and management, keeping economic costs low.

Biodiversity and nature have determined the location of the protected areas, which means that many people live relatively far from the scenic nature reserves. This makes getting out into nature an arduous project for many. Transport time in particular prevents individuals and groups with less resources available from visiting the areas.



Protection of the relatively species rich forests have been prioritised to halt the species decline. Many of the former production forests are now protected and managed very extensively, if they are utilised for production at all. The former farmland has been reforested or transformed into meadows with an abundance of species – occasionally with solar panels on part of the area. The total production area has been significantly reduced but shall still produce food, timber, and other biological products.



Nature and biodiversity

People's nature experience in focus

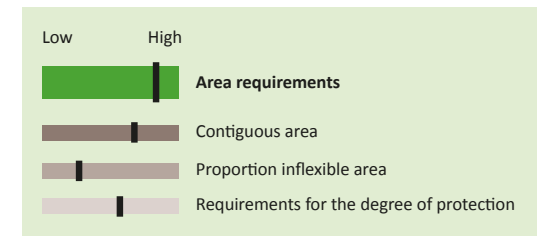
Nature is becoming more prominent both in the Danish landscape and in the Danes' consciousness and sense of identity. The scale of Danish nature conservation efforts follows international recommendations, and many of the large and small natural areas have been located with the aim of bringing nature as close to people as possible.

It is now easy to get out into nature and sit under a tree, or to look out over a meadow with grazing wild horses. Nature playgrounds, shelters, lookout towers and walking routes in nature corridors between cities offer a wide range of activities in nature. Having good recreational opportunities close to the bigger cities is a priority, as they can benefit multiple people. Smaller towns, on the other hand, have good public transport links to neighbouring nature areas. Several safari parks have been established across the country where moose, wild boars or wolves can be seen. The large natural areas have also had a positive impact on biodiversity, which is increasing.



On average, people head into nature several times a week. This has had a positive impact on our mental health. Consequently, health care costs have fallen.

Prioritising natural areas close to cities has led to increased competition for urban land, which in turn has put increased pressure on urban planning. It has also led to the abandonment of some of Denmark's most productive agricultural fields, as these were often found close to cities.



Nature and biodiversity

Focus on production

Denmark's productive land is world-class, so protection efforts are organised in a way that allows for as high production as possible. As a result, the protected natural areas are relatively small, but they are well protected.

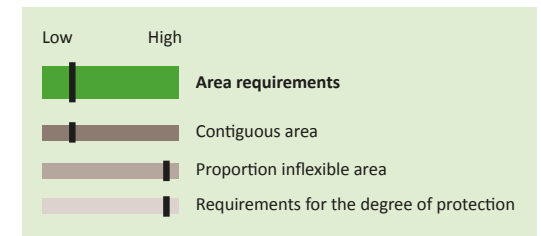
Nature conservation is mainly focused on those areas that were subject to some form of nature conservation in the 2020s. The challenge of fragmented natural areas has not been completely solved. However, many smaller initiatives in the production landscape have led to improved connections between the fragmented natural areas. Living fences, protection lines around fields and perennial crops have given us a productive landscape with more insects, birds and flowers. Closer-to-nature management in production forests has contributed to better conditions for vulnerable and endangered species. Even in urban green areas, there are many small initiatives to increase biodiversity.

Several species remain vulnerable, while others are recovering. Climate change is increasing the pressure. Coastal ecosystems are particularly challenged as small natural areas are squeezed



between rising sea levels and cultivated or built-up land. The small areas require a considerable maintenance effort. The total area for protection is below international recommendations, and to compensate, we are paying other EU countries to set aside extra land for nature conservation.

Human access to the strictly protected nature reserves is restricted. Small areas can be difficult to access and activities that may disturb biodiversity need to be practised in other areas. However, people are still able to walk in most of the protected areas, and walking remains the favourite outdoor activity for Danes.



Urban settlement

Cities are expanding outwards

Over the past 30 years, cities have grown significantly, both in area footprint and population. Urban expansion has converted rural areas and industrial zones around cities into urban areas.

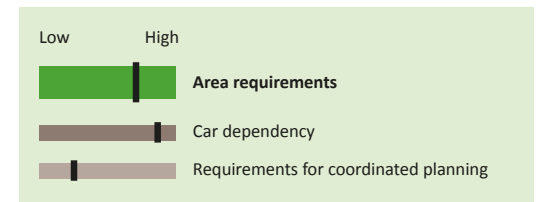
Residential neighbourhoods have grown in size and number, as Danes still prefer to have their own plot of land with a garden. There are stricter requirements for both buildings and privately owned outdoor areas. These include requirements for green roofs, localised rainwater drainage, the preservation of private trees in and around plots, and a ban on tiles and gravel in private gardens. The lawns that were once a typical garden aesthetic in the 2020s have been transformed into vegetable patches and biodiverse flower beds. The new business zones around cities are subject to the same green requirements and are planned so that the areas between buildings are home to numerous plant and animal species.

Urban expansion has increased the distance to larger (and wilder) nature areas for urban residents. Most urban dwellers no longer have access to open spaces in their daily lives and have to make do with local blue-green oases on their way to and from their daily activities.



All new and renovated buildings are constructed using recyclable and sustainable building materials. Generally, the stricter requirements for demolition of housing stock have led to more people renovating existing buildings and using this opportunity to minimise their homes' energy consumption.

All transport is electrified. Public transport has kept pace with urban expansion and has thus expanded significantly. Yet private cars take up a lot of space in cities. Traffic therefore remains a major challenge in cities that have not introduced congestion charging. However, the distance between home and work has generally been reduced, due to more urban dwellers taking advantage of local shared office space and the increase in retail shops in residential areas. The mix of more retail, commercial and shared office space has had a positive effect on urban life and improved quality of life; for example, the reduced commute time has freed up time for other more leisure-orientated activities.



Urban settlement

Cities are growing upwards

Population growth and the need for business and service functions have been met through densification and the transformation of previous industrial and commercial areas. In addition, the improved administrative and economic framework for community property and communities has generally resulted in an increase in shared living arrangements.

People are not only sharing living space, but also other material resources. Sharing economies combined with circular practices have led to the per capita consumption in Danish cities being among the lowest in the EU. A significant part of the commercial sector is now of a nature that allows for a mix of residential and commercial uses. For those industries that require distance from residential areas, compact and symbiotic business zones have been established outside cities.

Private courtyards and gardens have been transformed into public spaces and community gardens. Urban nature and climate adaptation are also an integral part of buildings, e.g. as green roofs and facades. All buildings are supplied with renewable energy and heat, and food production is also spreading to urban environments. There are many successful synergistic examples of building renovation, climate adaptation and food

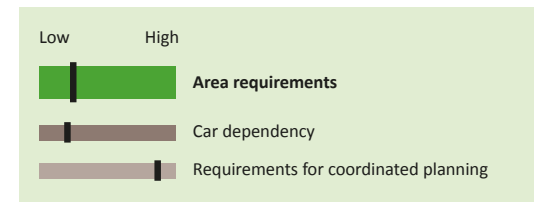


production. The latter has resulted in e.g. more urban dwellers getting involved in local food communities and thus benefiting from more outdoor time.

Cities are largely free from private car use, so motorised traffic consist mostly of service and freight transport. Former car parks and most of the road space have been converted into housing or green and recreational areas, resulting in a wealth of green oases that have become key catalysts for urban life. Green spaces and a vibrant urban landscape are recognised as essential for mental and physical health in cities.

The growth in green urban areas and the multiple climate adaptation measures have resulted in more species – including new ones – finding their way into cities. Traffic noise has been replaced with the humming sounds of animals and people.

For the vast majority of people, densification has resulted in services, shopping, business and leisure activities being located within a 15-minute walking distance.



Settlement in rural areas

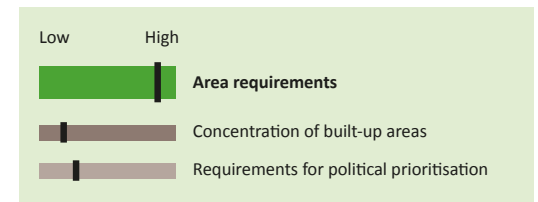
Dispersed settlement in rural areas

Villages still exist and the ongoing rural-urban migration has freed up land for other uses. People use parts of the land for fruit and flower production based on regenerative food production principles.

Although public services and shops have disappeared, new social communities have emerged that help each other in the everyday life. Transport to and from the areas is mainly covered by flexi-transport (taxis and minibuses), partly financed by the public sector. This is not nearly as flexible as the private car, but residents are satisfied with the widespread use of private car-sharing schemes that meet their daily transport needs. Thanks to a flexible job market, most people living in rural areas who do not work locally can largely work from home. Many villagers have jobs that involve working from a home office.



The dispersed housing in rural areas means that more people have energy plants, high-tech CO₂ capture solutions and high-voltage pylons as neighbours, which is a necessary part of the transition. In return, residents have access to the open countryside, fields and large continuous natural areas with an abundance of species. There has been a constant need, as well as a political wish, to support life in rural areas through e.g. tax deductions for travelling expenses, loan financing, entrepreneurial pools and financial support for rural development.



Settlements in rural areas

Clustered settlements in rural areas

The general pattern of rural settlement has changed. A large number of villages have been turned into local centres that – through targeted decentralisation efforts and digital solutions – have managed to establish a high level of public services such as care services, citizen services, schools, libraries, cultural services, association and sports facilities and local food production.

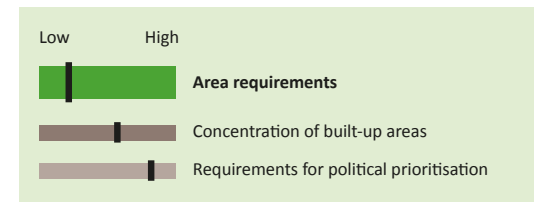
Permission has been granted to build new housing in the open countryside within a given perimeter around the village centres, subject to stricter considerations for both the local environment and landscape aesthetics. This has led to an increase in available housing surrounding the redeveloped village centres. The concentration of residents in the surrounding area and the many cultural and service offerings have contributed to a thriving local business community. The many artisans and speciality shops selling local produce attract tourists from home and abroad.

Urban development in and around the growing villages is planned according to the principles of the 15-minute village. This means that everyday services such as shopping, leisure activities and community centres can be reached by cycling and walking. The surrounding countryside is connected



to the villages by good cycling, walking and public transport systems, so most residents are satisfied with the car-sharing and car-pooling schemes available. This has reversed the trend from the 2020s of more and more cars per rural household. Generally, there is a high level of satisfaction among residents with the newly established high-frequency public transport services to major cities.

The many shared services in and around villages have attracted people who used to live more dispersed in the open countryside. There is a high level of satisfaction with the opportunity to live in and close to nature and close to other community services. The empty houses in the areas further away from the village centres have been demolished, and unnecessary infrastructure is removed and repurposed. This has allowed for the establishment of natural areas and the allocation of space for electricity infrastructure, energy or CCS plants, thus ensuring multifunctional land uses that benefit both people and the environment.



Background

Biological production

Biological production covers the production of food, materials for the chemical and construction industries and inputs for energy production and includes both agricultural fields and production forests. Today, biological production covers about 70% of the total area.

How we made it

The fundamental methodological difference between the two imagined futures is the expectation of how much food production can be achieved per hectare. Here, the weighting between the production of plant and animal calories is crucial for determining the total area requirement, as there can be a significant increase in production per hectare in plant-based food production, particularly in comparison to cattle-based production.

It is assumed that while dietary composition does not differ significantly between the two imagined futures, production chains do. Both imagined futures require considerable research and innovation, but in very different directions.

What is the key assumption?

In the future, we are able to feed at least as big share of the global population as we are today.

Other possible considerations

- We need to be able to feed a larger share of the global population than we do today
- Food production should support biodiversity
- Meaningful jobs and life in the countryside
- Best possible chance to push the global agenda
- Maximising Danish production to reduce global land pressure
- Safeguarding groundwater resources

Significant trends and developments

- Decrease in crop area in other parts of the world due to climate change
- New forms of production such as aquaculture and agroforestry
- Strong increase in demand for meat and dairy products globally due to a growing population and a significantly larger middle class

Nature and biodiversity

Protected natural areas are areas where nature and biodiversity are the primary purpose. Today, various forms of nature conservation cover 16.1% of Denmark's land area, but more than half of it is inadequately protected. Space is one of the most important factors to reverse biodiversity loss into gain (Biodiversity Council, 2022).

How we made it

The three imagined futures differ in terms of the total amount of area set aside for nature conservation, the size and connectivity of the individual areas, their location in relation to level of biodiversity and people, and how strictly protected the areas are.

Biodiversity is enhanced through a large total area set aside for protection, but both the size and location of the contiguous areas are important for the overall effect (The Danish Biodiversity Council, 2022; Fløjgaard et al., 2017). The level of protection – both from production and a range of (not all) recreational activities – in the areas is also important (Ejrnæs et al., 2022). For human recreation, distance plays a significant role.

What is the key assumption?

Species decline has been halted and good conditions in our ecosystems have been ensured. Denmark honours international agreements on biodiversity and biodiversity protection.

Other possible considerations

- Denmark must outperform in order to ensure progress in international negotiations
- Focus on the protection of unique nature in an international context
- Focus on preventing social inequality in access to nature

Significant trends and developments

- Displacement of habitats due to climate change
- More invasive species

Background

Urban settlement

Urban settlement includes the development of the largest cities and urban zones in Denmark. Today, 3.1 million Danes live in cities with more than 20,000 inhabitants and around 4.8 million Danes live in cities of 1,000+ inhabitants (Statistics Denmark, 2022).

How we made it

The fundamental difference between the two imagined futures is whether the built-up area will continue to spread outwards with a growing population, as it has done historically, or whether urban population growth can be decoupled from expansion of the urban area. To cope with more people in the same space, the number of living square metres per person must be reduced. This can be done, for example, by building smaller flats, building higher and building more shared spaces. Living area is not the only parameter in urban development. Bringing together community functions: business, shopping, leisure, etc. is a strategic tool to reduce the distance (and time) travelled daily. Equal access to urban nature and fresh air is important for the overall well-being of urban dwellers.

What is the key assumption?

As urbanisation and population growth continue, the cities of the future will have to accommodate more people.

Other possible considerations

- Business development
- Framework for new forms of community and cultural development
- Equal access to nature, culture and services

Significant trends and developments

- The percentage of the population past working age is increasing
- The emergence of self-driving technology

Settlements in rural areas

Settlements in rural areas include the smallest villages and isolated houses that dot the Danish landscape. Today, around 1 million inhabitants live in cities with less than 1,000 inhabitants, of which around 600,000 inhabitants live in dispersed settlements with as few as one household (Statistics Denmark, 2022).

How we made it

The two imagined futures assume that the same number of people live in the countryside, but that they follow two different residence patterns. One future continues the dispersed pattern we see today, where the rural-to-urban movement “dilutes” the dispersion but doesn’t fundamentally change the pattern. In the second future, the rural population is more concentrated in clusters, where concentration increases slightly, while the concentration outside cluster zones decreases significantly. Given the 30-year time perspective, it is expected that natural migration patterns can support new settlement patterns.

What is the key assumption?

Rural areas must continue to provide space for settlement in the future, so that people can continue to be part of local communities and live close to nature.

Other possible considerations

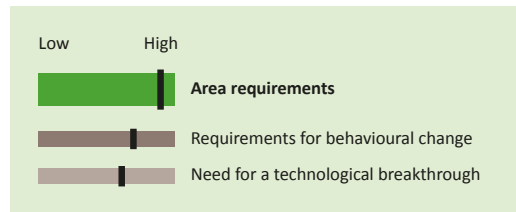
- Changing economic activity and economic development in rural areas
- Infrastructure and equal access to mobility
- More flexibility in rural settlement frameworks

Significant trends and developments

- More cohabitation or more flexible working lives
- The emergence of self-driving technology

Indicators

Biological production



Area requirements

Compares the area reserved for biological production if Denmark were to be able to feed an equivalent proportion of the global population as today. The larger the land use, the lower the flexibility for other land needs.

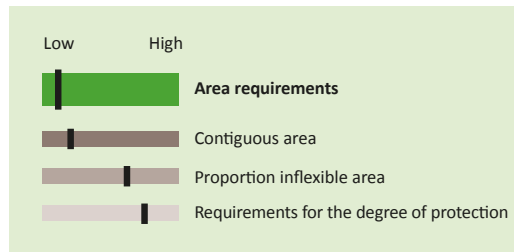
Requirements for behavioural change

Introducing new products and new ways of living requires consumption patterns to change. If the imagined future requires a major change in Danes' behaviour, this will need to be addressed, as behavioural changes cannot be expected to occur by themselves.

Need for technological breakthrough

Indicates to what extent the imagined future requires research and development to change course or continue in the same field as before. Technological breakthroughs will also require efforts to build new value chains and equip businesses to commercialise new products.

Nature and biodiversity



Area requirements

Compares the amount of land set aside for nature conservation. The larger the area to be set aside, the more must be diverted from other land uses, primarily biological production.

Contiguous area

Compares the size of each protected natural area. Larger contiguous areas are better for biodiversity but require greater changes in land use.

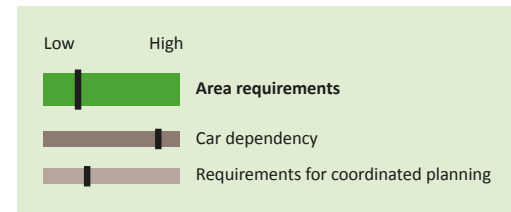
Proportion inflexible area

Indicates how flexible the location of the protected natural areas is. A higher degree of inflexible area implies more constraints in the overall land use strategy.

Requirements for the degree of protection

The degree of protection indicates how limited other activities are in the protected natural areas. A higher degree of protection is generally better for biodiversity, but results in lower multifunctionality. Conversely, a lower level of protection may allow for some degree of e.g. timber or renewable energy production on the site.

Urban settlement



Area requirements

Compares the size of the area occupied by cities. A larger area implies that cities expand outwards, a smaller one that cities grow upwards (densify) rather than outwards.

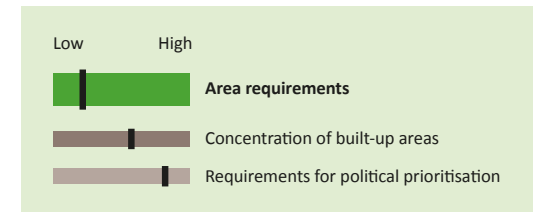
Car dependency

Indicates to what extent the imagined future leads to private car ownership or walking, cycling and use of public transport.

Requirements for coordinated planning

The need for coordinated planning increases when more functions need to be squeezed into the same space.

Settlements in rural areas



Area requirements

The total area requirement does not refer to the actual space occupied, but the total area that is the "sphere of interest" around settlements. The "sphere of interest" is defined both by physical distance and by views and sight lines from settlements. It has an impact on the possibilities for implementing land use changes. The greater the area requirement, the greater the proportion of the Danish area is part of a "sphere of interest".

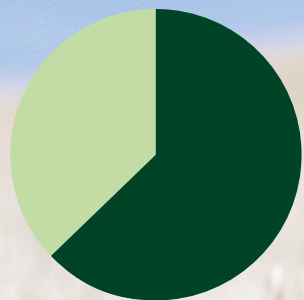
Concentration of built-up areas

Indicates how dispersed the settlement is in the landscape. A concentrated settlement means that key daily functions such as services, cultural life and business are gathered within a 15-minute walking and/or cycling distance.

Requirements for political prioritisation

Indicates to what extent the imagined future relies on political decisions in order to be achieved. A high prioritisation requirement indicates that there are important and wide-ranging decisions to be made, but also that multiple coordinated decisions are required across different areas.

Where do the Danes stand?



63%

believe that significant lifestyle changes are needed and that technology alone cannot solve the climate challenge.

CONCITO's Climate Barometer 2022



64%

do not support the use of plant-based alternatives to meat and dairy products.

CONCITO's Climate Barometer, 2022

Challenges and dilemmas

The various imagined futures show us that we face a number of challenges and dilemmas. A number of decisions need to be taken that will have far-reaching consequences for people, flora and fauna. Because these decisions affect all of us, it is essential that we pursue a vision and goals that are rooted in a broad public consensus. We need a democratic process to create the vision.

Discussions about visions for the future can quickly become expansive and even a bit far-flung. To help stay focused, here are some examples of the challenges and dilemmas we face. These can be used to guide the debate on future land use

in a constructive direction. They can also give us an idea of where we need more information to be able to make a decision. The list is certainly not exhaustive and future debate will highlight new dilemmas and perspectives that also will need to be addressed.

In the coming years, CONCITO will attempt to use this project to collect the knowledge necessary for these discussions to evolve on an informed basis. The aim is to have a clear and positive vision for future land use in Denmark and to identify elements of a future national land use strategy that can enable this vision.

Challenges

1

How do we strike a balance between production areas and everything else?

Many land requirements of the future are space-intensive, and although there are some possibilities for combining production with other uses, the total production area will need to be reduced. Which considerations will determine where the balance lies?

2

How do we deal with a smaller production area?

When the production area shrinks, our possibilities for producing the food and materials we need will shrink as well. What do we need to do to prevent a decline in production from negatively affecting society, both here at home and across the globe?

3

How do we find the synergy between national targets and local implementation?

Many of our objectives will be defined nationally but implemented locally. What framework is necessary to allow enough freedom for effective local implementation that fulfils national objectives?

4

How do we strike a balance between global and domestic needs?

Denmark exists in a global world, and the choices we make at home affect choices elsewhere. Danish efforts to improve local biodiversity and the well-being of Danes could worsen environmental problems abroad. How do we balance our global and national responsibilities?

Dilemmas

1

Production forest **or** biodiversity forest

The fastest way to improve biodiversity is to protect existing forests rather than convert agricultural land. Until new production forests have been deployed elsewhere, this will mean that timber production will fall drastically for a period of time, which may contradict e.g. a desire to use more wood in construction. What can wait – biodiversity gains or timber production?

2

Densification **or** urban expansion?

Land on the urban perimeters has a high potential societal value, whether for production, biodiversity or recreation. To make the most of this value, cities must grow upwards, through densification, not outwards. Yet urban densification could negatively impact people's well-being. How do we balance environmental and climate objectives with the desire for a high level of human well-being? And what can we do to ensure that these two objectives do not become opposing forces?

3

Difficult target fulfilment **or** strong political priorities?

If there is no desire to change the Danish rural settlement pattern, more rural residents will have to accept living next door to energy plants, energy infrastructure or conservation areas, and achieving the targets will become more difficult and expensive. On the other hand, the deployment of cluster villages will require significant investment in those villages and a political prioritisation that focuses on a preference to live in the countryside. Which of the two routes best ensures the achievement of the objectives, and which is the easiest

4

Smart technologies **or** changes in behaviour?

The technological solution – the energy-efficient machines, the electric cars, etc. – often get all the attention, partly because they promise that we won't have to fundamentally change our way of life. But is it realistic to put all our focus on technology alone? When considering the total resource footprint – energy, materials, land – we must question whether technology can deliver the sustainable solutions without behavioural changes. Is our focus on technological solutions preventing us from talking about the behavioural changes that we as people also need to make?

Sources

- Arler, F., Jørgensen, M. S., Galland, D., & Sørensen, E. M. (2015). Kampen om m² – Prioritering af fremtidens arealanvendelse i Danmark. <https://vbn.aau.dk/da/publications/prioritering-af-fremtidens-arealanvendelse-i-danmark>
- Arler, F., Jørgensen, S. M., & Sørensen, E. M. (2017). Prioritering af Danmarks areal i fremtiden. Fonden Teknologirådet. <https://teknolo.dk/app/uploads/2017/04/Areal-afslutningsrapport.pdf>
- Baastруп, R., Friis, M., & Schou, M. (2022). Omstilling på vippen – En hvidbog om forbrug, adfærd og folkelig deltagelse i grøn omstilling.
- The Danish Biodiversity Council. (2022). Fra tab til fremgang – Beskyttet natur i Danmark i et internationalt perspektiv. <https://www.biodiversitetsraadet.dk/pdf/2022/12/Biodiversitetsraadet-2022-Fra-tab-til-fremgang-Final-hjemmeside.pdf>
- Callesen, G. E., Gylling, M., & Bosselmann, A. S. (2020). Den danske import af soja 2017-2018 – Hvor store arealer beslaglægger den i producentlandene, og hvor stor andel af den importerede soja anvendes til svine- og mælkeproduktion? https://static-curis.ku.dk/portal/files/236266436/FR0_Udredning_2020_03.pdf
- Canal-Vergés, P., Ebbensgaard, T., Frederiksen, L., Lautsen, K., & Flindt, M. R. (2022). Havvandsstigningernes betydning for kystnaturen. <https://storymaps.arcgis.com/stories/3e1d0d5c888d4ba29203c19cab3c686e>
- Collective Impact. (2022). Seks anbefalinger til en jordreform. <https://collectiveimpact.dk/wp-content/uploads/2022/11/Seks-anbefalinger-til-en-jordreform.pdf>
- CONCITO. (2022). Climate Barometer 2022. https://concito.dk/files/media/document/Klimabarometer%202022_.pdf
- Statistics Denmark. (2023). AREALDK: Areal efter arealdække, område og enhed. <https://www.statistikbanken.dk/AREALDK>
- Statistics Denmark. (2022). Statistikdokumentation: Byopgørelsen – Danmarks Statistik. <https://www.dst.dk/da/Statistik/dokumentation/statistikdokumentation/byopgoerelsen>
- Statistics Denmark. (2017). Landbrugsregnskaber i 100 år 1916-2015. <https://www.dst.dk/Site/Dst/Udgifter/GetPubFile.aspx?id=28376&sid=landregn100aar>
- Animal Protection Denmark & Danish Society for Nature Conservation. (2022). Sådan ligger landet 2022 – tal om landbruget. https://www.dyrenesbeskyttelse.dk/sites/dyrenesbeskyttelse.dk/files/publikationer/S%C3%A5dan%20ligger%20landet/SLL_2022_Digital%202.pdf
- Ejrnæs, R., Bladt, J., Dalby, L., & Nygaard, B. (2021). Naturkapitalindeks for danske kommuner i 2020. Metodebeskrivelse og guide. <https://dce2.au.dk/pub/TR205.pdf>
- Ejrnæs, R., Bladt, J., & Fløjgaard, C. (2022). Potentiale for at reservere 30 % af landarealet til beskyttede og strengt beskyttede områder i Danmark, nr. 507. <https://dce2.au.dk/pub/SR507.pdf>
- Ejrnæs, R., Nygaard, B., Kjær, C., Baatrup-Pedersen, A., Kirstine Brunbjerg, A., Clausen, K., Fløjgaard, C., S Hansen, J. L., D Hansen, M. D., Eske Holm, T., Just Johnsen, T., & Sander, L. (2021). Danmarks biodiversitet 2020. Tilstand og udvikling. <https://dce2.au.dk/pub/SR465.pdf>
- The Danish Energy Agency. (2022). Klimastatus og -fremskrivning 2023 | Energistyrelsen. <https://ens.dk/service/fremskrivninger-analyser-modeller/klimastatus-og-fremskrivning-2023>
- Epinion for Altinget and DR. (2022). Measurement: Stort flertal af danskerne vil ikke have mindre landbrug – Altinget: Fødevarer. <https://www.altinget.dk/foedevarer/artikel/maaling-stort-flertal-af-danskerne-vil-ikke-have-mindre-landbrug>
- Danish Business Authority. (2020). Planloven. Lovtidende A, j.nr. 2020-8957 (LBK nr. 1157). <https://www.retsinformation.dk/eli/lta/2020/1157>
- European Commission. (2022). Proposal for a regulation of the European parliament and of the Council on nature restoration. <https://doi.org/10.5281/zenodo.5657041>
- European Commission. (2021). EU Biodiversity Strategy for 2030 - Bringing nature back into our lives. <https://doi.org/10.2779/048>
- EEA. (2020). State of nature in the EU - Results from reporting under the nature directives 2013-2018. <https://doi.org/10.2800/705440>
- Eurostat. (2021). LUCAS EU's land use and land cover survey. <https://ec.europa.eu/eurostat/documents/4031688/14187915/KS-09-21-309-EN-N.pdf/7b948a5b-9135-1ee3-3a2b-a26d58c6f2f7?t=1644247217894>
- Fløjgaard, C., Bladt, J., & Ejrnæs, R. (2017). Naturpleje og arealstørrelser med særligt fokus på Natura 2000 områderne. <https://dce2.au.dk/pub/sr228.pdf>
- Henriksen, H. J. (2023). Ændringer i grundvand. Klimatilpasning.dk. <https://www.klimatilpasning.dk/viden-om/fremtidens-klima/klimaenaendringeridanmark/%C3%A6ndringer-i-grundvand/>
- Henriksen, H. J., Højberg, A. L., Olsen, M., Seaby, L. P., Keur, P. van der, Stisen, S., Trolborg, L., Sonnenborg, T. O., Refsgaard, J. C., & GEUS. (2012). Klimaeffekter på hydrologi og grundvand – Klimagrundvandskort. In Koordineringsenheden for forskning i klimatilpasning (KFT), Aarhus Universitet. <https://www.klimatilpasning.dk/media/340310/klimagrundvandskort.pdf>
- IPCC. (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf
- Jack, T., & Ivanova, D. (2021). Small is beautiful? Stories of carbon footprints, socio-demographic trends and small households in Denmark. Energy Research & Social Science, 78, 102130. <https://doi.org/10.1016/j.erss.2021.102130>
- Kantar Gallup for Danish Society for Nature Conservation. (2020). Ny undersøgelse: Danskerne vil have mere vild natur – Danmarks Naturfredningsforening. <https://www.dn.dk/nyheder/ny-undersogelse-danskerne-vil-have-mere-vild-natur/>
- {56 Danish Council on Climate Change . (2022). Kommentering af Global Strategi 2022. https://klimaraadet.dk/sites/default/files/imorted-file/kommentering_af_global_strategi_0.pdf
- Climate Adaptation. (2020). Spildevand og oversvømmelser. <https://www.klimatilpasning.dk/sektoer/vand/spildevand-og-oversvoemmelse/>
- Danish Agriculture & Food Council. (2019). Analyse af danskernes syn på klima og bæredygtighed. Markedsanalyse, Forbrugøkonomi & Statistik. <https://www.ernaeringsfokus.dk/media/iilfk0lw/analyse-af-danskernes-syn-paa-klima-og-baeredygtighed-leveret.pdf>
- Norstat for the Danish Agriculture & Food Council and the Danish Forestry Association. (2021). Danskernes holdninger til brug af naturen. https://www.danskskovforening.dk/wp-content/uploads/2022/02/danskernes-holdninger-til-brug-af-naturen_november-2021.pdf
- Pedersen, R. A., Payne, M. R., Langen, P. L., Boberg, F., Christensen, O. B., Sørensen, A., Madsen, M. S., Olesen, M., Su, J., & Darholt, M. (2021). KlimaAtlas-rapport Danmark. Danmarks Meteorologiske Institut. www.dmi.dk/klimaAtlas
- The Danish Government. (2022). Ansvar for Danmark – Det politiske grundlag for Danmarks regering. <https://www.stm.dk/statsministeriet/publikationer/regeringsgrundlag-2022/>
- Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, Carl, Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. Science, 347(6223). <https://doi.org/10.1126/SCIENCE.1259855>
- Termansen, M., Konrad, M., Levin, G., Hasler, B., Jellesmark Thorsen, B., Aslam, U., Bojesen, M., Hedemark Lundhede, T., Emil Panduro, T., Estrup Andersen, H., & Strange, N. (2017). Udvikling og afprøvning af metode til modellering af økosystemtjenester og biodiversitetsindikatorer. <https://dce2.au.dk/pub/sr226.pdf>
- YouGov for VELUX. (2019). Ny undersøgelse: Danskerne længes efter mere natur i hverdagen. <https://presse.velux.dk/ny-undersogelse-danskerne-inges-efter-mere-natur-i-hverdagen/>

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