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JUSTICE, DIRECTION, RESPONSIBILITY

An analytical framework for sustainability transitions in an interconnected world

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Colophon

Justice, direction, responsibility: An analytical framework for international cooperation and foreign policy

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Summary

Sustainability transitions increasingly involve cross-border interdependencies, competing interests, and difficult choices about costs, benefits, and responsibilities. This report introduces the Justice–Direction–Responsibility (JDR) framework as a structured way to analyse these choices and support reflection on the pursuit of sustainability transitions in an interconnected world (see Figure 1).

Sustainability transitions involve normative and political choices

Transitions are not only technical and economic processes; they involve normative and political choices about how the benefits and burdens of change are distributed, what kinds of futures are pursued, and who is expected to act. These choices are often implicit in policy debates but are rarely addressed in a structured and integrated way.

The proposed JDR framework prompts reflection around three core questions: What is at stake, and for whom (justice)? What kind of change is being pursued (direction)? And who is expected to act, and on what grounds (responsibility)? Together, these dimensions help examine how justice considerations, transition pathways, and responsibility allocations interact in practice. By making these dimensions explicit, the framework helps to surface underlying assumptions and trade-offs in transition decision-making, thereby making them discussable, negotiable, and contestable.

Justice: Who benefits, who bears the costs?

‘Justice’ provides a lens for understanding how and why benefits, burdens, opportunities, and decision-making power are distributed across actors, places, and generations. Examining sustainability transitions with a justice lens helps identify trade-offs, spillovers, and unintended consequences that may otherwise remain overlooked. Different justice perspectives can highlight different aspects of the same transition and may therefore lead to different assessments of what counts as a fair, desirable, or legitimate outcome. This plurality is analytically useful because it makes visible that transition choices are not value-neutral but shaped by underlying assumptions that can be explicitly examined.

Direction: What kind of change is pursued?

‘Direction’ refers to the different possible pathways of sustainability transitions and the underlying assumptions about what kind of change is desirable, feasible, or prioritised. Transition strategies may seek to maintain, reform, or transform existing systems and each orientation implies different priorities, trade-offs, and temporal horizons. They also reflect different assumptions about how change should occur, and about who should bear the costs and risks of transition. Making the direction of change explicit reveals contested choices about the future that often remain implicit in policy processes.

Responsibility: Who is expected to act?

‘Responsibility’ refers to how and why obligations for action in sustainability transitions are attributed across different actors, institutions, and governance levels. Sustainability transitions depend on decisions by governments, businesses, financial institutions, consumers, and international partners. A responsibility lens helps examine who is expected to act, on what grounds, and how responsibilities are shared across actors and countries. Responsibilities can be assigned on the basis of different principles, including capacity to act, contribution to the problem, legal obligations, or moral claims. In practice, responsibility is rarely fixed or singular, but relational

and contested, and distributed across multiple actors whose roles may overlap, shift, or conflict over time.

The JDR framework supports structured reflection on sustainability transitions that are embedded in interconnected global systems

Dutch sustainability transitions are shaped by global flows of materials, energy, finance, knowledge, and governance. As a result, domestic policies can generate impacts beyond national borders, while developments elsewhere influence transition pathways in the Netherlands. In an interconnected world, responsibility often extends beyond national borders. The JDR framework helps make these interdependencies visible by linking questions of justice, direction, and responsibility within a single analytical structure, allowing transition choices to be assessed across global value chains and governance contexts. Crucially, this works across countries, as the framework rests on core principles of justice that can be applied regardless of the national situation.

Taken together, the JDR framework supports a more structured reflection on sustainability transitions by making explicit how different understandings of justice shape transition pathways, and how these in turn imply different distributions of responsibility in an interconnected world. Ultimately, this is particularly useful for debates about justice, direction, and responsibility in relation to sustainability transitions, as well as for understanding how justice intersects on a more complex, pluralised, and global scale.

Figure 1

The Justice – Direction – Responsibility (JDR) Framework: A quickstart guide



Source: PBL

1 Introduction

Sustainability transitions are not only shaped by technical and economic considerations, but also by normative and political questions about what is just, what kind of change is pursued, and who should be responsible. Though often implicit or contested, such questions are increasingly central to both science and policy for transitions. They become particularly visible and consequential in an international context, where sustainability transitions involve more and more cross-border effects and interdependencies that extend beyond national policy boundaries. This is particularly noticeable in the Netherlands, which is closely connected to global environmental, economic, and social systems. Flows of materials, energy, finance, knowledge, and people consistently link Dutch society to developments elsewhere. As a result, sustainability transitions in areas such as energy, food, materials, biodiversity, and climate extend beyond national borders, and domestic policy choices both shape, and are shaped by, both national and international dynamics.

This creates a need for shared analytical tools that can help make such considerations and decisions within transitions explicit and open to discussion in a structured way; support more transparent negotiation between actors with different priorities; and clarify where disagreements stem from substantive value differences rather than technical disagreements. This report, entitled ‘Justice, direction, responsibility’, provides a structured way to reflect on the global dimensions of transitions, in particular looking at how domestic strategies relate to international systems, and how their impacts, trade-offs, and implications are distributed across countries, communities, and generations, with the Netherlands as its primary context. To support this reflection, the report introduces the Justice–Direction–Responsibility (JDR) framework. Policy debates on sustainability transitions already involve implicit questions about who is affected and how, what kind of change is pursued, and who is expected to act. The JDR framework brings these dimensions together in a clear and systematic way. While it does not prescribe specific outcomes or pathways, it does help to make underlying assumptions explicit and support more consistent analysis of transition choices. The framework does not introduce new normative considerations into policy debates; rather it helps to identify and structure those that are already inherently and irrevocably present. It supports an iterative and reflective approach towards guiding sustainability transitions, in which policies and their impacts are reviewed and adapted throughout the policy and implementation process.

The framework is intended for policymakers and researchers working at the interface of environmental policy and international developments. It supports:

- identifying how Dutch transitions connect to global systems, including other countries and international value chains;
- analysing how impacts and trade-offs are distributed;
- distinguishing between different types of transition pathways; and
- clarifying how responsibilities are understood and allocated across actors and scales.

The framework was developed by researchers at PBL as a practice-oriented synthesis of insights from environmental justice, sustainability transitions, and governance literatures. It was developed iteratively through engagement with policy-relevant research on global sustainability transitions, including earlier conceptual work and its application to empirical cases (ongoing). Rather than being derived from a single theoretical model, JDR emerged as a heuristic to address recurring

analytical challenges: making normative assumptions explicit, comparing alternative transition pathways, and clarifying the roles of different actors in an interconnected context.

The aim of this report is twofold: first, to introduce and clarify the JDR framework as a practical analytical tool for examining sustainability transitions (Chapter 3); and second, to demonstrate its application through a set of international policy examples based on the Netherlands (Chapter 4). The empirical analysis focuses on how Dutch policy choices in selected transitions relate to international interdependencies, and how questions of justice, direction, and responsibility are reflected in these choices. The cases are intended to illustrate the analytical value and practical use of the framework rather than to provide a comprehensive assessment of Dutch sustainability policy or of the transitions themselves. The framework and its application should be understood as a basis for further analysis and reflection; future research could further test and refine the framework through broader empirical application and systematic comparison across cases and countries.

By offering a shared structure and vocabulary, the framework aims to support more transparent analysis and more informed dialogue on sustainability transitions in an interconnected world. It is not a prescriptive guide or a normative assessment of what constitutes a ‘just’ transition. Rather, it is a reflective and analytical tool designed to support clearer reasoning and provoke more candid considerations of how policy choices around sustainability transitions relate to global interdependencies.

The report is structured as follows. Chapter 2 provides the conceptual foundation, introducing key ideas on transitions, global interdependencies, system boundaries, and spillovers. It also situates justice, direction, and responsibility within broader debates on sustainability transitions. Chapter 3 presents the Justice–Direction–Responsibility (JDR) framework in detail and explains how it can be used as an analytical tool. Chapter 4 illustrates the framework through applied examples, showing how it can be used to analyse concrete policy choices and trade-offs in practice.

2 The (inter)national context of sustainability transitions

This chapter develops the conceptual foundation for the report by situating domestic – and particularly Dutch – sustainability transitions within global systems of interdependence and change. It introduces key concepts for understanding the international dimensions of sustainability transitions, including interdependence, spillovers, and the evolving global (environmental) governance context. These concepts form the starting point for understanding the analytical framework introduced in Chapter 3.

2.1 Transitions across scale

Sustainability transitions are long-term processes directed towards bringing structural change in societies yet are often managed at national or sectoral levels. In practice they are embedded in systems that operate across multiple spatial and institutional scales, and generate cross-border interdependencies and justice implications that extend beyond the boundaries of individual policy domains or nation states. Understanding these dynamics therefore requires attention not only to national efforts but also to international connections, including how effects are distributed and mediated across different scales, from local production systems to global value chains and governance frameworks. To better understand this relationship, what are some of the key flows and connections between domestic and global sustainability agendas?

2.1.1 Dutch connections to global systems

Societies and economies, even local ones, are increasingly interconnected through global systems. These interconnections take many forms, including flows of people, raw materials, food, energy, finance, and knowledge. As a result, policy decisions in one country – whether on climate, circular economy, or energy – often have effects that extend beyond their national borders. In turn, developments elsewhere, such as climate impacts, geopolitical tensions, and changes in trade, energy, or resource markets, can shape domestic economic, environmental, and security agendas.

These interconnections are especially visible in relationships between entire countries, where the pressures and benefits of global transitions are distributed differently across contexts, shaped by historical and economic structures, governance arrangements, and existing inequalities (Baker & Phillips 2019; Vela Almeida et al. 2023). For example, critical raw materials that underpin energy transitions are often extracted in contexts where local communities face significant social and environmental impacts (de Haes & Brink 2025). Agricultural supply chains can contribute to deforestation in one region while supporting food security and economic development in another. Similarly, climate and trade policies developed at national and supranational levels can influence development pathways beyond their jurisdictions (World Bank 2024). Adjusting these dynamics to become more sustainable through transitions is evidently fundamentally embedded in global environmental, production, and governance systems.

In highly globalised, high-income economies such as the Netherlands, the aforementioned interdependencies are often expressed through extensive trade linkages and globally dispersed production and consumption systems. For example, in 2022, the Netherlands ranked sixth worldwide in the import and export of global goods (Ministry of Foreign Affairs 2025), and in 2021, the global land-use footprint of Dutch consumption was slightly over 13 million hectares, of which about 30 percent in other EU countries and over 60 percent outside the EU (Hanemaaijer et al. 2025; PBL 2025). These connections take various forms, including for example:

- **Material and energy flows:** The Dutch economy depends heavily on imports, for example of animal feed, fossil energy, and critical raw materials. These flows link domestic production and consumption to economic, environmental, and geopolitical conditions in producing regions, creating dependencies and exposure to external risks.
- **Trade and logistics:** As home to Europe's largest port (Rotterdam), a major energy and chemicals hub (Hanemaaijer et al. 2025), a globally connected aviation hub (Schiphol), and one of the world's highest-value agricultural exporters (PBL 2025), the Netherlands plays a central role in global trade. Dutch consumption, transit, and production chains contribute to environmental pressures both domestically and abroad, while also transmitting global risks to the Netherlands.
- **Labour and demographics:** Reliance on international labour – for example in construction, logistics, agro-commodities, and installation technology – makes Dutch transitions sensitive to global demographic trends, labour market dynamics, and labour rights conditions across supply chains (WRR 2025).
- **Climate exposure:** As a low-lying, densely populated delta, the Netherlands is highly exposed to climate impacts. Domestic safety and infrastructure therefore depend significantly on global mitigation outcomes.
- **Political and governance interdependencies:** Through EU membership, multilateral institutions, and international negotiations, the Netherlands is part of collective decision-making processes that shape global transition pathways. These processes affect domestic policy choices and distribute costs, benefits, and risks across countries, and Dutch preferences and capacities also contribute to how such rules are formed.

2.1.2 Global interconnections and spillovers

Sustainability transitions unfold within interconnected societal systems that span sectors, scales, and borders. Decisions taken in one part of a system – in a certain country, sector, or temporal horizon, for example – can create effects elsewhere, sometimes far removed in either space or time. Transitions therefore need to be understood as whole-of-economy and whole-of-society processes, requiring coordination across sectors and engagement across societal actors (Avelino et al. 2024; UNDP 2025). This way of thinking, known as systems thinking, helps us understand how different parts of a system are connected, and how actions in one area can create effects elsewhere, even over different time periods (Meadows 2008). System boundaries are often difficult to define, as it is not always clear where one system ends and another begins, particularly where systems are interconnected across sectors, scales, and borders. Different actors may therefore interpret both systems and transitions in different ways. Additionally, the justice implications of transitions are often not confined to the actors, sectors, or territories where policies are implemented.

One manifestation of the complexity of global interconnections regarding sustainability is 'problem shifting' (Adipudi et al. 2025), whereby efforts to address one sustainability challenge create or

relocate pressures elsewhere. Burdens may be displaced across sectors (for example from energy to land use), across places (for example from consumer countries to producer countries), or across time (for example from current to future generations). A common way to track and measure this impact is through spillovers, which can be described as cross-border consequences of actions taken in one country that affect outcomes in another (Li 2021). Spillovers can be positive, such as technology diffusion or sustainable investment, or negative, such as emissions embodied in imports, environmental pressures associated with resource extraction, or reduced fiscal capacity resulting from tax avoidance. Negative spillovers can indicate forms of problem shifting in which domestic sustainability gains are accompanied by environmental or social costs elsewhere.

Box 2.1. Spillovers and system boundaries in the Dutch context

The Dutch economy is deeply embedded in global trade networks and flows (see Section 2.1.1). This position makes the Netherlands both a significant driver and recipient of global environmental pressures. Environmental pressures linked to Dutch demand partly arise elsewhere (Hanemaaijer et al. 2025; van Hinsberg et al. 2024), and at the same time, Dutch or European sustainability measures may reduce emissions at home while transferring environmental or social costs abroad (OECD 2023; SDG Transformation Center 2025). This raises questions of responsibility, including how Dutch policies, institutions, and historical patterns of global engagement shape the distribution of costs and benefits within and across borders (WRR 2025).

When system boundaries are drawn around the Netherlands for the purpose of monitoring domestic sustainability efforts, significant environmental and economic linkages extend beyond those borders. The Netherlands ranks among the top global performers on domestic SDG progress, yet also among those with the largest negative spillovers abroad, reflecting emissions, trade, and financial linkages that externalise pressures to other regions (Sachs et al. 2025). As transitions accelerate, these impacts – intended or otherwise – could become more visible in diplomatic, economic, and development relations (Martens et al. 2023).

As the Netherlands and the EU pursue climate neutrality and circular economy ambitions, demand for critical raw materials used in renewable energy technologies, batteries, and digital infrastructure is expected to increase (de Haes & Brink 2025; de Haes & Lucas 2024). Extraction and processing of these materials often take place in regions facing environmental pressures and governance challenges. This illustrates how transition policies aimed at reducing domestic environmental impacts may be linked to environmental and social pressures elsewhere.

Recognising spillovers helps reveal how domestic transitions are connected to international outcomes and how sustainability improvements in one context may depend on developments in another. For this reason, attention to spillovers has become an important component of assessing the justice implications of sustainability transitions. At the same time, attributing and interpreting spillovers is not straightforward. Global value chains are complex, and questions arise regarding responsibility, national interest, and the balance between domestic policy objectives and global common goods (Ministry of Foreign Affairs 2025). Spillover indicators can make transboundary impacts visible, but they do not by themselves clarify how such impacts should be understood or addressed.

2.2 Transitions in a changing international context

Sustainability transitions take place within an increasingly interconnected and rapidly changing international context characterised by shifting geopolitical relations, pressures on multilateral institutions, and competing visions of development and sustainability. As shown in the previous section, transitions generate cross-border interdependencies and spillovers in environmental, economic, and social terms. At the same time, the geopolitical and institutional conditions in which these transitions unfold are themselves shifting, shaping how transition pathways are governed, contested, and distributed across countries. Together, these developments – briefly outlined in this section – shape how transitions are understood and governed.

2.2.1 Shifting multilateral order

Current rules and structures in the liberal multilateral world order, such as the United Nations or the North Atlantic Treaty Organisation, are increasingly under pressure. The shifting international landscape is pressing national governments to reorientate their domestic priorities as well as reconsider strategies for international cooperation (Klingebiel 2025). Multiple shifts are happening at the same time, where nation states need to respond to acute crises and threats, reorientate their strategies and partnerships, and – looking towards the future – need to decide on how to contribute towards the future architecture of multilateralism in a multi-polar world. This requires countries to reconsider underlying values and motivations that inform and steer positioning in international cooperation, depending on their domestic needs and opportunities.

While current tensions may bring renewed attention to questions about the efficacy of the international order, these debates are not new. Calls for the reform of multilateral institutions like the UN have been raised for decades, particularly by countries of the Global South, reflecting concerns about the uneven distribution of representation, the application of existing rules, and the capacity of states to respond to geopolitical shifts. While some countries – including high-income, trade-embedded economies such as the Netherlands – have relatively greater room to shape and reorient their international positions, many countries in the Global South operate under more constrained conditions (AIV 2025). Their policy space is often shaped by structural dependencies, including reliance on commodity exports, exposure to volatile global markets, and conditionalities linked to international financial institutions and trade agreements. In such contexts, the ability to actively redefine engagement with multilateralism or to pursue alternative development pathways is more limited, and choices are frequently made within narrow economic and geopolitical constraints.

2.2.2 Changing drivers of sustainability transitions

Shifting multilateral dynamics further shape what transitions are possible and how they are pursued. Actions taken to accelerate transitions can drive geopolitical tensions, while transitions themselves can also be a source of economic and geopolitical advantage, with some actors strategically leveraging sustainability policies to strengthen their own position.

The pace and direction of sustainability transitions are increasingly influenced by strategic, economic, and security considerations around supply-chain dependencies, resource competition, and geopolitical fragmentation (WRR 2024). Competition over access to critical resources such as

lithium, cobalt, and rare earth elements has intensified (de Haes & Lucas 2024; Lamain 2022), as countries attempt to secure the materials they need for renewable energy technologies. Rivalries over green technology leadership – in batteries, solar manufacturing, hydrogen, and other low-carbon industries – are becoming increasingly more pronounced (Dagnachew et al. 2025). This has contributed to a shift in which sustainability transitions are framed primarily as responses to domestic needs and ways to gain or maintain strategic advantage rather than as collective global challenges (European Parliament 2022), thereby undermining multilateral, integrated cooperation. The accompanying policy responses include the nationalisation of sustainability efforts, reshoring and friendshoring of supply chains, and the use of instruments such as due-diligence legislation and carbon border adjustment mechanisms. While these instruments were initially designed to strengthen corporate accountability across global value chains, their implementation increasingly interacts with trade and competitiveness concerns, and can become entangled with geoeconomic strategies aimed at protecting domestic markets while influencing practices abroad (Vela Almeida et al. 2023). This creates tensions between normative ambitions in regulatory instruments and their strategic use, with implications for cross-border justice questions, including how costs and benefits are distributed and how environmental and social externalities are allocated across global supply chains.

Recent crises have further reinforced the strategic framing of sustainability transitions. The energy crisis triggered by the war in Ukraine vividly demonstrated the vulnerabilities of relying on volatile fossil-fuel markets, leading governments to accelerate investments in domestic renewable capacity (Schaik & Cretti 2023). Climate impacts, such as extreme weather, water scarcity, and food insecurity, are increasingly posed as so-called threat multipliers, potentially exacerbating conflict and instability (NATO 2024). This highlights the importance of adaptation, resilience, and diversification strategies as a response to continuously changing circumstances.

However, scarcity- or security-oriented approaches can also narrow attention to stability and risk management, which may leave less room for distributional questions or local perspectives (Lamain 2025; Scoones et al. 2019). While such framings are often justified by the need to manage complex and context-specific risks, they may also obscure the underlying social, political, and economic drivers of vulnerability, thereby limiting attention to distributional and contextual dimensions of transition choices (Lamain 2022). In parallel, governments and other actors may mobilise justice claims within international cooperation in ways that reflect both normative and strategic objectives (Palm 2021). For example, states may emphasise the injustice of climate impacts or resource extraction abroad while simultaneously pursuing trade, security, or competitiveness interests, or frame their global engagement as just while giving limited attention to domestic inequities. These dynamics can create asymmetries in how justice claims are used and interpreted, with implications for trust and cooperation across policy arenas (Claar 2022).

2.3 Transitions and justice questions

2.3.1 Just transitions

Sustainability transitions¹ are not neutral processes: they shape, and are shaped by, what is included or excluded, how costs and benefits are distributed, and which systems of value are reinforced or transformed. They also unfold in contexts characterised by incomplete knowledge, uncertainty about future pathways, and differing actor interests and capacities to influence change. Because sustainability transitions involve changes in how resources, opportunities, risks, and decision-making power are distributed, they inevitably raise questions of justice. Who benefits from transition processes, who bears their costs, whose interests are prioritised, and whose voices are included in decision-making are all examples of political and normative questions that emerge alongside efforts to transform existing systems.

Although widely used in policy and research, the term ‘just transitions’ encompasses different and sometimes implicit interpretations of fairness and distribution (Oates & Verveld 2024; see also Section 3.3). A common concern, however, is that transition strategies focused primarily on technical or economic objectives may overlook how harms and benefits are distributed across populations and places. This can obscure the externalisation of social and environmental costs, reinforce existing inequalities, or generate new forms of disadvantage (Blanksma Çeta 2025; McGowan & Antadze 2023). Linking considerations of justice to sustainability transitions is therefore increasingly seen as important for the legitimacy, effectiveness, and durability of transition outcomes (Avelino et al. 2024; Ramos-Mejía et al. 2018).

Box 2.2. Transitions and transformations

The terms transformation and transition are closely related and are sometimes used synonymously when referring to changes in complex adaptive systems. Differences are just as likely to reflect alignment with a certain disciplinary community as they are to reflect fundamentally distinct underlying processes.

In this report, transitions and transformations are distinguished primarily in terms of the nature and scope of change being considered. Transitions can refer to changes within particular societal subsystems (e.g. energy, mobility, or cities) but can also encompass interconnected changes across multiple sectors and scales. The term transformation (and its derivatives) is used more specifically to refer to fundamental changes that alter underlying societal structures, relationships, and institutions and may extend beyond individual sectors (de Krom et al. 2025a; Hölscher et al. 2018).

Though the exact differences remain debated in the literature, this understanding is generally in line with standard multilateral policy. For example, the IPCC differentiates between a transition as ‘the process of changing from one state or condition to another in a given period of time’, and transformation as ‘a profound change in the fundamental attributes of natural and human systems, [which] could reflect strengthened, altered or aligned paradigms, goals, or values towards

¹ A short glossary of key terms is provided at the end of the report to clarify usage across different literatures and policy contexts.

promoting adaptation for sustainable development, including poverty reduction’ (IPCC 2014). Similarly, IPBES demarcates transformative change as ‘fundamental, system-wide shifts in views, structures, and practices’ (O’Brien et al. 2025).

In practice, the boundaries between transitions and transformations are often blurred. Transitions may contain transformative elements or contribute towards broader transformation, while transformations are typically enabled through multiple interacting transitions across sectors and scales. In this report, as in wider usage, it is useful to understand the distinction as heuristic rather than absolute.

2.3.2 Justice considerations in science and policy

Justice questions extend beyond transition design into the ways in which transitions are analysed, interpreted, and integrated into policy processes. Policy decisions often rely on science and scientific evidence, which can be challenging: implicit normative assumptions related to justice might intertwine with scientific analysis and political judgement (Maas 2022). This entanglement can give the impression that value-laden decisions stem directly from scientific evidence, blurring the distinction between empirical findings and policy choices. Furthermore, shifts in value perspectives may be influenced by power dynamics, institutional constraints, and political strategy as much as by new evidence (Klingebiel 2025).

The blending of facts and values introduces two interrelated concerns. First, it may complicate political responsibility; if decisions are framed as being determined purely by ‘what science tells us’, accountability for their societal consequences becomes harder to trace. Second, science itself may become politicised, with scientific expertise either contested or undermined in cases of disagreement, potentially eroding trust in knowledge institutions (Hulme et al. 2020; Jasanoff & Simmet 2017). In such contexts, claims of neutrality might obscure the normative dimensions of decision-making (Turnhout 2024).

Clearly and explicitly defining justice considerations helps clarify the boundary between empirical analysis and normative judgement. This does not eliminate uncertainty or disagreement, nor does it resolve underlying power asymmetries or geopolitical tensions. Its value lies in making visible and clarifying where political choices are made and on what basis or foundation, thereby supporting accountability and reducing the risk of misattributing responsibility between science and policy domains.

3 The Justice–Direction–Responsibility framework

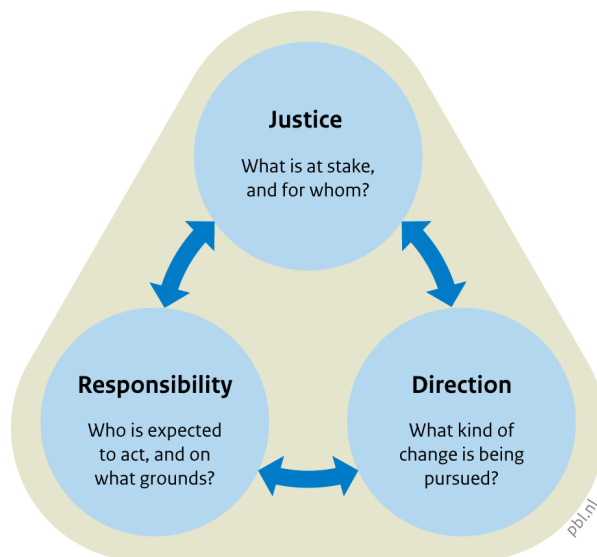
3.1 Introducing the JDR framework

This chapter introduces the Justice–Direction–Responsibility (JDR) framework as a way to analyse how sustainability transitions are shaped, distributed, and governed across actors and scales, particularly, though not exclusively, in contexts where sustainability transitions generate cross-border effects. It responds to the analytical challenges identified in Chapter 2, where sustainability transitions were shown to be interconnected across scales, (geo)politically sensitive, and characterised by inherent embedded justice questions. Building on previous work (Oates & Verveld 2024), this chapter brings together questions of justice, the direction of transition pathways, and the allocation of responsibilities across actors and scales into a single analytical lens. The framework organises analysis around three guiding concepts and associated questions (Figure 3.1).

- **Justice:** What is at stake, and for whom?
- **Direction:** What kind of change is being pursued?
- **Responsibility:** Who is expected to act, and on what grounds?

Figure 3.1

JDR concepts for analysing sustainability transitions



Source: PBL

Each concept reflects a well-established line of inquiry: justice highlights how benefits, burdens, and recognition are distributed; direction concerns the depth and orientation of systemic change; and responsibility addresses how roles and obligations are allocated across actors and scales. Together, these three concepts provide a complementary structure for examining more normative, strategic, and political aspects of sustainability transitions.

Importantly, the framework is a heuristic device: it structures reflection and analysis through key questions rather than offering predefined answers. It does not prescribe specific outcomes or provide a step-by-step method for defining what is just. Instead, it helps clarify how problems are framed, identify how impacts and trade-offs are understood, and makes explicit how responsibilities are interpreted across actors and scales. The framework can complement commonly used quantitative transition indicators by supporting interpretation of what such indicators might mean in normative and political terms.

The framework also has limitations. The concepts of justice, direction, and responsibility are themselves contested and cannot eliminate normative disagreement. Applying the framework requires interpretation and judgement, and different users may reach different conclusions when examining the same transition. In addition, the framework can help to make trade-offs and assumptions visible, but it cannot itself resolve political disagreements or determine which transition pathway should ultimately be pursued. Further research and practical application can help refine the framework and examine its usefulness across different cases, scales, and governance contexts.

Within these boundaries, the framework's value lies in making implicit assumptions explicit. In sustainability transitions, many core decisions are not purely technical, but rather rest on normative judgements about priorities, pathways, and responsibility allocations (Hickey and Robeyns 2020). When these assumptions remain implicit, they may be treated as technical constraints rather than value-laden choices. Making them explicit allows a wider range of options to be considered more deliberately, including whose perspectives are included in defining problems and solutions. Explicit articulation of these dimensions enables different interpretations of justice, direction, and responsibility to be compared in a structured way. This supports more transparent dialogue between actors with different priorities and helps clarify whether disagreements are substantive (value-based) or technical in nature. Explicitness is not an end in itself but rather a condition for more accountable and contestable decision-making in complex governance contexts.

The following sections of this chapter introduce each key concept of the framework respectively. Each section outlines key ideas, highlights international implications, and provides a set of reflection prompts that can be used to explore how the dimension applies in specific policy or research contexts.

Box 3.1. Framework development – methods and approach

The JDR framework was developed through an iterative process combining conceptual synthesis, policy reflection, and exploratory application. It sought to develop an analytical heuristic that could support reflection on justice at the science–policy interface, specifically with regard to transitions research and practice.

The starting point was a review of literature on environmental justice, sustainability transitions, governance, and international environmental policy, building on earlier conceptual work on just transitions (Oates & Verveld 2024). This literature highlighted recurring questions concerning justice, transition pathways, and the allocation of responsibilities – inherently normative topics with which research is increasingly expected to engage, particularly in policy-relevant contexts, whilst also maintaining analytical neutrality.

The framework was subsequently refined through ongoing engagement with researchers and policymakers working on international sustainability transitions within PBL. These discussions, including collaborative reflection sessions around concrete policy questions, helped identify recurring analytical challenges encountered in practice, such as making normative assumptions explicit, comparing alternative transition pathways, and clarifying responsibilities across actors and scales.

Finally, the framework was explored through its application to a number of illustrative policy cases. These applications served to test the analytical usefulness of the framework, refine its structure, and demonstrate how it can support structured reflection across different policy domains. Some of these results will be published as standalone reports in the future (e.g. Dagnachew et al. 2026).

3.2 Justice: What is at stake, and for whom?

Key ideas

Justice is increasingly invoked as something to be achieved in sustainability transitions: calls for a ‘just transition’ have become prominent in climate and environmental movements and are increasingly reflected also in policy agendas and international sustainability debates. In practice, however, it is a contested and strongly normative concept, with different interpretations leading to different conclusions about what is fair or desirable. The JDR framework, therefore, does not treat justice as a fixed goal or outcome, but rather brings together different perspectives on justice, using them as an analytical lens for examining how transition processes can affect different groups, places, and generations.

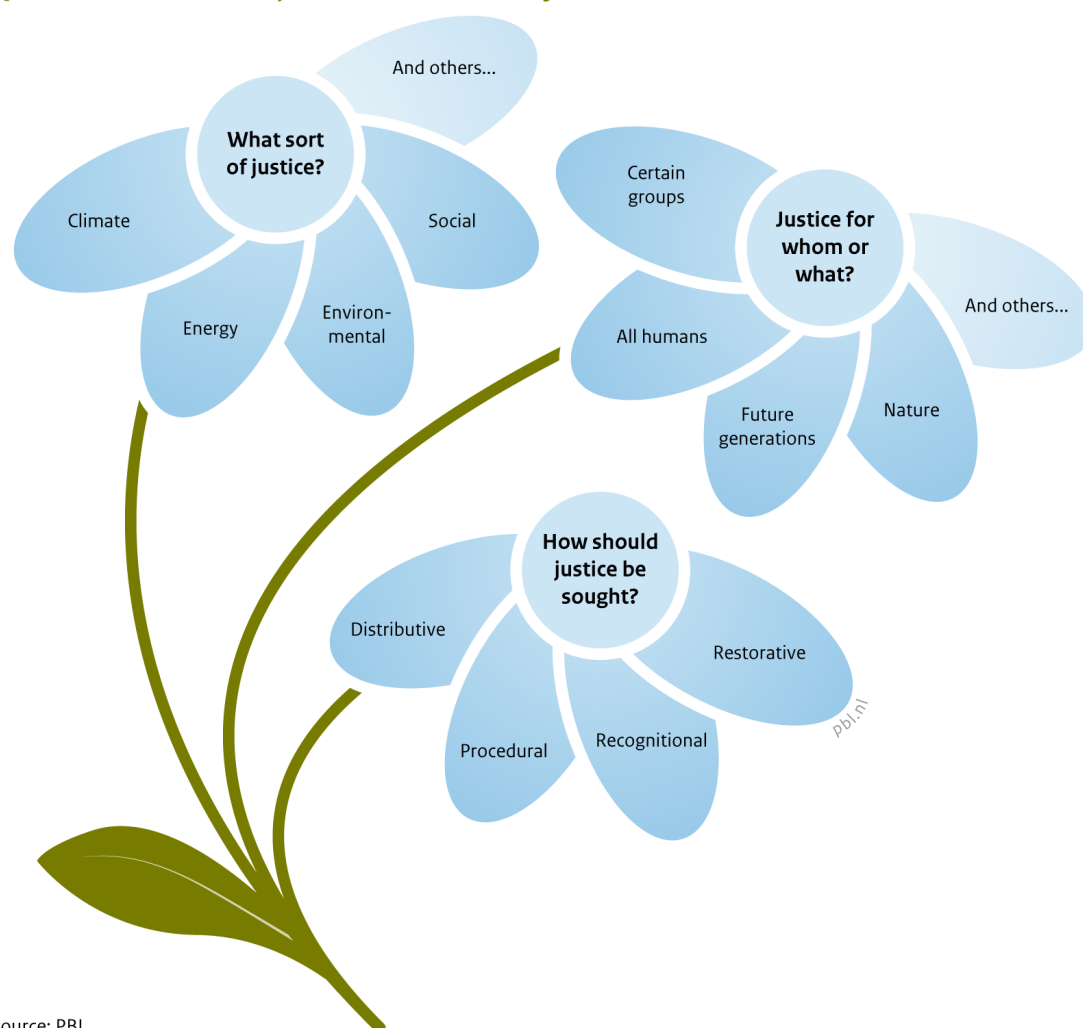
Three guiding questions (though not exhaustive) can help to systematically navigate this diversity of justice dimensions (see Figure 3.2). First of all, *what sort of justice?* Labels such as climate justice, environmental justice, or economic justice indicate the specific type of issue or inequality that is being addressed. Secondly, *justice for whom or what?* This may refer to different social groups, generations, countries, species or, increasingly, non-human nature itself. Third, *how is justice being sought?* One tripartite model commonly used in response to this question distinguishes between different ways in which justice is pursued: distribution (how benefits, burdens, risks, and responsibilities are allocated), procedure (how decisions are made and whose voices shape them), and recognition (whether different values, identities, knowledges, and experiences are

acknowledged and respected). Some frameworks also include reparative or restorative dimensions, which focus on historical or structural patterns of disadvantage.

Different disciplines tend to refer to and operationalise justice in different ways. For example, economists tend to focus on allocation, lawyers on rights and judicial process, resource analysts on access, and political scientists on representation (Biermann et al. 2009; Gupta & Lebel 2010; Kalfagianni et al. 2020), which reinforces that no single perspective captures the full picture. The above-named justice dimensions – and many more besides – are not independent or mutually exclusive; they are interconnected and sometimes reinforce or contradict one another (Hazrati & Heffron 2021). In this sense, justice can be seen as a plural and contested concept rather than a fixed endpoint, which shapes how transition outcomes are evaluated and negotiated.

Figure 3.2

Questions to ask about justice in sustainability transitions



Source: PBL

Analytical implications

As an analytical lens, justice helps reveal how transition processes create different impacts across groups, places, and generations, and how these effects are connected across sectors and systems (WRR 2023). Its purpose is not to settle debates about what is just, but rather to make explicit

underlying values, priorities, and assumptions, thereby providing a shared language for navigating disagreements and iterating towards not *perfect justice*, but *more just* outcomes (Reckien et al. 2023).

Different justice perspectives highlight different dimensions of these processes, including distributional effects, participation in decision-making, recognition of diverse knowledge and identities, and the allocation of responsibility. Engaging with multiple justice perspectives is therefore not primarily about adding more viewpoints, but about understanding how different perspectives illuminate different forms of inequality, exclusion, and obligation. This is particularly relevant to sustainability transitions, where policy choices can have far-reaching and uneven effects across sectors, places, and borders. In this way, justice serves not only as an evaluative standard but also as a basis for dialogue and contestation – an arena in which actors can debate legitimate futures and negotiate the direction of transitions (Avelino et al. 2024; see also Section 2.2).

International dimensions

Sustainability transitions produce cross-border effects, meaning that questions of justice are not confined to national contexts but extend across interconnected systems. Applied internationally, a justice lens helps reveal how policy choices distribute benefits and burdens across borders, whose perspectives are included in decision-making, and how responsibilities are framed in relation to (for example) historical emissions, resource use, or vulnerability. It allows analysis of where national interests and global equity considerations align, and helps highlight tensions arise. This is especially relevant for national policy strategies, foreign policy, and international cooperation, as well as for advancing global governance frameworks. Justice is an interconnecting principle that helps to explore and expose the consequences of – and, where necessary, alternatives for – policy choices, complementing conventional criteria such as effectiveness and efficiency by drawing attention to distributional effects, recognition of affected groups, and participation in decision-making.

Many global environmental governance frameworks already embed justice-related principles. Examples of this include differentiated responsibilities, inclusive participation, or intergenerational protection. In this sense, underlying ideas of justice are therefore already present in normative commitments within international agreements. Table 1 illustrates some of the ways in which the different dimensions of justice are translated into concrete policy responses in global environmental governance. These reflect particular ways of framing problems, identifying relevant actors, and assigning responsibilities, and they implicitly or explicitly embody assumptions about whose justice counts and how global fairness is weighed against national priorities. Familiarity with justice as an analytical lens raises awareness and helps recognise how justice dimensions are present or missing, and how they are used or interpreted in governance and policy processes.

Table 1

Types of justice and typical international environmental policy responses (non-exhaustive)

Type of justice	Typical representation in international environmental governance and policy
Distributive	• Trade-offs between domestic sustainability targets and impacts abroad • Burden sharing, climate finance, and adaptation support • Sharing costs/benefits of energy transitions • Allocation of emissions reductions and mitigation burdens across countries or sectors (e.g. through climate targets, emissions trading systems, and border carbon measures) • Distribution of environmental, health, labour, and economic risks across actors and countries in raw material supply chains
Procedural	• Participation of Low- and Middle-Income Countries (LMICs) in global climate, biodiversity, and trade negotiations • Transparency and accountability mechanisms in multi-level governance • Stakeholder engagement in development cooperation programming • Consultation requirements in supply-chain due diligence (e.g. Corporate Sustainability Due Diligence Directive (CSDDD), Organisation for Economic Co-operation and Development (OECD) guidelines) • In- or exclusion of affected groups in decision-making about mining, infrastructure, energy siting, or land-use planning
Recognition	• Addressing structural exclusions in global governance (e.g. representation of small island states, African Union in G20) • Acknowledging different development pathways and responsibilities in international cooperation • Acknowledging historical dependencies and power asymmetries shaping current global economic and political orders • Responding to uneven power relations in global supply-chain governance • Valuing informal or precarious labour in transition policies (e.g. waste pickers in circular economy strategies) • Incorporation of Indigenous and local community knowledge in land-use, biodiversity, and climate adaptation strategies
Restorative	• Debates about fair terms of partnership in development cooperation and global value chains • Climate reparations, loss and damage funding, and discussions of historical emissions • Trade and investment policies addressing past harms (e.g. colonial-era extraction legacies) • Just energy transitions in regions dependent on fossil industries (coal phase-out funds, structural adjustment) • Repair and compensation for environmental harm linked to extraction and consumption patterns in high-income countries

Reflection prompts

The questions below can be used to structure analysis or discussion in policy and research contexts:

- What type of justice do you recognise in transition policy in your field of work? And which ones are new to you and merit more attention and exploration? (scope)
- Which groups or regions are most affected – positively or negatively – by transition policies? (impact)
- How does consideration of different types of justice change your awareness on how groups and regions might be affected? What do you know about their take on the ambition and approach of the transition?
- How are perspectives from LMICs represented in decision-making and monitoring processes?
- To what extent can justice questions be raised and answered in an internal setting, as part of a research agenda or policy strategy, or should they be part of an ongoing dialogue? How to balance this effort?

These prompts are not exhaustive and are not intended as a checklist. Rather they are designed to support discussion, comparison of perspectives, and iterative reflection in the context of concrete transition challenges.

3.3 Direction: What kind of change is being pursued?

Key ideas

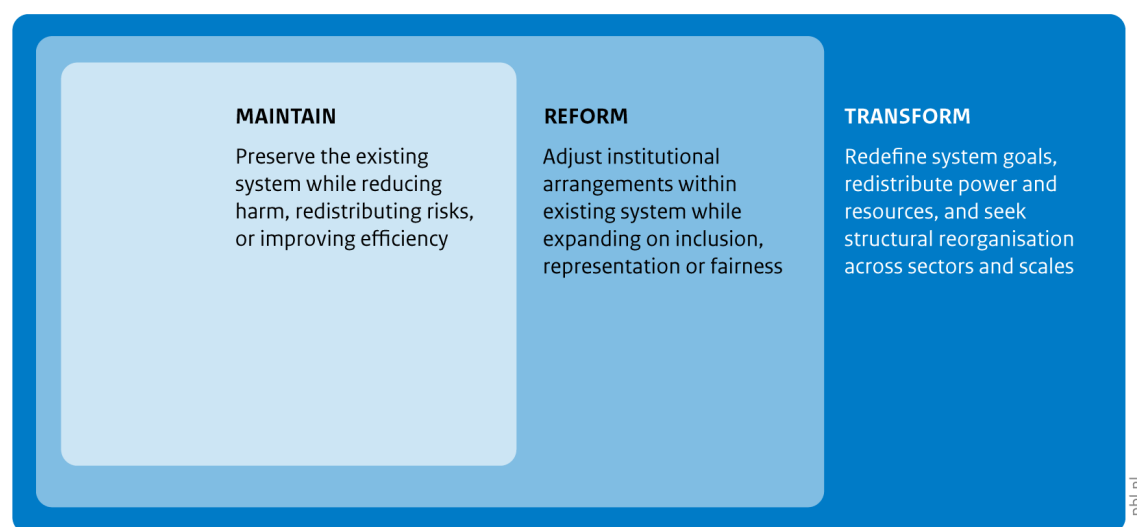
Sustainability transitions are not only about whether change occurs, but also about what kind of change is pursued. Transition strategies differ in how quickly they aim to achieve change, how widely benefits are distributed, and how fundamentally existing systems are altered. As a result, governments often face difficult choices about the pace, scope, and depth of transition. These trade-offs are captured in the ‘transition trilemma’ of speed, breadth, and depth (Van Wijk & Fischhendler 2025; Termeer et.al. 2024). Governments are expected to steer transformative change but often face uncertainty about how best to balance these competing demands and struggle with deploying tailored governance strategies that inevitably involve difficult choices (de Krom et al. 2025b; Termeer et al. 2024). Rapid or wide deployment of sustainability innovations, for example, can dilute structural depth of transitions, addressing immediate challenges without shifting underlying systems; conversely, deep structural change can slow diffusion or limit participation. Recognising and navigating such tensions and trade-offs can prevent transitions from becoming unintentionally trapped in shallow optimisation (Goldstein & Waddock 2025) or relying solely on technocratic reasoning (Blanksma Çeta 2025).

The ‘direction’ element of the framework concerns how these choices are reflected in the type and depth of change being pursued. If justice clarifies what is at stake and for whom, direction focuses on the strategies adopted in response. Different understandings of justice may influence these strategies, ranging from incremental adjustment to more fundamental system change. In the JDR framework, these strategies are represented along a continuum of transformative potential, from maintain to reform to transform (Just Transition Research Collaborative 2018; Oates & Verveld 2024; see also Figure 3.3 and Box 2.2). These orientations can be used as a simple analytical heuristic to characterise transition strategies:

- **Maintain:** Interventions that preserve the core structure and goals of existing systems while reducing harm, redistributing risks, or improving efficiency. These approaches focus on stabilising transitions, protecting affected groups, and mitigating negative impacts without altering underlying institutional logics. Common policy responses might include reparations to affected workers (Pollin 2023) or improvements to existing energy use (Dall-Orsoletta et al. 2022).
- **Reform:** Interventions that adjust institutional arrangements, decision-making procedures, or access to resources within the existing system. Reform expands inclusion, representation, or fairness but operates within prevailing economic and governance paradigms. Policy responses might include subsidy reform (Green & Gambhir 2020) or revised and more stringent due diligence standards (Morfea 2025).
- **Transform:** Interventions that redefine system goals, redistribute power and resources, and alter the underlying paradigms, rules, and relationships that structure the system. Transformative approaches question dominant logics and seek structural reorganisation across sectors and scales. Common policy responses to calls for transformative environmental governance include reorienting economic and policy systems oriented towards collective well-being and ecological integrity (Mesiäislehto et al. 2025), redistributing decision-making power (Oates & Sudmant 2024), strengthening participation and co-creation (Ziervogel et al. 2022), integrating diverse knowledge systems (Escobar 2018), and enabling adaptive governance systems (Visseren-Hamakers et al. 2021).

Figure 3.3

Different types of just transition based on transformative potential



Source: PBL

These modes are not hierarchical stages along a single trajectory and each may be appropriate under different political, institutional, and temporal conditions. Indeed in practice, transition strategies often combine elements of all three. Distinguishing between these orientations helps to clarify how ambitious a transition is, and what kinds of change it prioritises. Such ambitions are not fixed, but may evolve in response to societal dynamics, including public support, contestation, and political and economic interests that shape what is considered feasible or legitimate (Martens et al. 2023).

Analytical implications

Using the lens of direction can structure analysis in three ways. First, it clarifies whether policies primarily aim to optimise existing systems, adjust them, or reconfigure them more fundamentally. Second, it highlights how different approaches engage with underlying beliefs, dominant paradigms, and existing structures that shape current production systems, governance arrangements, and patterns of resource use. Finally, it helps to identify trade-offs. For example, more incremental approaches may be easier to implement and deliver short-term results, but risk reproducing existing inequalities or dependencies. More transformative approaches may address structural causes, but often involve greater uncertainty, contestation, and institutional change. This prompts reflection on whether policies are primarily designed to adjust outcomes within existing systems, or to reshape the underlying structures and processes that generate those outcomes (EEA 2020).

International dimensions

The direction and depth of domestic transitions reverberate beyond national borders. National policies on climate, the circular economy, and trade influence global flows of energy, food, materials, and finance. These interactions can either reinforce existing global dependencies – for example, by locking LMICs into extractive supply roles – or enable shifts with more transformative characteristics – such as towards fairer value chains, shared innovation, or equitable access to green technologies. Understanding how justice claims shape the direction of transitions differently at domestic, regional, and global levels also increases sensitivity towards tensions between these claims. It also offers opportunities to adjust or redirect transitions. Further, using justice as a lens to unpack and interpret direction helps translate between these scales, diagnosing where mismatches occur (such as between EU standards and local capacity), and identify the need for new accountability or cooperation mechanisms.

Reflection prompts

The questions below can be used to structure analysis or discussion in policy and research contexts:

- What vision of change underpins transition strategies? Where does this sit in the different modes of transition ‘maintain-reform-transform’?
- How do transition policies contribute to global systemic change? Do policies enable or constrain more transformative pathways internationally?
- Where do synergies and tensions arise between transition objectives and development pathways elsewhere?
- When do these questions and considerations surface in policy development cycles?
- How can governance structures allow for feedback, learning, and course correction in light of justice concerns?

These prompts are not exhaustive and are not intended as a checklist. Rather they are designed to support discussion, comparison of perspectives, and iterative reflection in the context of concrete transition challenges.

3.4 Responsibility: Who is expected to act, and on what grounds?

Key ideas

Responsibility in sustainability transitions is not a fixed or purely technical matter, but a dynamic and contested political question. Many contemporary environmental challenges do not lend themselves to simple answers about who is at fault or who should act (Hansen-Magnusson & Vetterlein 2022). Instead, responsibility is most often allocated according to different principles, debates around which also underpin many justice-based approaches, including for example:

- Capacity (who has the ability to act?)
- Contribution (who causes or perpetuates harm?)
- Benefit (who gains from the arrangements?)
- Connectedness (who has ties or special obligations through history or dependence?)

These principles reflect different ways of reasoning about responsibility. They may lead to different and sometimes competing conclusions about who should act and on what grounds. In practice, these allocation principles are operationalised through different overlapping understandings of responsibility, including (Bosselmann, 2022; Hansen-Magnusson & Vetterlein, 2022):

- Earth system responsibility: A forward-looking, collective perspective that focuses on maintaining the stability of the planet as a whole. It emphasises shared risks (e.g. climate change, biodiversity loss) and the need for all actors to act in ways that safeguard ecological systems for current and future generations, regardless of causation.
- Legal responsibility: Responsibilities that are formally defined and enforceable through laws, regulations, and agreements. This includes international agreements (e.g. Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC), United Nations Framework Convention on Climate Change (UNFCCC)), national laws, and domestic rulings (e.g. *Urgenda*, *Milieudefensie v. Shell*), as well as emerging expectations around corporate due diligence.
- Moral responsibility: Broader expectations about what constitutes fair and appropriate action, beyond what is legally required. This can include addressing historical contributions to environmental harm, recognising unequal impacts, and supporting efforts to repair damage or reduce future risks, even where no formal obligation exists.

These dimensions often coexist, sometimes uneasily, as they can point to different expectations about who should act and on what grounds. For example, legal obligations may set minimum requirements, while moral or earth system perspectives may call for more far-reaching action, creating tensions in how responsibility is interpreted and justified in practice (Dubash 2020). Responsibility is therefore increasingly seen not only as technical or legal, but also as socially constructed and politically contested (Goodhart 2023).

Allocating responsibility thus requires judgments about which impacts are acceptable, who is accountable, and how different values should be weighed. In practice, this means that responsibility allocations are not neutral, but reflect underlying assumptions about fairness, power, and legitimacy. Rather than prescribing specific responsibilities, considering responsibilities

through different justice lenses helps clarify how different actors and institutions justify their roles, and how these justifications shape governance arrangements and policy choices: who is expected to act, on what grounds, and towards what outcomes? This concerns both outcomes and processes, responsibility is also dynamic; as the understanding of justice evolves, so too can expectations about responsibility. Capacities change, interdependencies deepen, and policy arrangements need to therefore adapt over time. This makes responsibility dynamic and requires ongoing negotiation and adjustment.

Competing interpretations of responsibility – such as equal per-capita emissions rights versus differentiated responsibilities based on historical contribution – lead to very different policy implications. Similarly, procedural choices matter: whether affected actors are included in decision-making, or only consulted after decisions are made, shapes how responsibility is experienced and contested. Ignoring these dimensions may lead to conflict or backlash, particularly where responsibilities are perceived as imposed or unfair (Patterson et al. 2025). Responsibility is also relational, as it extends beyond individual actors to relationships between groups, countries, and generations. For example, responsibility may depend on how countries are linked through trade, how past actions have affected others, or how current decisions relate to non-human nature. It also raises intergenerational questions about responsibility towards future generations whose well-being depends on present decisions (Ferrari et al. 2021).

Analytical implications

A responsibility lens can help analyse how responsibility for shaping transitions processes is constructed, distributed, and contested across actors and scales, and how these allocations shape transition outcomes. It does so in three main ways. First, it can make visible how responsibility is attributed in practice – whether through capacity, contribution, benefit, or connectedness – and how these different logics lead to different policy conclusions about who should act and in what way. Recognising how narratives actively frame problem scope, direction of solutions, and actor responsibility creates opportunities to strengthen inclusion and accountability in policy processes and decision making. Second, it helps identify gaps and tensions between different expressions of responsibility, such as legal obligations, moral expectations, and earth system constraints. These do not always align, and their interaction often shapes real-world governance dilemmas. Finally, this lens reveals how responsibility is distributed across actors and levels of governance, including where responsibility is shifted, diluted, or left ambiguous in complex global systems. Such an analysis is not intended to prescribe who should act, but rather to support reflection on how responsibility is constructed and with what consequences for governance, accountability, and implementation in practice.

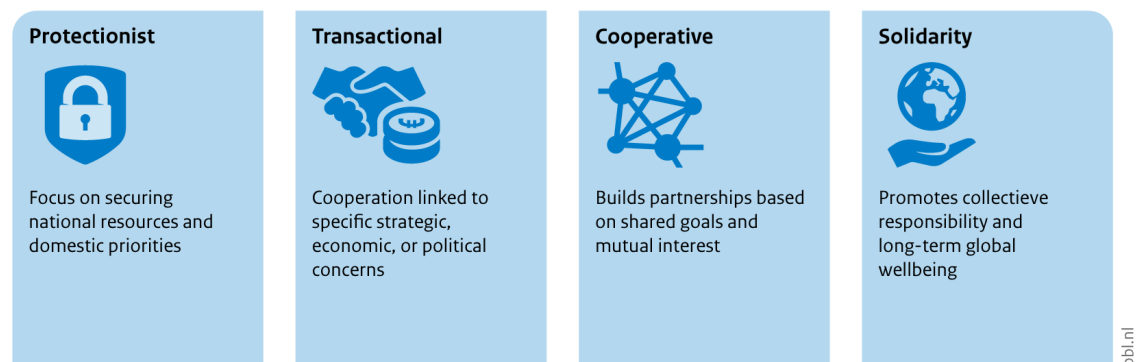
International dimensions

Global interdependence can extend responsibility beyond national borders. Domestic choices made in the Netherlands affect people, ecosystems, and economies abroad, just as developments elsewhere shape Dutch sustainability pathways. Responsibility can therefore extend beyond national impacts to include transboundary and global effects, such as environmental spillovers (Ministry of Foreign Affairs 2025) or shared resources (IIED 2024). In addition to these material interdependencies, global responsibility can also be framed in moral and political terms, for example through commitments to global equity and the principle of ‘leaving no one behind’ (Ministry of General Affairs 2023).

The conceptual debates and tensions described above highlight that international responsibility is neither straightforward nor uniformly interpreted, but rather deeply contextual and politically contested. States navigate a complex terrain of competing expectations, historical legacies, power asymmetries, and ethical imperatives. While debates in law, science, and ethics establish the grounds for responsibility, they do not automatically resolve how a country like the Netherlands translates these into concrete policy choices.

These choices can be illustrated through a set of responsibility profiles (Figure 3.4). These profiles describe different logics through which a state might interpret and act upon its international responsibilities, and how different logics of responsibility may shape policy decisions (Klingebiel 2025) helping to surface the assumptions, trade-offs, and potential consequences embedded in different policy choices.

Figure 3.4
Responsibility engagement profiles



Source: PBL

Each profile reflects different understandings of justice and implies a different degree of responsibility for impacts elsewhere. The logics are not mutually exclusive or hierarchical, but rather reflect different political and justice rationalities through which states position themselves in international sustainability transitions. What is considered appropriate or legitimate responsibility may differ depending on context, including a country's development status, resource base, and perceived vulnerabilities or dependencies.

For example, approaches that may appear 'protectionist' in one context, can reflect efforts to safeguard domestic livelihoods or natural resources, particularly in lower-income contexts, while similar approaches in high-income contexts may be interpreted as safeguarding accumulated wealth or existing advantages. In the context of food systems, a protectionist stance may justify direct income support through the EU Common Agricultural Policy based on food security and domestic stability considerations, while a solidarity-oriented stance may prioritise action aimed at strengthening international cooperation on trade, production, and sustainability standards in global food systems, including concerns related to health and planetary boundaries. These differences highlight how responsibility logics are embedded in broader justice claims. Responsibility is therefore not uniform but depends on how actors interpret justice, interdependence, and appropriate action.

Reflection prompts

The questions below can be used to structure analysis or discussion in policy and research contexts:

- Who can be considered responsible, for what, and based on what principles? How do different responsibility logics shape these allocations?
- Where does policy have the greatest leverage to fulfil its responsibilities for advancing justice in transitions, and on what grounds?
- Are policies meeting legal obligations, ethical expectations, or both? Are legal obligations and ethical expectations mutually reinforcing or does it lead to disparities?
- How are responsibilities shared across actors (state, market, society) and scales (local – global)?
- Are there mechanisms in place to revisit and adapt responsibility as systems evolve? Are such adaptations in governance mechanisms getting enough attention?

These prompts are not exhaustive and are not intended as a checklist. Rather they are designed to support discussion, comparison of perspectives, and iterative reflection in the context of concrete transition challenges.

4 Applying the JDR framework to illustrative policy questions

The following illustrative examples show how justice, direction and responsibility considerations can be embedded in transition analyses across international topics. They are designed as learning resources to support shared reflection and dialogue rather than exhaustive applications of the framework.

4.1 A ‘fair’ climate target for the Netherlands

The policy question

The Netherlands, like all EU Member States, is committed to achieving climate neutrality by 2050. At EU level, a target of 90% reduction in net greenhouse gas emissions by 2040 compared with 1990 levels has been agreed upon, while the Netherlands regards a 90% reduction a logical intermediate step towards the 2050 goal (Ministry of Economic Affairs and Climate, 2024). More broadly, the Netherlands is bound by its commitments under the UN Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, which requires countries to pursue ambitious climate action while taking considerations such as national circumstances, equity, responsibility, and capacity into account. What could these commitments and considerations mean for the Netherlands?

A previous PBL study (van Vuuren et al. 2024) provides a useful starting point for illustrating how the JDR framework can be used. Its analysis of alternative emission reduction pathways and allocation principles makes questions of justice particularly visible. The discussion below builds on these insights, using the JDR framework to reflect on how different levels of climate ambition and allocation principles embody different assumptions and trade-offs, and to explore broader considerations that can arise when reflecting on climate targets and transition pathways.

Applying the JDR lens

Justice: What is at stake, and for whom?

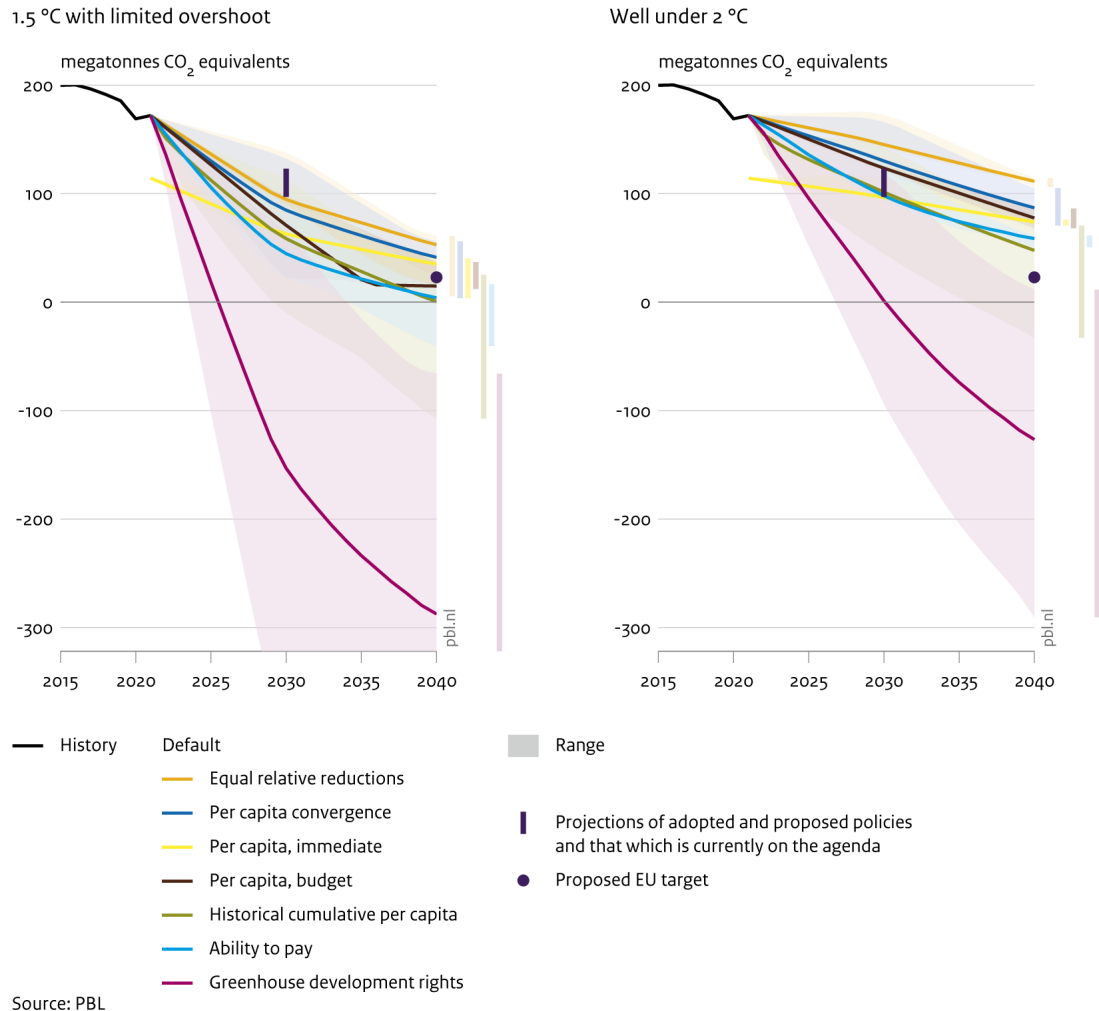
Dutch mitigation pathways are shaped not only by domestic policy choices, but also by European frameworks, global supply chains, and developments in countries providing key materials and technologies. Different pathways also have implications for a wide range of actors, including industry, workers, farmers, consumers, and international partners.

Different distributive principles lead to different interpretations of appropriate emission reduction targets (see Figure 4.1, from van Vuuren et al. 2024): capability suggests that wealthier countries should reduce more; historical responsibility links higher past emissions to greater present obligations; and per capita approaches allocate equal per capita shares of a global carbon budget. Another approach, grandfathering, would maintain existing shares but is widely contested in equity debates because it places a relatively greater mitigation burden on LMICs (van Vuuren et al. 2024). Procedural questions might concern whose voices shape target setting, while recognitional justice

considerations ask how different national circumstances and development needs are taken into account. Restorative perspectives, in turn, draw attention to historical contributions to climate change and questions of responsibility and repair.

Figure 4.1

Greenhouse gas emissions for the Netherlands, per allocation rule



Whichever level of ambition might be chosen, there are different pathways through which that goal can be pursued. Every pathway has justice consequences. Some may place heavier burdens on particular sectors, communities, or income groups, while others may generate more significant cross-border impacts, for example through increased demand for imported materials, land, or energy. Exploring these implications early on helps prevent blind spots and makes it easier to anticipate tensions, trade-offs, or opportunities for co-benefits.

Direction: What kind of change is being pursued?

Different pathways reflect different understandings of how emissions reductions could be achieved. While some rely primarily on technological innovation and large-scale deployment of low-carbon technologies, with a focus on optimising current systems ('maintain'), other approaches place greater emphasis on behavioural change or demand reduction ('reform'). Still others aim for more fundamental transformations of economic and social systems ('transform').

Underlying such pathways are assumptions about what kind of future is being pursued, and for whom. More demanding climate targets may require faster and more far-reaching changes, raising questions about the extent to which emissions reductions should rely on technological solutions, behavioural and demand changes, or broader transformations of existing systems. Some pathways rely heavily on uncertain technologies such as large-scale carbon dioxide removal after 2040 – a possibility, but not a guarantee. If these technologies develop more slowly or at smaller scales, later generations may inherit a greater mitigation burden. Other pathways assume stable global supply chains or that neighbouring European countries will move at a similar pace. These assumptions may all be plausible, but they are not neutral; they all shape which risks are considered acceptable and how burdens are distributed over time. They therefore speak to the direction of transition, while also raising questions of intergenerational justice.

Just as important are assumptions that may remain implicit or are obscured. For example, some analyses may begin from the premise that limiting temperature increase to 1.5 °C above pre-industrial levels is still achievable, while others might assume it no longer realistic; some may think it self-evident that even limiting temperature increase to 1.5 °C, achievable or otherwise, is insufficiently ambitious for climate-vulnerable countries. When such normative expectations remain unspoken, they can lead to analyses that appear more ‘objective’ than they actually are. Disclosing these underlying assumptions helps create more transparent and informed discussions, both within research teams and between researchers and policymakers.

Responsibility: Who is expected to act, and on what grounds?

Different pathways distribute expectations differently between domestic sectors, European partners, international cooperation mechanisms, and future generations. Some pathways emphasise strong near-term emissions reductions, while others allow more reductions to take place later, relying more heavily on future technological developments such as large-scale carbon removal. Similarly, some pathways emphasise domestic mitigation efforts, while others rely more strongly on international coordination, including cooperation to support emission reductions across countries (under Article 6 of the Paris Agreement), climate finance, and technology transfer. These choices imply different understandings of what role the Netherlands should play within broader European and global transitions, and also differ in their assumptions about what other actors will or should do. Reflecting on responsibility clarifies the range of roles the Netherlands could adopt, from a frontrunner within Europe, to a contributor to global mitigation efforts, to a partner supporting low-carbon development elsewhere.

What this reveals

This example clarifies that considering a climate target is not only a question of feasibility, but also one of justice, responsibility, and purpose, thereby connecting to broader questions of international cooperation, solidarity, and policy coherence. Different targets and pathways embody different assumptions about fairness, different visions of how transition should occur, and different understandings of responsibilities within Europe and the wider world. The JDR framework can help to structure and make explicit these different considerations, supporting reflection on the normative considerations and assumptions that are underpinning different choices and pathways.

4.2 Agricultural transition or food system transformation

The policy question

Food security and the agricultural transition have become central domestic priorities in the Netherlands. The associated policy domain is increasingly shaped by multiple, competing priorities, such as reducing environmental pressures from agriculture (nitrogen pollution, biodiversity loss, emissions), maintaining farmer livelihoods and economic viability, ensuring affordable food, contributing to global food security, reducing pressures associated with Dutch consumption abroad, and maintaining trade relationships (Mook et al. 2026). These objectives are all interconnected and crucial, but do not always necessarily point towards the same policy choices.

Historically, agricultural policy has focused largely on domestic production, farmer incomes, and environmental impacts within the Netherlands. Increasing attention to global food systems has broadened the discussion towards questions of trade, consumption patterns, health, biodiversity, and impacts beyond national borders (AIV 2026; Ministry of Agriculture, Fisheries, Food Security and Nature 2026). Yet despite strong interlinkages between Dutch agriculture, food security, and international commodity trade, these issues are often addressed in separate policy domains. This raises questions about how different objectives, actors, and scales are connected in discussions about future food systems.

The JDR framework can be used to explore how Dutch agricultural transition policies relate to broader food system dynamics across scales and sectors. There is no single globally-agreed target for food system transformation (as in the climate example); there is, however, growing recognition that the transformation of food systems is central for achieving a wide range of policy goals, including climate, biodiversity, and health objectives, with increasing attention to paid to this challenge. The following section stipulates how the JDR framework is particularly useful in identifying and dealing with justice, direction, and responsibility dimensions within the debate of Dutch food and agricultural policy.

Applying the JDR lens

Justice: What is at stake, for whom?

Dutch food and agricultural systems are deeply embedded in global supply chains. Domestic production and consumption generate environmental pressures abroad through land use, resource extraction, emissions, and biodiversity loss (CBS 2024). Similarly, the Netherlands is impacted by production abroad. Distributional concerns include access to healthy and sustainable food and the environmental impacts of production and trade. Recognition justice draws attention to food cultures, knowledge systems, and affected communities, and procedural justice raises questions about how people are involved in shaping food system futures, including through emerging initiatives such as food councils. Expanding the system boundary raises questions about how the benefits and burdens of Dutch food production and consumption are distributed globally (and not just within the Netherlands). For example, environmental pressures associated with Dutch consumption may occur outside the Netherlands through land use change, resource use, or commodity production. At the same time, transition policies may create different consequences for farmers, consumers, producers in exporting countries, and future generations. These perspectives

highlight that questions about food system change are not only about environmental outcomes, but also about whose knowledge, interests, and values are recognised in defining desirable futures (RUAF 2019).

Direction: What sort of change is being pursued?

Dutch agricultural debates are often framed around questions of agricultural transition, including farming practices, emissions reduction, biodiversity, and the future of agricultural production. In contrast, recent global assessments increasingly frame food system challenges as requiring system-wide transformation rather than incremental adjustment: reports such as IPBES (2025) and Eat Lancet (2025) emphasise the need for coordinated changes across production, consumption, trade, health, and ecosystems. These perspectives highlight different possible directions of change, ranging from efficiency improvements within existing systems to more structural reconfiguration of food systems and their underlying drivers. These narratives are not mutually exclusive, but they imply different understandings of what food systems are for and how change should occur.

Different narratives underpin these framings, and different framings of the food challenge imply different directions of change. A market-oriented narrative emphasises improving environmental performance while maintaining productivity, innovation, and export-oriented agriculture, often linked to the Netherlands' role in global food trade and technological leadership. In contrast, food transformation perspectives emphasise sovereignty, namely the rights of communities to shape their own food systems, including production, distribution, and consumption, with greater attention to local contexts, equity, and ecological sustainability (Cabral et al. 2026; Chipuriro 2023; Deaconu et al. 2024; Doorninck et al. 2025; Tanzer et al. 2022; Wiebe 2023; Zollet et al. 2021). Examining these narratives does not itself determine which pathway is preferable, but does make explicit the assumptions about desirable futures that underpin different approaches.

Responsibility: Who is expected to act, and on what grounds?

Food systems transformations demand action across multiple actors and scales, including governments, private sector actors, and consumers. Responsibility may be placed on farmers to change production practices, consumers to change consumption patterns, companies to transform supply chains, or governments to create enabling conditions. Given the embeddedness of Dutch agriculture in global supply chains, responsibilities arguably extend beyond national borders, particularly in relation to environmental impacts and trade relations.

Broadening the scope of analysis also raises questions about whose interests and impacts are considered in defining food system objectives, and who has a role in shaping these objectives. Concepts frequently used in policy debates, such as food security, sustainability, or resilience, may implicitly or explicitly emphasise certain priorities while leaving others less visible. Within government, this highlights the need for improved coordination between sectoral policy siloes, since food intersects with health, economy and agriculture policy domains. By addressing explicitly who is expected to act and on what grounds, such policy objectives can be substantiated and made explicit.

What this reveals

Applying the JDR framework shows that the way a given issue is framed, strongly influences which solutions appear feasible or desirable. A focus on agricultural transition foregrounds farming practices and environmental performance within the Netherlands, whereas a food-system perspective brings in additional questions into view concerning health, trade, consumption,

biodiversity, and global sustainability. The JDR framework does not determine whether the Netherlands should prioritise agricultural transition or broader food system transformation, given that these are highly interdependent and require a parallel inquiry. Rather, the JDR lens helps reveal how different framings embody different assumptions about justice, different directions of change, and different allocations of responsibility across actors and scales. In doing so, it supports a more explicit discussion of the choices involved and their implications within an interconnected food system, increasing both transparency and accountability in policy processes and decision-making.

4.3 A ‘responsible’ supply of critical raw materials

The policy question

Dutch and EU energy transition and climate neutrality ambitions depend on technologies that require large quantities of critical raw materials such as lithium, cobalt, and rare earth elements. Conventional indicators show that extraction and processing of these types of materials are concentrated in regions facing significant environmental pressures and governance challenges, such as the mining of cobalt in the Congo or lithium and nickel extraction in Australia. A JDR lens can help explore how these patterns relate to questions of justice, transition pathways, and responsibility across global value chains, thereby shedding new light on the justice implications of the neutrality ambitions as well as the extraction and processing chain of such raw materials.

Applying the JDR lens

Justice: What is at stake, and for whom?

Increased demand for critical raw materials may create economic opportunities in producing countries, but it simultaneously contributes to environmental degradation, land-use change, water stress, labour risks, or social conflict elsewhere, especially in producing countries (de Haes & Lucas 2024). Bringing in a justice perspective therefore poses the question of who benefits from value creation along supply chains and who bears the associated costs. It also raises questions of recognition: are producing countries and affected communities viewed primarily as suppliers of strategic resources, as sources of risk, or as partners in the transition? Procedural considerations are useful here, as they concern who participates in defining sustainability standards, monitoring impacts, and shaping decisions that affect local livelihoods and environments (CMER 2025; de Haes & Brink 2025). Ultimately, a justice perspective may clarify how and where there are systemic imbalances within the discourse of raw material extraction and processing, especially with regards to spillovers (Dagnachew et al. 2026).

Direction: What kind of change is being pursued?

Recognising spillovers does not by itself determine how they should be addressed. In practice, different policy approaches can emphasise different ways of responding to the challenge of securing critical raw materials, depending on how the problem is framed and what is prioritised. A maintain orientation may focus on maintaining reliable access to critical raw materials in order to support climate and industrial objectives. In such situations, spillovers are primarily addressed through risk management approaches such as diversification of suppliers, strategic stockpiling, or efforts to stabilise supply chains. A reform orientation shifts attention to the structure and governance of global supply chains themselves. Responses may focus on strengthening sustainability standards, introducing corporate due diligence requirements, developing certification

schemes, or supporting environmental and labour safeguards in producing countries. The aim is less to change the overall system of material demand, and more to improve how existing supply chains operate and how impacts are governed. A transform orientation places greater emphasis on the underlying drivers of material demand and the systems that generate them. This includes strategies aimed at reducing material intensity and reconfiguring resource use, such as circular economy strategies, sufficiency approaches, recycling, alternative technologies, or changes in system design. In this framing, spillovers are addressed not only within supply chains, but also through adjustments to the patterns of production and consumption that generate them. These orientations are also relevant more broadly, to the energy transition itself (Dagnachew et al. 2026): policies may maintain existing energy system structures while reducing their impacts, reform how the system is governed and supplied, or seek to transform patterns of energy production and consumption.

Responsibility: Who is expected to act, and on what grounds?

If Dutch and European demand contributes to environmental and social impacts elsewhere, who should be expected to act, and on what grounds? Different answers are possible. Responsibility may be linked to contribution, reflecting the role of European consumption and policy demand in driving extraction. It may be linked to capacity, recognising the resources, authority, or ability of governments, firms, and consumers to take action, or to leverage, which focuses more on the position of actors within a system and their ability to influence the behaviour of others or shape outcomes through for example procurement, investment, trade policy, or international cooperation.

Many contemporary policy instruments introduced to regulate global supply chains can be understood as attempts to operationalise these responsibilities. Demand-side measures such as supply-chain due diligence requirements, sustainability standards, and responsible sourcing initiatives seek to assign obligations to companies and public authorities. On the supply side, producing countries can also shape responsibility allocation through policies that govern extraction and exports, for example Indonesia's nickel export restrictions and related requirements for domestic value addition (Adegboye et al. 2025).

Responsibility also relates to participation and recognition. Efforts to include producing countries and affected communities in decision-making processes often depend on whether meaningful engagement is recognised as a responsibility rather than as a voluntary addition. For example, instruments such as Free, Prior and Informed Consent (FPIC) illustrate this tension. FPIC is widely recognised as a principle intended to ensure that affected communities can meaningfully shape decisions about resource extraction. From a responsibility perspective, the key issue is not only whether FPIC exists, but who is responsible for ensuring that it is upheld, verified, and given consequence in decision-making processes across the supply chain. Without clear responsibility allocation, procedural commitments may remain difficult to implement in practice (Mathai 2025).

What this reveals

Applying the JDR lens shows different ways in which critical raw materials can be interpreted as a governance challenge that connects European transition ambitions to social, environmental, and political dynamics elsewhere in the world. The framework reveals how different understandings of justice shape which impacts are considered relevant, how different transition directions imply different responses to those impacts, and how responsibility can be allocated across actors and scales. In doing so, it moves the discussion beyond securing access to materials towards broader

questions about the kind of transition being pursued, whose interests it serves, and how its consequences are addressed within global value chains.

5 Final reflections

Sustainability transitions cannot be understood solely in terms of technical feasibility or environmental performance. They are shaped by different ways of defining problems, drawing system boundaries, weighing competing objectives, and assigning responsibility – entanglements that become ever more salient as sustainability transitions unfold in an increasingly interconnected and contested international context. Decisions taken in one place can have far-reaching consequences elsewhere, while different actors may legitimately disagree about what constitutes a desirable transition, how its costs and benefits should be distributed, and who should be expected to act. Geopolitical tensions, shifting patterns of international cooperation, resource dependencies, and growing awareness of transboundary spillovers all reinforce the need to consider how domestic policy choices relate to broader global systems.

Drawing on insights from the literature on sustainability transitions, environmental justice, systems thinking, and governance, this report has proposed the Justice–Direction–Responsibility (JDR) framework for analysing sustainability transitions in an interconnected world. Applying the JDR framework does not produce a single ‘correct’ answer for how sustainability transitions should unfold. Instead, it makes visible the assumptions, value judgements, and trade-offs that underpin different policy choices. In doing so, it helps distinguish disagreements that stem from empirical uncertainty from those that arise because actors hold different views about what outcomes are desirable, who should benefit, whose interests should be prioritised, and who should bear responsibility for change. It creates a more transparent basis for analysing alternatives, comparing perspectives, and reflecting on the implications of different transition pathways. This, in turn, can support more informed dialogue between researchers, policymakers, and other stakeholders, while strengthening accountability for the choices that are ultimately made. In this sense, the JDR framework is intended to help move discussions from implicit normative disagreement to explicit, structured deliberation.

In relating the JDR framework to a case study like the Netherlands, this report has situated Dutch sustainability transitions within broader international systems of production, trade, and environmental change. In doing so, it has shown how questions of justice, transition direction, and responsibility emerge across these interconnected, international systems, and why they deserve explicit consideration alongside more conventional technical and economic analyses. The JDR framework provides a structured way to reflect on these connections, helping to identify where additional evidence, broader stakeholder engagement, or institutional safeguards may be needed.

Ultimately, the value of the JDR framework lies not in resolving normative debates, but in improving how they are conducted. By making questions of justice, direction, and responsibility explicit, it supports more transparent and reflective reasoning about sustainability transitions and helps clarify how the Netherlands could navigate its role within an interconnected world while remaining accountable for the broader implications of its transition choices.

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Appendix: Key terms

The report employs certain terms that remain subject to debate. While it is beyond the scope of this report to provide detailed discussions of each individual term, brief clarifications are provided below (and, where relevant in text) to signal key interpretive differences. The broader point made in relation to justice considerations also applies to language use more generally: shared understanding does not depend on agreement on precise definitions, but on clarity about what is being communicated, by whom, and with what intent and implications.

Table A.1
Glossary of key terminology

Justice– Direction– Responsibility (JDR) framework	The JDR Framework is a conceptual and analytical framework for examining sustainability transitions through three interrelated dimensions: justice, direction, and responsibility. The framework supports structured reflection on how transitions are shaped, how their benefits and burdens are distributed, what kinds of change are pursued, and how responsibilities are allocated across actors and scales. Rather than prescribing a preferred transition pathway, it helps make underlying assumptions, trade-offs, and normative choices more explicit in transitions research and policy.
Justice lens	The term ‘justice’ itself is primarily used in wider literature to refer to normative issues around fairness, equity, and the systemic distribution of benefits and burdens, often focusing on marginalised groups. A <i>justice lens</i> , in contrast, helps to make different and sometimes competing justice claims explicit by using different underlying justice dimensions and philosophies to expose different claims, without passing judgment on the justness of these claims (McCauley & Heffron 2018; Newell & Mulvaney 2013).
Transition	Transitions are complex and long-term processes comprising multiple actors involving systemic and deep structural changes in ‘the overall configuration of transport, energy, and agri-food systems, which entail technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge’ (Geels 2011).
Transition policy	Transition policy refers to intentional coordination and steering of a transition by a government authority or executed by non-state actors, mobilizing relevant actors, developing strategies and policy instruments and create conditions to give direction, facilitate and support the actual transition process. A transition policy (or plan) often takes the form of a strategic, time-bound framework outlining how an organization, government, or entity shifts its operations, assets, and business model toward a specific goal, most commonly a net-zero or sustainable, low-carbon economy.
Transition strategies	Transition strategies and transition policies differ primarily in scope, with strategies providing the long-term, high-level vision and ‘why’ of change, while policies act as the specific, actionable ‘how’ to implement that change. Strategies are often iterative and adaptive, whereas policies are typically structured to regulate, incentivise, or manage the transition process.

Transformation	Transformation – and transformative change – is a process that involves fundamental, system-wide shifts in views, structures and practices. Although the specific pathways to achieve transformation vary depending on context and societal baselines, the ultimate goal is to overcome the systems and structures that perpetuate environmental problems and social injustice. <i>Note: The terms ‘transitions’ and ‘transformations’ are often used interchangeably to refer to processes of transformative change. In environmental governance literature, a distinction is often made between transitions, which typically refer to orderly shifts occurring in specific sectors, systems or locations (e.g. the energy system), and transformations, which refer to broader and deeper societal shifts taking place across multiple systems (e.g. the Industrial Revolution) (O’Brien et al. 2025).</i>
Sustainability transition	A sustainability transition is a long-term, fundamental, and multidimensional shift in societal systems – such as energy, mobility, and food – towards more environmentally sustainable and socially just modes of production and consumption. They differ from historically studied transitions as they are intentionally steered and goal-oriented (Köhler et al. 2019), driven by the active aim of addressing global environmental crises like climate change, biodiversity loss, and resource scarcity.
Just transition	Broadly speaking, just transitions refer to approaches that explicitly address how ongoing sustainability transitions distribute costs, benefits, and responsibilities in a way that is seen as equitable. Although the term is widely used, its meaning and implications for policy and research often remain contested and implicit (Oates & Verveld 2024). Generally it is used to reflect a desire to address environmental sustainability in a way that also enhances social equity, based on the idea that the sustainability transition (whether towards zero-carbon, circularity, more efficient resource use, or any other form of sustainability-related future) should also be equitable and inclusive, benefiting both people and the planet.