SIM4NEXUS 8 POLICY COHERENCE RECOMMENDATIONS TO THE EUROPEAN GREEN DEAL

Key messages

Horizon 2020 project SIM4NEXUS **has investigated the nexus between water, land, energy, food and climate. Recommendations for the elaboration of the Green Deal are:**

1. A nexus approach during the whole policy cycle helps to **maximize policy coherence**, exploit synergies and address unwanted trade-offs between policy domains. For the energy transition, the nexus between water, land, energy and food is relevant.
2. A clean energy transition **involves the use of bioenergy**. Large scale use of bioenergy from crops, plantations and forests may have severe trade-offs to water, land, global food security, climate adaptation and even climate mitigation. Trade-offs cross borders and scales. **Policies stimulating directly or indirectly the use of bioenergy should only be put in place if both food security and climate-neutrality are assessed and likely.** This should be regulated and enforced.
3. **Shifting from animal products to plant-based proteins in our diet and increasing resource efficiency in the agro-food chain** are synergistic with goals for energy, climate, natural resources and health. However, livestock farmers may need to change their business, which could be supported by policies.
4. Nature-based solutions for water issues, such as reforestation and restoration of soils and natural river courses have more synergy with climate change mitigation and adaptation than pure technical measures have, such as canals, artificial reservoirs and pumps.
5. There is **great potential for the Common Agricultural Policy (CAP)** to contribute to sustainable use of water, land and energy, climate mitigation and adaptation, but putting this into practice is proving rather difficult. **Stricter environmental conditions for public funding and lowering the administrative burden** for applicants to a subsidy for voluntary measures may stimulate sustainable practices.

6. As the transitions proposed in the Green Deal are uncertain and complex, they require an **experimental pathway**, so **effective monitoring of progress towards targets, policy output and the process** must be in place. Policy evaluations must pay more attention to synergy and trade-offs between policies (targets, measures, instruments) during implementation. A **database of implemented and evaluated nexus projects** would stimulate learning about synergy and trade-offs in practice.
7. **Successful nexus policymaking depends on political will, mindset, knowledge management and careful organisation of the process.** A checklist was developed of success factors for a nexus policy process, categorised into Knowledge management, Dealing with uncertainty and complexity, Social dynamics, Resources and Monitoring.
8. A broad assessment of policy coherence between policy domains could become part of European impact assessments. Results can be used to define the nexus scope of the policy-making process.

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SIM4NEXUS: focus on policy coherence

Design and implementation of the European Green Deal *'will require intense coordination to exploit the available synergies across all political areas'*. This intention could be brought into practice by a nexus approach with a focus on coherence between policy fields. **Effectivity and efficiency increase if synergy between policies is exploited and negative trade-offs are foreseen, prevented, mitigated or compensated.** Policies can reinforce each other or counteract. Sometimes this depends on the way policies are implemented and may consistent options be available. If trade-offs cannot be avoided or mitigated, choices must be made and negative effects mitigated or compensated. This is only possible if trade-offs were assessed and foreseen. The Horizon 2020 project SIM4NEXUS has analysed the nexus between water, land, energy, food and climate (WLEFC nexus) from a biophysical, socioeconomic and governance perspective. The project aims to support European policy for smart, sustainable and inclusive growth. Models were developed and policy coherence within the WLEFC nexus was investigated in **twelve cases (see map): global, Europe, Greece, Latvia, the Netherlands, Sweden, Andalusia (Spain), Sardinia (Italy), South West England (United Kingdom), Azerbaijan, two transboundary cases covering the Czech Republic, Slovakia and Germany and the upper-Rhine basin in Germany and France**. In this policy brief, we give an overview of the main recommendations relevant to the European Green Deal.

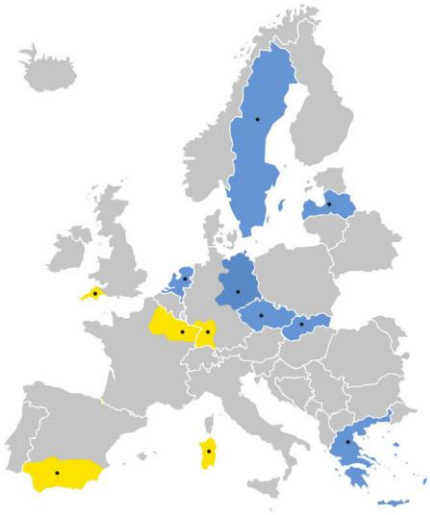

Figure 1 Map of case studies in Europe

Nexus approach

Water, land, food, energy, and climate are interconnected, comprising a coherent system (the WLEFC nexus), dominated by complexity and feedback. Putting pressure on or solving problems in one part of the nexus may create impacts in one or more of the others. Understanding and management of the nexus, a nexus approach, are critical to securing the efficient and sustainable use of our scarce resources. Policy coherence is an important aim of a nexus approach. With the use of models, SIM4NEXUS aims to assess long-term society-wide **impacts of resource use and policies** in the above-mentioned sectors. Interconnections between the sectors in the nexus are demonstrated in serious games.

Recommendations from SIM4NEXUS global and European case studies

Use policy coherence for decarbonisation at the lowest possible cost

The European Green Deal communication identifies the decarbonization of the energy system and increased energy efficiency as central elements in the transitions to a climate-neutral Europe. It also states that *'smart integration of renewables, energy efficiency and other sustainable solutions across sectors will help to achieve decarbonisation at the lowest possible cost'*. Solutions across sectors and policy domains, using a nexus approach, may refer among others to the European energy and climate policies on the one hand and the strategy 'From Farm to Fork' on the other hand.

The European and Global SIM4NEXUS cases modelled several scenarios towards 2050, a 'reference scenario' with continuation of policy adopted by the end of 2016, excluding new policies resulting from the Paris agreement, a 'climate scenario' that intends to hold the increase in the global average temperature to well below 2 °C above pre-industrial level with carbon pricing, a 'food scenario' with reduced consumption of animal products and a resource efficient agro-food chain, and scenarios that combine several strategies.

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Trade-offs from bioenergy

In the transition to a climate-neutral Europe, the energy system will rely more on renewables and **by 2050, bioenergy, grown in Europe or imported, will contribute 20-30% to the energy mix**, according to SIM4NEXUS modelling, consistent with other literature sources[1]. As bioenergy will play a crucial role in projected future energy systems, bioenergy plantation and large-scale afforestation may interfere with food security on the global scale. **By 2050, globally up to 230 million more people compared to the reference scenario could be at risk of hunger under ambitious afforestation and bioenergy targets, among others in Europe** (Doelman et al., 2019). At the same time, the climate-neutrality of biomass sources cannot be guaranteed, due to continued deforestation in tropical regions and risks of indirect land-use change, especially with fragmented international climate policy.
Consequently, **policies stimulating directly or indirectly the use of bioenergy should only be put in place if both food security and climate-neutrality are assessed and likely.** This should be regulated and enforced.

Climate mitigation in agriculture may raise prices and decrease livestock

The European Green Deal acknowledges the importance of the food system, proposing that '*at least 40% of CAP funding will contribute to climate action'* and '*consumers will be challenged to choose healthy and sustainable diets and reduce food waste'*. According to model calculations for the EU, **imposing mitigation measures on agriculture to reduce greenhouse gas emissions will increase the price of farm products, especially of meat and dairy products, and decrease production, particularly in the livestock sector**. Crop production is projected to be significantly less impacted as crop activities can expand into areas previously used for feed crops and grassland for livestock. This, in turn, may lead to a slight extensification of arable farming. These changes in the agricultural sector will reduce affordability of animal food products, change the landscape, change emissions of nutrients and pesticides, reduce emissions of antibiotics, and may increase water use.

Food system: environmental benefits of a healthy diet

A global transition to a 'sustainable' diet will have substantial environmental and health benefits. Reducing overconsumption of animal products by switching to a more plant-based diet, will cause a reduction of the number of animals in the livestock sector. In contrast with imposing extra greenhouse gas mitigation measures on the agricultural sector, a change in consumer behaviour has the benefit of lowering prices for livestock products. Maintaining low prices for agricultural goods benefits access for the global poor. In both the 'climate' and 'food' scenarios, livestock farmers will face a reduced demand for their products and may need to change their business, which could be supported by policies.

If Europe would be the only region in the world that moves to more plant-based diets, there will be a reduction of greenhouse gas and nutrient emissions by European agriculture, but less compared to a situation of global diet change, as European livestock farmers are projected to partly produce for export. These findings match with those by the EU Agricultural Outlook 2019- 2030 (EC, 2019).

[1] Based on model calculations by PBL Netherlands Environmental Assessment Agency (PBL) and Wageningen Economic Research (WEcR).

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Recommendations from SIM4NEXUS regional cases

The crux is in the implementation

Conflicts between policies may arise when measures are articulated and implemented. **Most energy and climate-related conflicts during implementation reported by SIM4NEXUS cases stem from increasing bioenergy and intensification and expansion of agriculture**. (Munaretto et al., 2018).

Increasing bioenergy may go against climate objectives

Production of **first-generation biofuel crops**, stimulated by European and national renewable energy policy, may create negative trade-offs during implementation. The aim of EU policy on renewables is to phase out the use of food and feed crops for energy generation.

Large-scale monoculture has changed the agricultural landscape, regional hydrology and local climate in the **Czech Republic, Slovakia and eastern Germany**, according to this transboundary SIM4NEXUS case. The **large-scale cultivation of maize and rape has changed the regional hydrology, leading to local weather extremes, such as heatwaves, droughts and local floods.** This even conflicts with climate goals.

According to the **Latvian case**, growing crops and fast-growing trees for the production of energy biomass helps to increase the share of renewable energy in Latvia and other EU Member States that import this biomass, and increases the use of local energy sources, in line with energy security and economic agriculture objectives. However**, expansion and intensification of agriculture and forestry to increase bioenergy production is a severe problem for water, land and even climate objectives**. Expansion of arable land at the cost of forests, natural and semi-natural meadows, and the intensification of fertilizer use on existing arable land to increase yields of food or feed crops, conflict with climate change mitigation targets (greenhouse gas emissions and carbon sequestration) and have a negative impact on soil and water quality. It also reduces the land available for other agricultural production, causes fragmentation and degradation of land and deteriorates ecosystems and biodiversity, thus reducing the ability for adaptation to climate change.

The **South-West England case** reported that the UK Renewable Heat Incentive (RHI) has been set up to encourage the uptake of renewable heat technologies amongst households, communities and businesses, through financial incentives. This **policy support for energy generation can affect conditions in the food system**, as bioenergy crops compete with the food and feed sector, and with the appropriateness of land use for growing such crops. Growing maize may generate energy, but it requires water, and land can be left bare and subject to soil erosion. Also, subsidies do not take energy efficiency into account, nor long-term impacts of contracts and how these fit with agro-environmental schemes.

Modernising irrigation may increase energy use

Improving water supply may increase energy demand and cause rebound effects in water use. The **Andalusian case** reported that progress in **modernising existing irrigation systems** may have positive effects on objectives in the water domain but **has largely negative effects on energy and climate**, due to increased energy use in these irrigation systems, water re-use and desalinisation of water.

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CAP: great potential to grow crops more environment-friendly

There is great potential for the CAP to contribute to sustainable use of water, land and energy, climate mitigation and adaptation, but putting this into practice is proving rather difficult. **Stricter conditions for public funding and lowering the administrative burden for applicants to a subsidy for voluntary measures may stimulate sustainable practices.** For example, Good Agricultural and Environmental Conditions (GAEC) and the Greening measures linked to the **direct payments of the CAP** have the potential to improve soil quality and the water regime in the agricultural landscape. But these **Greening measures have only been partially implemented and did not lead to the expected results** in for example the **Czech Republic**. According to data from 2015, Ecological Focus Areas (EFAs) had been implemented only to a little extent. There had been no increase in the share of permanent grassland, as greening obligations had been met by mowing existing grassland. Crop diversification had also been applied so as to only meet the minimum requirements. The reason for keeping the implementation of greening and environmental measures to a minimum appeared to be those non-productive elements in the landscape interfered with farm practices, lowering their efficiency. Agro-environmental and climate measures are voluntary and set by the **Second Pillar of the CAP** as part of the Rural Development Programme. The objective of the measures is to promote sustainable agricultural land use. Because these measures are voluntary, the success of their implementation depends on access to the related subsidy—the **administrative burden of the application and accountability process is often too great** for applicants to obtain the subsidies, as reported by the **Czech case**. Only a few farmers have chosen to adopt these measures.

Nature-based solutions generate multiple benefits

Nature-based solutions, such as soil restoration, increasing infiltration capacity, restoring natural courses of streams and rivers, reforestation, creating marshes and patches of natural areas to restore local hydrology, **have more synergy with land management, climate change mitigation and adaptation than pure technical solutions**, such as canals, artificial reservoirs and pumps, as described in the **Czech and Slovakian cases**.

Recommendations from the SIM4NEXUS **policy analysis**

Assess and emphasize synergies between policies

The coherence between EU policy objectives for water, land, energy, food and climate was investigated, using the scoring scale developed by Nilsson et al. (2016). **Most EU policies for water, land, energy, food and climate (WLEFC) are coherent, but options for synergy are not systematically assessed and addressed in policy documents.** For example, good management of water and land, the supply of good quality water and restoration of degraded soils combined with prevention of soil degradation can create a cascade of positive effects in the WLEFC nexus. These objectives reinforce each other, facilitate energy services, help climate change mitigation and adaptation, and support rural economies, farmers income and ecosystems. Another example of an objective that creates synergy in the whole nexus is increasing resource efficiency in the agro-food chain. It reduces the use of energy and water, combats drought and scarcity of natural resources, decreases land degradation and indirect land-use change, stimulates innovation and supports the competitiveness of European farmers.

Address trade-offs at a strategic policy level

Incoherencies between European policies are sometimes recognised in policy documents, but **not always sufficiently addressed**. Incoherence and unaddressed trade-offs at a strategic level may hamper implementation and cause unintended impacts. For example, the EU Directive on promoting the use of energy from renewable sources to reach climate goals and energy security has potentially negative trade-offs to water, land, biodiversity and food production. The Directive addresses effects on land more strictly than effects on water. Nevertheless, expansion and intensification of energy crops and hydropower will affect water quantity and quality. For energy crops grown **outside the European Union**, the Directive addresses effects on water through a voluntary reporting scheme in the supply chain and not by legal criteria, leaving private actors responsible for the protection of water resources in the production areas that may lack strong institutions to protect their water systems. (Munaretto & Witmer, 2017).

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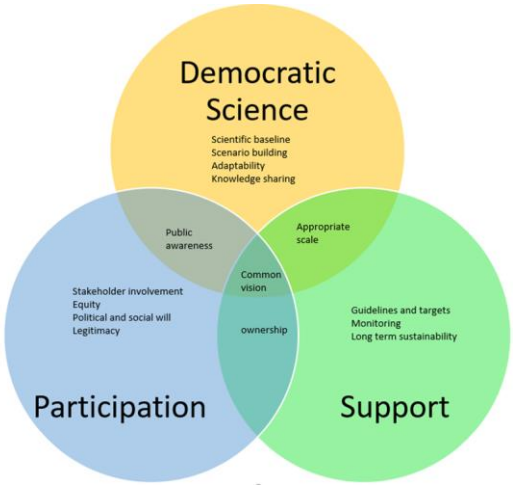
Success factors for a nexus approach



Successful nexus policy has many dimensions and is multi-scale. It concerns the whole policy cycle and depends on political will, mindset, knowledge management and careful organisation of the process.

A framework for good nexus governance was developed based on literature and cases. Success factors for the policy-making process were categorised into three overlapping pillars, **Democratic science, Participation and Support,** with a **common vision in the centre.** Success factors concern knowledge management, dealing with uncertainty and complexity, social dynamics, resources and monitoring

Figure 2 Three overlapping pillars that support successful nexus policy-making (Selnes et al., 2019).

Start the policy process with nexus assessment and work thematically

A broad assessment of policy coherence could be part of an impact assessment at the start of a policy-making process. There is no institutionalised procedure for a comprehensive nexus assessment of new policies. The result of such an assessment could define the nexus scope of the policy-making process. **New integrating themes can stimulate a nexus approach.** Such themes are for example circular and low-carbon economy, sustainable production, supply and consumption of healthy food, good management of land and water related to climate change adaptation and mitigation. These themes cross European Commission Directorate Generals, national ministries and scales, and are hubs for nexus approaches. New institutions, temperate or permanent, can be developed around these hubs to facilitate the nexus policy process. (Witmer et al., 2018)

Monitoring to learn and adjust the way forward

Uncertainty and complexity are intrinsically linked to a nexus approach and require an **experimental pathway, so effective monitoring must be in place**. Currently, policy incoherence that manifests during implementation is insufficiently monitored and reported to strategic levels. This prevents learning from practice. As the list of nexus approach success factors is extensive, the question arises when nexus governance is 'good enough'. This must be explored by applying the success factors in practice, monitoring the results and evaluating the process. **A database could be developed with implemented and evaluated cross-sector (nexus) projects and lessons learned**, categorised according to administrative level and sectors involved. It is important to register where and how in the nexus synergy and trade-offs happened.

Serious games connect knowledge and people

The SIM4NEXUS cases develop Serious Games that will **aid learning** about the WLEFC nexus by helping users to **understand and explore the interactions** in the nexus. The player can **divide the problem into manageable interventions** and can learn by doing. The game can be used as an information and education tool. It may also be used when representatives from different sectors in the nexus discuss options for policy interventions to show synergy and trade-offs. More information on the Serious Game can be found here.

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Nexus thinking in **Horizon Europe**

Thinking in systems, cross-disciplinary cooperation and breaking down silos are at the centre of the final proposal for Horizon Europe and mission-oriented research and innovation. Although the word 'nexus' is not mentioned in these publications, **methods and experiences from nexus studies and applications can be of great value for the implementation of the programmes and missions**. A database of implemented and evaluated nexus projects and lessons learned could also be of great value here.

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